

# School of Medical and Allied Sciences

Bachelor of Pharmacy
(B. Pharm.)
Program Code: 12

(2022-2026)

Approved in the 29<sup>th</sup> Meeting of Academic Council Held on 09 August 2022



Registrar ik is, Wangalam University Schila Road, Gurugram, (Haryana)



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#### **PREFACE**

The KRMU envisions all its programs in the best interest of their students and in this endeavour it offers a new vision to all its courses. Through its programs it aims to provide a focused, student-centric syllabus with an agenda to structure the teaching-learning experiences experientially.

The curriculum strengthens students' experiences and prepare the students for both, academia and employability, sustainability and life-long learning.

Each program reflects the promise to accomplish the learning outcomes by studying the courses. The graduate attributes encompass values related to well-being, emotional stability, critical thinking, social justice and also skills for entrepreneurship.

The K.R. Mangalam University hopes the curriculum will help students in making an informed decision at the time of working in the field of pharmacy.

#### ACKNOWLEDGEMENT

The development of the curriculum for Undergraduate degree courses in the School of Medical and Allied Sciences is a result of thoughtful deliberations at various stages of dedicated and specialized experts. This curriculum has been framed to meet the expectations of an academically challenging environment, develop problem-solving skills by students and align with current standards and to enrich the students to make them self-enablers and/or match job requirements on successful completion of their degrees.

I wish to acknowledge all our experts who have been involved in the process of developing this curriculum for B. Pharmacy. I am greatly gratified Ms. Manvi Arora for her supervision contribution, guidance, and support throughout the development of this curriculum. Special thanks and gratitude to Prof. Aditya Mallik Vice Chancellor, K.R. Mangalam University who have been instrumental and encouraging throughout the process of developing this curriculum. Last, but not the least, I also sincerely thanks to all faculty members for preparation of this handbook for B. Pharmacy program.

Dean

**School of Medical and Allied Sciences** 

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#### 1. Introduction

The K.R. Mangalam Group has made a name for itself in the field of education. The K.R. Mangalam story goes back to the chain of schools that offered an alternative option of world-class education, pitching itself against the established elite schools, which had enjoyed a position of monopoly till then. Having blazed a new trail in school education, the focus of the group was aimed at higher education.

K.R. Mangalam University is the fastest-growing higher education institute in Gurugram, India. K. R. Mangalam University was established under the Haryana Private University Act 2006, received the approval of Haryana Legislature vide Amendment Act # 36 of 2013 and consent of the Hon'ble Governor of Haryana on 11th April 2013, which was published in the Gazette notification vide Leg. No.10/2013, dated 3rd May 2013.

Since its inception in 2013, the University has been striving to fulfil its prime objective of transforming young lives through ground-breaking pedagogy, global collaborations, and world-class infrastructure. Resources at K.R Mangalam University have been continuously upgraded to optimize opportunities for the students. Our students are groomed in a truly interdisciplinary environment where they grow up with integrative skills through interaction with students from engineering, social sciences, management and other study streams.

#### 1.1 K. R. Mangalam University is unique because of its

- I. Enduring legacy of providing education to high achievers who demonstrate leadership in diverse fields.
- II. Protective and nurturing environment for teaching, research, creativity, scholarship, social and economic justice.

#### 1.2 Objectives

- 1. To impart undergraduate, post-graduate and Doctoral education in identified areas of higher education.
- 2. To undertake research programs with industrial interface.
- 3. To integrate its growth with the global needs and expectations of the major stake holders through teaching, research, exchange & collaborative programs with foreign, Indian Universities/Institutions and MNCs.
- 4. To act as a nodal center for transfer of technology to the industry.

To provide job oriented professional education to the student community with particular focus on Haryana

#### 2. About School

School of Medical and Allied Sciences mainly focused on training to students for various subjects and practical aspects related to drug formulation and testing along with co-curricular development. School offers Diploma, undergraduate, post graduate courses in pharmacy and Bachelor degree in physiotherapy post. We provide an extra edge to our students by teaching and training by leading Pharma industry experts to facilitate industry academia interaction, participation in conferences / workshops / skill development programs, carrier guidance, coaching for GPAT and other competitive examinations. We encourage students to participate in various health camps organized by department to make general awareness amongst people regarding various diseases like diabetes, hypertension, communicable and non-communicable diseases. We provide placement assistance to students for getting jobs in various government and private laboratories. We have tie up with various pharmaceutical industries like Dabur Research Foundation, Sun Pharma, Arbo Pharma, Indian Pharmacopeial Commission, Catalyst Clinical Services, Suraksha Pharma, Medicamen Biotech , Mankind Pharma etc. which provide various carrier opportunities in pharmaceutical production, pharmaceutical quality control, quality assurance, pharmaceutical sales & distribution, drug information services, health insurance, medical coding, supply chain management, forensic sciences, pharmacovigilance, product management team, clinical trials, clinical data management and in Indian Pharmacopeia Commission.

#### 3. School Vision

To contribute towards healthcare needs of the society by producing a skilled, motivated and accessible workforce dedicated towards achieving health for all.

#### 4. School Mission

**M1:** To produce self-motivated, self-reliant and socially sensitive young healthcare professionals catering to the needs of academia, industry and research.

**M2:** To create a centre of excellence for learning and research in the field of pharmaceutical and allied health sciences with inter-disciplinary approach in emerging area of science and technology with focus on industry-academia interaction.

**M3:** To nurture transformational research for the benefit of the society.

**M4:** To interlink pharmaceutical and allied health sciences with interdisciplinary life sciences.

### 5. Programs offered by the school

School offers diploma, undergraduate, post-graduate and doctoral Programme in Pharmacy all these programs are designed to impart scientific knowledge to the students and will provide theoretical as well as practical training in their respective fields. The programs offered by the school are approved by Pharmacy Council of India, New Delhi.

### 5.1 B. Pharmacy

School of Medical and Allied Sciences offers B. Pharmacy degree course which is duly approved by the Pharmacy Council of India (F.No.01.109/2020-PCI, minutes of 109thcentral council meeting on 08-09April,2020, Item No. HR-17 /2020-2021). The curriculum has been specifically designed so as to impart latest knowledge and skills relevant to Pharmaceutical Sciences including Industrial Visits / Training / Guest Lectures of Experts from Industry and Academia.

#### **5.2 Eligibility Criteria:**

### 5.2.1 First year B. Pharm:

Candidate shall have passed 10+2 examination conducted by the respective state/central government authorities recognized as equivalent to 10+2 examination by the Association of Indian Universities (AIU) with English as one of the subjects and Physics, Chemistry, Mathematics (P.C.M) and or Biology (P.C.B / P.C.M.B.) as optional subjects individually. Any other qualification approved by the Pharmacy Council of India as equivalent to any of the above examinations.

# **5.2.2** B. Pharm lateral entry (to third semester):

A pass in D. Pharmacy course from an institution approved by the Pharmacy Council of India under section 12 of the Pharmacy Act.

#### **4.2.3** Course Outline:

Inorganic chemistry / Organic chemistry / Pharmaceutics / Analysis / Environmental Sciences / Biochemistry / Pharmaceutical Chemistry / Pharmacology / Pharmacognosy.

# 4.2.4 Career Options:

Opportunities exist in Drug Inspector Drug Analyst Research & Development of Drugs, Cosmetics, Diagnostics and Vaccines, Drug Patents, Medical Writing, Quality Control, Clinical Research, Hospital Pharmacy, Community Pharmacy/Pharmaceutical Marketing, pharmaceutical industries, regulatory education and forensic drug laboratories.

# 4.2.5 Program Duration

The course of study for B. Pharmacy shall extend over a period of eight semesters (four academic years) and six semesters (three academic years) for lateral entry students. The curriculum and syllabi for the program shall be prescribed from time to time by Pharmacy Council of India, New Delhi.

### 4.2.6 Class Timings

The classes will be held from Monday to Friday from 09:10 am to 04:00 pm.

### 5.2.7 Syllabus

The syllabus of B. Pharmacy programs offered by SMAS is as per the norms of Pharmacy Council of India, New Delhi as mentioned below Programme Duration: - 4 Years the maximum period for the completion of the B. Pharmacy Programme offered by the University shall be four years.

# 5. Syllabus and Scheme of Studies of B. Pharmacy Programme

# 6.1 Four year B. Pharmacy Programme at a glance

|         | Semester<br>I | Semester II | Semester<br>III | Semester<br>IV | Semester<br>V | Semester<br>V I | Semester<br>VII | Semester<br>VIII | Total |
|---------|---------------|-------------|-----------------|----------------|---------------|-----------------|-----------------|------------------|-------|
| Courses | 12            | 10          | 8               | 9              | 9             | 9               | 11              | 6                | 74    |
| Credits | 30            | 29          | 24              | 28             | 25            | 22              | 27              | 23               | 208   |

|             | Semester-I                             |   |   |   |   |
|-------------|--|---|---|---|---|
| Course code | Course Title                           | L | T | P | C |
| BP101T      | Human Anatomy and Physiology I– Theory | 3 | 1 |   | 4 |

| BP102T                | Pharmaceutical Analysis I – Theory                  | 3  | 1 |    | 4  |
|-----------------------|---|----|---|----|----|
| BP103T                | Pharmaceutics I – Theory                            | 3  | 1 |    | 4  |
| BP104T                | Pharmaceutical Inorganic Chemistry – Theory         | 3  | 1 |    | 4  |
| BP105T                | Communication skills – Theory *                     | 2  | - |    | 2  |
| BP106RBT/<br>BP106RMT | Remedial Biology/<br>Remedial Mathematics – Theory* | 2  | - |    | 2  |
|                       | Human Anatomy and Physiology –                      |    |   |    |    |
| BP107P                | Practical   |    | - | 4  | 2  |
| BP108P                | Pharmaceutical Analysis I – Practical               |    | - | 4  | 2  |
| BP109P                | Pharmaceutics I – Practical                         |    | - | 4  | 2  |
| BP110P                | Pharmaceutical Inorganic Chemistry – Practical      |    | - | 4  | 2  |
| BP111P                | Communication skills – Practical*                   |    | - | 2  | 1  |
| BP112RBP              | Remedial Biology – Practical*                       |    | - | 2  | 1  |
|                       | Total   | 16 | 4 | 20 | 30 |

|             | Semester-II                                    |    |   |    |    |  |
|-------------|--|----|---|----|----|--|
| Course code | Course Title                                   | L  | T | P  | С  |  |
| BP201T      | Human Anatomy and Physiology II – Theory       | 3  | 1 |    | 4  |  |
| BP202T      | Pharmaceutical Organic Chemistry I – Theory    | 3  | 1 |    | 4  |  |
| BP203T      | Biochemistry – Theory                          | 3  | 1 |    | 4  |  |
| BP204T      | Pathophysiology – Theory                       | 3  | 1 |    | 4  |  |
| BP205T      | Computer Applications in Pharmacy – Theory *   | 3  | - |    | 3  |  |
| BP206T      | Environmental sciences – Theory *              | 3  | - |    | 3  |  |
| BP207P      | Human Anatomy and Physiology II –Practical     |    | - | 4  | 2  |  |
| BP208P      | Pharmaceutical Organic Chemistry I– Practical  |    | - | 4  | 2  |  |
| BP209P      | Biochemistry – Practical                       |    | - | 4  | 2  |  |
| BP210P      | Computer Applications in Pharmacy – Practical* |    | - | 2  | 1  |  |
| Total       |  | 32 | 4 | 14 | 29 |  |

|             | Semester-III |   |   |   |   |
|-------------|--------------|---|---|---|---|
| Course code | Course Title | L | T | P | C |

| Total   |   | 12 | 4 | 16 | 24 |
|---------|---|----|---|----|----|
|         |   |    |   |    |    |
| BP 308P | Pharmaceutical Engineering –Practical           |    | - | 4  | 2  |
| BP307P  | Pharmaceutical Microbiology – Practical         |    | - | 4  | 2  |
| BP306P  | Physical Pharmaceutics I – Practical            |    | - | 4  | 2  |
| BP305P  | Pharmaceutical Organic Chemistry II – Practical |    | - | 4  | 2  |
| BP304T  | Pharmaceutical Engineering – Theory             | 3  | 1 |    | 4  |
| BP303T  | Pharmaceutical Microbiology – Theory            | 3  | 1 |    | 4  |
| BP302T  | Physical Pharmaceutics I – Theory               | 3  | 1 |    | 4  |
| BP301T  | Pharmaceutical Organic Chemistry II –<br>Theory | 3  | 1 |    | 4  |

|             | Semester-IV                                    |    |   |    |    |
|-------------|--|----|---|----|----|
| Course code | Course Title                                   | L  | T | P  | C  |
| BP401T      | Pharmaceutical Organic Chemistry III- Theory   | 3  | 1 |    | 4  |
| BP402T      | Medicinal Chemistry I – Theory                 | 3  | 1 |    | 4  |
| BP403T      | Physical Pharmaceutics II – Theory             | 3  | 1 |    | 4  |
| BP404T      | Pharmacology I – Theory                        | 3  | 1 |    | 4  |
| BP405T      | Pharmacognosy and Phytochemistry I– Theory     | 3  | 1 |    | 4  |
| BP406P      | Medicinal Chemistry I – Practical              |    | - | 4  | 2  |
| BP407P      | Physical Pharmaceutics II – Practical          |    |   | 4  | 2  |
| BP408P      | Pharmacology I – Practical                     |    | - | 4  | 2  |
| BP409P      | Pharmacognosy and Phytochemistry I – Practical |    | - | 4  | 2  |
| Total       |  | 15 | 5 | 16 | 28 |

|             | Semester-V                                      |    |   |    |    |  |  |  |  |
|-------------|---|----|---|----|----|--|--|--|--|
| Course code | Course Title                                    | L  | T | P  | C  |  |  |  |  |
| BP501T      | Medicinal Chemistry II – Theory                 | 3  | 1 |    | 4  |  |  |  |  |
| BP502T      | Industrial PharmacyI– Theory                    | 3  | 1 |    | 4  |  |  |  |  |
| BP503T      | Pharmacology II – Theory                        | 3  | 1 |    | 4  |  |  |  |  |
| BP504T      | Pharmacognosy and Phytochemistry II- Theory     | 3  | 1 |    | 4  |  |  |  |  |
| BP505T      | Pharmaceutical Jurisprudence – Theory           | 3  | 1 |    | 4  |  |  |  |  |
| BP506P      | Industrial PharmacyI – Practical                |    | 0 | 4  | 2  |  |  |  |  |
| BP507P      | Pharmacology II – Practical                     |    | 0 | 4  | 2  |  |  |  |  |
| BP508P      | Pharmacognosy and Phytochemistry II – Practical |    | 0 | 4  | 2  |  |  |  |  |
|             | Total   | 15 | 5 | 12 | 26 |  |  |  |  |

|             | Semester-VI                                    |    |   |    |    |  |  |  |  |
|-------------|--|----|---|----|----|--|--|--|--|
| Course code | Course Title                                   | L  | T | P  | C  |  |  |  |  |
| BP601T      | Medicinal Chemistry III – Theory               | 3  | 1 |    | 4  |  |  |  |  |
| BP602T      | Pharmacology III – Theory                      | 3  | 1 |    | 4  |  |  |  |  |
| BP603T      | Herbal Drug Technology – Theory                | 3  | 1 |    | 4  |  |  |  |  |
| BP604T      | Biopharmaceutics and Pharmacokinetics – Theory | 3  | 1 |    | 4  |  |  |  |  |
| BP605T      | Pharmaceutical Biotechnology – Theory          | 3  | 1 |    | 4  |  |  |  |  |
| BP606T      | Quality Assurance –Theory                      | 3  | 1 |    | 4  |  |  |  |  |
| BP607P      | Medicinal chemistry III – Practical            |    | 0 | 4  | 2  |  |  |  |  |
| BP608P      | Pharmacology III – Practical                   |    | 0 | 4  | 2  |  |  |  |  |
| BP609P      | Herbal Drug Technology – Practical             |    | 0 | 4  | 2  |  |  |  |  |
|             | Total  | 18 | 5 | 12 | 30 |  |  |  |  |

|             | Semester-VII                                 |    |   |    |    |
|-------------|--|----|---|----|----|
| Course code | Course Title                                 | L  | T | P  | C  |
| BP701T      | Instrumental Methods of Analysis – Theory    | 3  | 1 |    | 4  |
| BP702T      | Industrial PharmacyII – Theory               | 3  | 1 |    | 4  |
| BP703T      | Pharmacy Practice – Theory                   | 3  | 1 |    | 4  |
| BP704T      | Novel Drug Delivery System – Theory          | 3  | 1 |    | 4  |
| BP705P      | Instrumental Methods of Analysis – Practical | 4  | 0 |    | 2  |
| BP706PS     | Practice School                              |    | 0 | 12 | 6  |
| 'otal       | 1  | 16 | 4 | 12 | 24 |

|   | Semester-VIII  |   |   |    |    |
|---|--|---|---|----|----|
| Course code   | Course Title   | L | T | P  | С  |
| BP801T  | Biostatistics and Research Methodology   | 3 | 1 |    | 4  |
| BP802T  | Social and Preventive Pharmacy   | 3 | 1 |    | 4  |
| BP803ET   | Pharma Marketing Management  |   |   |    |    |
| BP804ET   | Pharmaceutical Regulatory Science  |   |   |    |    |
| BP805ET   | Pharmacovigilance  |   |   |    |    |
| BP806ET BP807ET BP808ET BP809ET BP810ET BP811ET BP812ET | Quality Control and Standardization of Herbals Computer Aided Drug Design Cell and Molecular Biology Cosmetic Science Experimental Pharmacology Advanced Instrumentation Techniques Dietary Supplements and Nutraceuticals | - |   |    |    |
| BP813PW   | Project Work   |   | - | 12 | 6  |
| Total   |  |   | 4 | 12 | 22 |

## **Programme Educational Objectives (PEO)**

**PEO1:** To produce pharmacy graduates with profound knowledge and high technical skills to meet various aspects in wide areas of Pharmaceutical industry.

**PEO2:** To enable pharmacy graduates to gain theoretical and practical knowledge in various subjects to discover novel formulation for the benefits of the society.

**PEO3:** To prepare entrepreneurs in Pharma sector with effective communication skills, teamwork and ethical attitude with high integrity for the betterment of the community and the society.

**PEO4:** To promote and train the pharmacy graduates towards contribution of health care system and patient counselling for prevention and treatment of diseases.

**PEO5:** To encourage the pharmacy graduates for lifelong learning and highly competent career prospect related to interdisciplinary pharmaceutical sciences.

# **Programme Outcomes**

The entire curriculum of B. Pharmacy is planned to have following Programme outcomes

**PO 1 Pharmacy Knowledge**: Possess the core and basic knowledge associated with the profession of pharmacy.

**PO 2 Thinking Abilities**: Examine issues rationally and logically; shall acquire, evaluate, and synthesize information and knowledge relevant to an identified problem.

**PO3 Planning Abilities:** Demonstrate effective planning abilities including time management, resource management, delegation skills and organizational skills.

**PO 4 Leadership Skills**: Acquire knowledge of leadership traits and skills through curricular and co-curricular activities and develop skills and abilities that will enable him/her to lead or actively contribute to organizational improvement.

PO 5 Professional Identity: Understand, analyze and communicate the value of their professional roles in society.

**PO 6 Pharmacy and Society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety and legal issues and the consequent responsibilities relevant to the professional pharmacy practice.

**PO 7 Environment and sustainability:** Understand the impact of the professional pharmacy solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development

**PO 8 Professional Ethics**: Honor personal values and apply ethical principles in professional and social contexts and take responsibility for the outcomes associated with the decisions.

**PO 9 Individual or teamwork:** Understand the need for leadership and team-building for fulfillment of practice, professional and societal responsibilities.

**PO 10 Communication:** Develop good communication skills so as to communicate effectively with the pharmacy community and with society at large.

**PO 11 Modern & Usage:** Learn, select, and apply appropriate methods and procedures, resources, and modern pharmacy-related computing tools with an understanding of the limitations.

**PO 12 Life-long Learning:** Recognize the need for and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change. Self-assess and use feedback effectively from others to identify learning needs and to satisfy these needs on an ongoing basis.

# **Programme Specific Outcomes (PSO)**

After completion of the program students are able:

**PSO1**. To impart theoretical & Practical knowledge among students in the various fields of pharmaceutical sciences viz., Pharmaceutics, Pharmaceutical Chemistry, Pharmacology, Pharmacology, Pharmaceutical jurisprudence and Pharmaceutical marketing etc.

**PSO2**. To develop the skill acquired in various regulatory aspects related to clinical, preclinical and medical devices used for human use. The students will be able to experience hand on manufacturing, packaging of drugs. After completing this course students will be able to work as a skilled pharmacist in manufacturing of drugs and cosmetics

#### FOUR YEAR B. PHARM PROGRAMME AT A GLANCE

|         | Semester I | Semester II | Semester III | Semester IV | Semester V |
|---------|------------|-------------|--------------|-------------|------------|
| Courses | 12         | 10          | 8            | 9           | 8          |
| Credits | 30         | 29          | 24           | 28          | 26         |

|         | Semester V I | Semester VII | Semester VIII | Total |
|---------|--------------|--------------|---------------|-------|
| Courses | 9            | 6            | 13            | 75    |
| Credits | 30           | 24           | 22            | 213   |

# **Semester-I**

| BP 101T | Human Anatomy And Physiology-I | L | Т | P | С |
|---------|--------------------------------|---|---|---|---|
|         |                                |   |   |   |   |

| Version 2.0                |              | 3 | 1 | 0 | 4 |
|----------------------------|--------------|---|---|---|---|
| <b>Total Contact Hours</b> | 45 Hours     |   |   |   |   |
| Pre-requisites/Exposure    | Pharmacology |   |   |   |   |
| Co-requisites              | Pharmacology |   |   |   |   |

#### **Course Objectives**

# **Upon completion of this course the student should be able to:**

- 1. Explain the gross morphology, structure and functions of various organs of the human body
- 2. Describe the various homeostatic mechanisms and their imbalances
- 3. Identify the various tissues and organs of different systems of human body
- 4. Perform the various experiments related to special senses and nervous system
- 5. Appreciate coordinated working pattern of different organs of each system

#### **Course Outcomes (CO)**

#### On completion of this course, the student will be able to:

- CO1. This subject is designed to impart fundamental knowledge on the structure and functions of the various systems of the human body.
- CO2. It also helps in understanding both homeostatic mechanisms
- CO3. The subject provides the basic knowledge required to understand the various disciplines of pharmacy.
- CO4. It enlightens the students about the cells, various types of tissues in human body, skeleton system, skeletal and smooth muscles.

CO5. It also deals with the composition of blood, blood groups, blood coagulation, various disease-causing agents and preventive measures, balanced diet, disorders and treatment involve in nutritional deficiency.

|     | Programme and Course Mapping |     |     |     |     |     |     |     |     |       |      |      |       |       |
|-----|------------------------------|-----|-----|-----|-----|-----|-----|-----|-----|-------|------|------|-------|-------|
| CO  | PO1                          | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO 10 | PO11 | PO12 | PSO 1 | PSO 2 |
| CO1 | 3                            | 1   | -   | -   | 2   | 3   | 1   | -   | 1   | -     | 2    | 3    | 3     | 3     |
| CO2 | 3                            | 2   | -   | -   | 2   | 3   | -   | 1   | 1   | -     | 2    | 2    | 2     | 3     |
| CO3 | 3                            | 1   | -   | -   | 3   | 3   | -   | 2   | 1   | -     | 2    | -    | 3     | 3     |
| CO4 | 3                            | 1   | -   | -   | 3   | 3   | -   | 2   | 1   | -     | 2    | -    | 3     | 3     |
| CO5 | 3                            | -   | -   | -   | 3   | 3   | -   | 2   | -   | -     | 2    | -    | 2     | 2     |

1=lightly mapped

2= moderately mapped

3=strongly mapped

| Unit   | Relevance to the local, national, regional and global developmental | Relevance to the local, national, regional and global developmental needs  Relevance To the Employability/ Entrepreneurship/ Skill Development Relevance to the Professional Ethics, Gender, Human Values, Environment & Sustainability |          |        |               |                  | SDG  | NEP                 | POE/4 <sup>th</sup> IR |              |                              |   |                   |  |
|--------|---|---|----------|--------|---------------|------------------|--|---------------------|------------------------|--------------|------------------------------|---|-------------------|--|
| BP101T | Local   | Regional  | National | Global | Employability | Entrepreneurship | Skill Development  | Professional Ethics | Gender                 | Human Values | Environment & Sustainability |   |                   |  |
| Unit I | -   | -   | -        | -      | -             | -                | Enrichment of thinking ability and creativity as well a tool for building confidence | -                   | -                      | -            | -                            | SDG 3:<br>Ensure<br>healthy<br>lives<br>and<br>promote<br>well- | NEP (9.1-<br>9.3) | Student centric Technical Skills that match Industry Needs |

|         |   |   |   |   |   |   | in the students which is done by providing opportunities to students to give presentations and debates in the classroom   |   |   |   |   | being for all at all ages.  SDG 4.4: Skills for Decent Work                        |               |  |
|---------|---|---|---|---|---|---|---|---|---|---|---|--|---------------|--|
| Unit II | - | - | - | - | - | - | Enrichment of thinking ability and creativity as well a tool for building confidence in the students which is done by providing opportunities to students to give presentations | - | - | - | - | SDG 3: Ensure healthy lives and promote well- being for all at all ages.  SDG 4.4: | NEP (9.1-9.3) | Student centric Technical Skills that match Industry Needs |

|          |  |   |   |   |   | and debates<br>in the<br>classroom   |   |   |   | Skills<br>for<br>Decent<br>Work   |               |  |
|----------|--|---|---|---|---|--|---|---|---|---|---------------|--|
| Unit III |  | - | - | - | - | Enrichment of thinking ability and creativity as well a tool for building confidence in the students which is done by providing opportunities to students to give presentations and debates in the classroom | - | - | - | SDG 3: Ensure healthy lives and promote well- being for all at all ages.  SDG 4.4: Skills for Decent Work | NEP (9.1-9.3) | Student centric Technical Skills that match Industry Needs |

| Unit IV | - | - | - | - | - | - | Enrichment    | - | -           | - | - | SDG 3:  | NEP (9.1- | Student centric     |
|---------|---|---|---|---|---|---|---------------|---|-------------|---|---|---------|-----------|---------------------|
|         |   |   |   |   |   |   | of thinking   |   |             |   |   | Ensure  | 9.3)      | Technical Skills    |
|         |   |   |   |   |   |   | ability and   |   |             |   |   | healthy |           | that match Industry |
|         |   |   |   |   |   |   | creativity as |   |             |   |   | lives   |           | Needs               |
|         |   |   |   |   |   |   | well a tool   |   |             |   |   | and     |           |                     |
|         |   |   |   |   |   |   | for building  |   |             |   |   | promote |           |                     |
|         |   |   |   |   |   |   | confidence    |   |             |   |   | well-   |           |                     |
|         |   |   |   |   |   |   | in the        |   |             |   |   | being   |           |                     |
|         |   |   |   |   |   |   | students      |   |             |   |   | for all |           |                     |
|         |   |   |   |   |   |   | which is      |   |             |   |   | at all  |           |                     |
|         |   |   |   |   |   |   | done by       |   |             |   |   | ages.   |           |                     |
|         |   |   |   |   |   |   | providing     |   |             |   |   |         |           |                     |
|         |   |   |   |   |   |   | opportunities |   |             |   |   |         |           |                     |
|         |   |   |   |   |   |   | to students   |   |             |   |   | SDG     |           |                     |
|         |   |   |   |   |   |   | to give       |   |             |   |   | 4.4:    |           |                     |
|         |   |   |   |   |   |   | presentations |   |             |   |   | Skills  |           |                     |
|         |   |   |   |   |   |   | and debates   |   |             |   |   | for     |           |                     |
|         |   |   |   |   |   |   | in the        |   |             |   |   | Decent  |           |                     |
|         |   |   |   |   |   |   | classroom     |   |             |   |   | Work    |           |                     |
|         |   |   |   |   |   |   |               |   |             |   |   |         |           |                     |
|         |   |   |   |   |   |   |               |   |             |   |   |         |           |                     |
| Unit V  | - | _ | _ | - | - | _ | Enrichment    | _ | Gender      | _ | _ | SDG 3:  | NEP       | Student centric     |
|         |   |   |   |   |   |   | of thinking   |   | Based       |   |   | Ensure  | 21.1-     | Technical Skills    |
|         |   |   |   |   |   |   | ability and   |   | knowledge   |   |   | healthy | 21.10:    | that match Industry |
|         |   |   |   |   |   |   | creativity as |   | will        |   |   | lives   |           | Needs               |
|         |   |   |   |   |   |   | well a tool   |   | benefit the |   |   | and     | Adult     |                     |
|         |   |   |   |   |   |   | for building  |   | students to |   |   | promote | Education |                     |
|         |   |   |   |   |   |   | confidence    |   | respect     |   |   | well-   | and       |                     |
|         |   |   |   |   |   |   | in the        |   | and         |   |   | being   | Lifelong  |                     |
|         |   |   |   |   |   |   | students      |   | understand  |   |   | for all |           |                     |

| which is   | the other                    | at all   | Learning |
|--|------------------------------|--|----------|
| done by providing opportunities                                | gender in<br>a better<br>way | ages.  |          |
| to students to give presentations and debates in the classroom |                              | SDG<br>4.4:<br>Skills<br>for<br>Decent<br>Work |          |

| P102T Pharmaceutical Analysis (Theory) | L | Т | P | C |
|--|---|---|---|---|
|--|---|---|---|---|

| T   | 1  |           | 4                |         | 1 |  |  |  |  |  |  |  |  |
|---|--|-----------|------------------|---------|---|--|--|--|--|--|--|--|--|
| Version 2.0   |  | 3         | 1                | 0       | 4 |  |  |  |  |  |  |  |  |
| <b>Total Contact Hours</b>                                  | Total Contact Hours 45 Hours   |           |                  |         |   |  |  |  |  |  |  |  |  |
| Pre-requisites/Exposure Pharmaceutical Analytical Chemistry |  |           |                  |         |   |  |  |  |  |  |  |  |  |
| Co-requisites   | Co-requisites Analytical Chemistry   |           |                  |         |   |  |  |  |  |  |  |  |  |
|   | Course O   | bjective  | s                |         |   |  |  |  |  |  |  |  |  |
|   | course the student should be able to bry of Pharmacopoeia  |           |                  |         |   |  |  |  |  |  |  |  |  |
| 2. Understand the pr  | inciples of volumetric and electro chemical  | analysis  | }                |         |   |  |  |  |  |  |  |  |  |
| 3. Carryout various v                                       | volumetric and electrochemical titrations  |           |                  |         |   |  |  |  |  |  |  |  |  |
| 4. Develop analytica  | ıl skills  |           |                  |         |   |  |  |  |  |  |  |  |  |
| 5. To understand wit  | th acid base titration.  |           |                  |         |   |  |  |  |  |  |  |  |  |
|   | Course Outc  | omes (C   | <b>CO</b> )      |         |   |  |  |  |  |  |  |  |  |
| On completion of this course, the                           | he student will be able to:  |           |                  |         |   |  |  |  |  |  |  |  |  |
| CO1. This subject is designed to                            | impart fundamental knowledge on pharmac  | eutical p | preparations.    |         |   |  |  |  |  |  |  |  |  |
| CO2. The subject provides the ba                            | asic knowledge required to understand the v  | arious d  | isciplines of An | alysis. |   |  |  |  |  |  |  |  |  |
| CO3. This subject deals with the                            | monographs of inorganic drugs and pharma   | ceutical  | S.               |         |   |  |  |  |  |  |  |  |  |
| CO4. Provide Knowledge about                                | CO4. Provide Knowledge about Indian Pharmacopoeia, British Pharmacopeia and other Regulatory agencies. |           |                  |         |   |  |  |  |  |  |  |  |  |
| CO5. Carryout various volumetri                             | CO5. Carryout various volumetric and electrochemical titrations.                                       |           |                  |         |   |  |  |  |  |  |  |  |  |
| Programme and Course Mapping                                |  |           |                  |         |   |  |  |  |  |  |  |  |  |

PO

PO11 PO12

**PSO** 

PO8 PO9

PSO 2

PO2 PO3

PO4 PO5 PO6 PO7

CO

PO1

|   |   |   |   |   |   |   |   |   |   | 10 |   |   | 1               |   |
|---|---|---|---|---|---|---|---|---|---|----|---|---|-----------------|---|
| CO1   | 3 | 1 | - | - | 2 | 3 | 1 | - | 1 | -  | 2 | 3 | 3               | - |
| CO2   | 3 | 2 | - | - | 2 | 3 | - | 1 | 1 | -  | 2 | 2 | 2               | - |
| CO3   | 3 | 1 | - | - | 3 | 3 | - | 2 | 1 | -  | 2 | - | 3               | - |
| CO4   | 3 | 1 | - | - | 3 | 3 | - | 2 | 1 | -  | 2 | - | 3               | - |
| CO5   | 3 | - | - | - | 3 | 3 | - | 1 | - | -  | 3 | - | 2               | - |
| 1=lightly mapped 2= moderately mapped 3=strongly mapped |   |   |   |   |   |   |   |   |   |    |   |   | strongly mapped |   |

| levance to the al, national, gional and global velopmental eds | levance To the aployability/<br>trepreneurship/<br>ill Development | levance to the ofessional Ethics, ander, Human llues, vironment & stainability | G. | E/4 <sup>th</sup> IR |
|--|--|--|----|----------------------|
| Rel loca dev dev nee   | Rel<br>Em<br>Ent<br>Ski  | Rel<br>Pro<br>Ger<br>Val<br>Env<br>Sus   | SD | PO                   |

| BP1<br>02T |             |                        |              |        |               |                  |                   |                     |        |              |                              |      |         |
|------------|-------------|------------------------|--------------|--------|---------------|------------------|-------------------|---------------------|--------|--------------|------------------------------|------|---------|
|            | Local       | Regional               | National     | Global | Employability | Entrepreneurship | Skill Development | Professional Ethics | Gender | Human Values | Environment & Sustainability |      |         |
| Unit       | Empowerm    | Skilled professionals  | National     | -      | -             | -                | Understan         | -                   | -      | -            | -                            | 1.b  | Update  |
| I          | ent of      | in pharmaceutical      | Drug         |        |               |                  | ding the          |                     |        |              |                              | Cre  | d       |
|            | Local       | analysis can           | Quality and  |        |               |                  | principles        |                     |        |              |                              | ate  | Curricu |
|            | Workforce:  | contribute to the      | Safety:      |        |               |                  | and               |                     |        |              |                              | sou  | lum     |
|            | Developing  | development and        | Skilled      |        |               |                  | applicatio        |                     |        |              |                              | nd   |         |
|            | skills in   | growth of the regional | professional |        |               |                  | ns of these       |                     |        |              |                              | poli |         |
|            | pharmaceut  | pharmaceutical         | s in         |        |               |                  | techniques        |                     |        |              |                              | cy   |         |
|            | ical        | industry               | pharmaceuti  |        |               |                  | helps             |                     |        |              |                              | fra  |         |
|            | analysis at |                        | cal analysis |        |               |                  | develop           |                     |        |              |                              | me   |         |
|            | the local   |                        | play a vital |        |               |                  | expertise         |                     |        |              |                              | wor  |         |
|            | level       |                        | role in      |        |               |                  | in                |                     |        |              |                              | ks   |         |
|            | empowers    |                        | ensuring the |        |               |                  | selecting         |                     |        |              |                              |      |         |
|            | the         |                        | quality,     |        |               |                  | and               |                     |        |              |                              | (SD  |         |
|            | workforce   |                        | safety, and  |        |               |                  | applying          |                     |        |              |                              | G    |         |
|            | within the  |                        | efficacy of  |        |               |                  | the               |                     |        |              |                              | 1a)  |         |
|            | community   |                        | pharmaceuti  |        |               |                  | appropriat        |                     |        |              |                              |      |         |
|            |             |                        | cal products |        |               |                  | e                 |                     |        |              |                              |      |         |
|            |             |                        |              |        |               |                  | analytical        |                     |        |              |                              |      |         |

|      |              |                         |               |         |   |   | method for  |   |   |   |   |      |       |         |
|------|--------------|-------------------------|---------------|---------|---|---|-------------|---|---|---|---|------|-------|---------|
|      |              |                         |               |         |   |   | different   |   |   |   |   |      |       |         |
|      |              |                         |               |         |   |   |             |   |   |   |   |      |       |         |
|      |              |                         |               |         |   |   | pharmaceu   |   |   |   |   |      |       |         |
|      |              |                         |               |         |   |   | tical       |   |   |   |   |      |       |         |
|      |              |                         |               |         |   |   | compound    |   |   |   |   |      |       |         |
|      |              |                         |               |         |   |   | S.          |   |   |   |   |      |       |         |
| Unit | Local        | National Drug Quality   | Regulatory    | Capaci  | - | - | Laborator   | - | - | - | - | Ens  | Qua   | Interns |
| II   | Analytical   | and Safety: Skilled     | Compliance:   | ty      |   |   | у           |   |   |   |   | ure  | lity  | hip     |
|      | Services     | professionals in        | National      | Buildin |   |   | Technique   |   |   |   |   | heal | Uni   | Progra  |
|      | and          | pharmaceutical          | regulatory    | g and   |   |   | s: The      |   |   |   |   | thy  | vers  | ms      |
|      | Consulting:  | analysis play a vital   | bodies        | Knowl   |   |   | paragraph   |   |   |   |   | live | ities |         |
|      | Skilled      | role in ensuring the    | responsible   | edge    |   |   | mentions    |   |   |   |   | S    | and   |         |
|      | professiona  | quality, safety, and    | for drug      | Transf  |   |   | specific    |   |   |   |   | and  | Coll  |         |
|      | ls in        | efficacy of             | approval and  | er:     |   |   | laboratory  |   |   |   |   | pro  | eges  |         |
|      | pharmaceut   | pharmaceutical          | oversight     | Sharin  |   |   | techniques  |   |   |   |   | mot  | : A   |         |
|      | ical         | products circulating in | can benefit   | g       |   |   | associated  |   |   |   |   | e    | Ne    |         |
|      | analysis     | the country.            | from          | knowle  |   |   | with each   |   |   |   |   | well | W     |         |
|      | can offer    | ·                       | expertise in  | dge     |   |   | method,     |   |   |   |   | -    | and   |         |
|      | analytical   |                         | pharmaceuti   | and     |   |   | such as the |   |   |   |   | bein | For   |         |
|      | services     |                         | cal analysis. | buildin |   |   | constructi  |   |   |   |   | g    | war   |         |
|      | and          |                         | ·             | g       |   |   | on and      |   |   |   |   | for  | d-    |         |
|      | consulting   |                         |               | capacit |   |   | working of  |   |   |   |   | all  | look  |         |
|      | to local     |                         |               | y in    |   |   | electrodes, |   |   |   |   | at   | ing   |         |
|      | pharmaceut   |                         |               | pharma  |   |   | preparatio  |   |   |   |   | all  | Visi  |         |
|      | ical         |                         |               | ceutica |   |   | n of        |   |   |   |   | ages | on    |         |
|      | companies,   |                         |               | 1       |   |   | standard    |   |   |   |   | (SD  | for   |         |
|      | healthcare   |                         |               | analysi |   |   | solutions,  |   |   |   |   | G 3) | Indi  |         |
|      | institutions |                         |               | s       |   |   | and         |   |   |   |   |      | a's   |         |
|      | , and        |                         |               | globall |   |   | handling    |   |   |   |   |      | Hig   |         |
|      | research     |                         |               | y       |   |   | of          |   |   |   |   |      | her   |         |

|      | organizatio  |                         |               | enhanc   |   |   | precipitate |   |   |   |   |      | Edu  |          |
|------|--------------|-------------------------|---------------|----------|---|---|-------------|---|---|---|---|------|------|----------|
|      | ns.          |                         |               | es the   |   |   | S           |   |   |   |   |      | cati |          |
|      |              |                         |               | capabil  |   |   |             |   |   |   |   |      | on   |          |
|      |              |                         |               | ities of |   |   |             |   |   |   |   |      | Syst |          |
|      |              |                         |               | develo   |   |   |             |   |   |   |   |      | em   |          |
|      |              |                         |               | ping     |   |   |             |   |   |   |   |      | (9.1 |          |
|      |              |                         |               | countri  |   |   |             |   |   |   |   |      | -    |          |
|      |              |                         |               | es       |   |   |             |   |   |   |   |      | 9.3) |          |
|      |              |                         |               |          |   |   |             |   |   |   |   |      |      |          |
|      |              |                         |               |          |   |   |             |   |   |   |   |      |      |          |
| Unit | Their        | Public Health and       | Pharmaceuti   | Global   | - | - | Laborator   | - | - | - | - | Skil | Opti | Internat |
| III  | expertise    | Patient Safety: Skilled | cal Industry  | Collab   |   |   | у           |   |   |   |   | ls   | mal  | ional    |
|      | enhances     | professionals in        | Competitive   | oration  |   |   | Technique   |   |   |   |   | for  | Lea  | Exchan   |
|      | local        | pharmaceutical          | ness: A       | s and    |   |   | s: The      |   |   |   |   | Dec  | rnin | ge       |
|      | research     | analysis play a crucial | strong        | Partner  |   |   | paragraph   |   |   |   |   | ent  | g    | Student  |
|      | capabilities | role in ensuring the    | foundation    | ships:   |   |   | mentions    |   |   |   |   | Wor  | Env  | Progra   |
|      | and          | quality, safety, and    | in            | Global   |   |   | specific    |   |   |   |   | k    | iron | ms       |
|      | supports     | efficacy of             | pharmaceuti   | experti  |   |   | laboratory  |   |   |   |   | (SD  | men  |          |
|      | the          | pharmaceutical          | cal analysis  | se in    |   |   | techniques  |   |   |   |   | G    | ts   |          |
|      | developme    | products available in   | at the        | pharma   |   |   | associated  |   |   |   |   | 4.4) | and  |          |
|      | nt of new    | the country.            | national      | ceutica  |   |   | with each   |   |   |   |   |      | Sup  |          |
|      | pharmaceut   |                         | level can     | 1        |   |   | method,     |   |   |   |   |      | port |          |
|      | ical         |                         | enhance the   | analysi  |   |   | such as the |   |   |   |   |      | for  |          |
|      | products     |                         | competitiven  | S        |   |   | constructi  |   |   |   |   |      | Stu  |          |
|      | and          |                         | ess of the    | facilita |   |   | on and      |   |   |   |   |      | dent |          |
|      | technologie  |                         | domestic      | tes      |   |   | working of  |   |   |   |   |      | S    |          |
|      | S            |                         | pharmaceuti   | collabo  |   |   | electrodes, |   |   |   |   |      | (12. |          |
|      |              |                         | cal industry. | rations  |   |   | preparatio  |   |   |   |   |      | 1-   |          |
|      |              |                         |               | and      |   |   | n of        |   |   |   |   |      | 12.1 |          |
|      |              |                         |               | partner  |   |   | standard    |   |   |   |   |      |      |          |

|      |             |                          |              | ships    |   |   | solutions,  |   |   |   |   |      | 0)   |        |
|------|-------------|--------------------------|--------------|----------|---|---|-------------|---|---|---|---|------|------|--------|
|      |             |                          |              | betwee   |   |   | and         |   |   |   |   |      | ŕ    |        |
|      |             |                          |              | n        |   |   | handling    |   |   |   |   |      |      |        |
|      |             |                          |              | countri  |   |   | of          |   |   |   |   |      |      |        |
|      |             |                          |              | es,      |   |   | precipitate |   |   |   |   |      |      |        |
|      |             |                          |              | acade    |   |   | S           |   |   |   |   |      |      |        |
|      |             |                          |              | mic      |   |   |             |   |   |   |   |      |      |        |
|      |             |                          |              | institut |   |   |             |   |   |   |   |      |      |        |
|      |             |                          |              | ions,    |   |   |             |   |   |   |   |      |      |        |
|      |             |                          |              | and      |   |   |             |   |   |   |   |      |      |        |
|      |             |                          |              | pharma   |   |   |             |   |   |   |   |      |      |        |
|      |             |                          |              | ceutica  |   |   |             |   |   |   |   |      |      |        |
|      |             |                          |              | 1        |   |   |             |   |   |   |   |      |      |        |
|      |             |                          |              | compa    |   |   |             |   |   |   |   |      |      |        |
|      |             |                          |              | nies     |   |   |             |   |   |   |   |      |      |        |
|      |             |                          |              |          |   |   |             |   |   |   |   |      |      |        |
| Unit | Empowerm    | Quality Control and      | Research     | Interna  | - | - | Method      | - | - | - | - | Safe | Equ  | Skill  |
| IV   | ent of      | Assurance: Skilled       | and          | tional   |   |   | Selection   |   |   |   |   | and  | ity  | Develo |
|      | Local       | professionals in         | Developmen   | Trade    |   |   | and         |   |   |   |   | Incl | and  | pment  |
|      | Workforce:  | pharmaceutical           | t: National  | and      |   |   | Optimizati  |   |   |   |   | usiv | Incl |        |
|      | Developing  | analysis are crucial for | research     | Regula   |   |   | on: The     |   |   |   |   | e    | usio |        |
|      | skills in   | establishing and         | institutions | tion     |   |   | paragraph   |   |   |   |   | Lear | n in |        |
|      | pharmaceut  | maintaining quality      | and          | Compli   |   |   | introduces  |   |   |   |   | ning | Hig  |        |
|      | ical        | control and assurance    | universities | ance:    |   |   | different   |   |   |   |   | Env  | her  |        |
|      | analysis at | systems.                 | focusing on  | Global   |   |   | methods     |   |   |   |   | iron | Edu  |        |
|      | the local   |                          | pharmaceuti  | experti  |   |   | and         |   |   |   |   | men  | cati |        |
|      | level       |                          | cal sciences | se in    |   |   | techniques  |   |   |   |   | ts   | on   |        |
|      | empowers    |                          | can benefit  | pharma   |   |   | used in     |   |   |   |   | (SD  | (14. |        |
|      | the         |                          | from         | ceutica  |   |   | analytical  |   |   |   |   | G    | 1-   |        |
|      | workforce   |                          | expertise in | 1        |   |   | chemistry,  |   |   |   |   | 4.a) | 14.4 |        |
|      | within the  |                          | pharmaceuti  |          |   |   | providing   |   |   |   |   | · ·  |      |        |

|      | community   |                        | cal analysis  | S        |   |   | individual   |   |   |   |   |      | .2)  |         |
|------|-------------|------------------------|---------------|----------|---|---|--------------|---|---|---|---|------|------|---------|
|      |             |                        |               | promot   |   |   | s with a     |   |   |   |   |      |      |         |
|      |             |                        |               | es       |   |   | broad        |   |   |   |   |      |      |         |
|      |             |                        |               | interna  |   |   | understand   |   |   |   |   |      |      |         |
|      |             |                        |               | tional   |   |   | ing of the   |   |   |   |   |      |      |         |
|      |             |                        |               | trade    |   |   | available    |   |   |   |   |      |      |         |
|      |             |                        |               | and      |   |   | options for  |   |   |   |   |      |      |         |
|      |             |                        |               | regulat  |   |   | analysis.    |   |   |   |   |      |      |         |
|      |             |                        |               | ory      |   |   | j            |   |   |   |   |      |      |         |
|      |             |                        |               | compli   |   |   |              |   |   |   |   |      |      |         |
|      |             |                        |               | ance     |   |   |              |   |   |   |   |      |      |         |
|      |             |                        |               |          |   |   |              |   |   |   |   |      |      |         |
| Unit | Contributio | Regulatory             | Pharmacovi    | Interna  | - | - | Data         | - | - | - | - | Prof | Equ  | Hands-  |
| v    | n to Local  | Compliance: National   | gilance and   | tional   |   |   | Interpretat  |   |   |   |   | essi | ity  | on      |
|      | Research    | regulatory authorities | Post-         | Trade    |   |   | ion:         |   |   |   |   | onal | and  | Experie |
|      | and         | responsible for        | Marketing     | and      |   |   | Analytical   |   |   |   |   | Dev  | Incl | nce     |
|      | Innovation: | overseeing the         | Surveillance  | Regula   |   |   | chemistry    |   |   |   |   | elop | usio |         |
|      | Skilled     | pharmaceutical         | : Skilled     | tion:    |   |   | involves     |   |   |   |   | men  | n in |         |
|      | professiona | industry rely on       | professional  | Knowl    |   |   | the          |   |   |   |   | t of | Hig  |         |
|      | ls in       | professionals in       | s in          | edge     |   |   | interpretati |   |   |   |   | Tea  | her  |         |
|      | pharmaceut  | pharmaceutical         | pharmaceuti   | and      |   |   | on of        |   |   |   |   | cher | Edu  |         |
|      | ical        | analysis to enforce    | cal analysis  | skills   |   |   | experimen    |   |   |   |   | S    | cati |         |
|      | analysis at | regulatory standards   | can           | in       |   |   | tal data     |   |   |   |   | (SD  | on   |         |
|      | the local   | and ensure             | contribute to | pharma   |   |   | and          |   |   |   |   | G    | (14. |         |
|      | level can   | compliance             | national      | ceutica  |   |   | drawing      |   |   |   |   | 4.c) | 1-   |         |
|      | contribute  |                        | pharmacovig   | 1        |   |   | conclusion   |   |   |   |   |      | 14.4 |         |
|      | to research |                        | ilance        | analysi  |   |   | s based on   |   |   |   |   |      | .2)  |         |
|      | and         |                        | efforts.      | S        |   |   | the results  |   |   |   |   |      |      |         |
|      | innovation  |                        |               | facilita |   |   | obtained.    |   |   |   |   |      |      |         |
|      | initiatives |                        |               | te       |   |   |              |   |   |   |   |      |      |         |
|      | within the  |                        |               | interna  |   |   |              |   |   |   |   |      |      |         |

| community |  | tional   |  |  |  |  |  |
|-----------|--|----------|--|--|--|--|--|
|           |  | trade in |  |  |  |  |  |
|           |  | pharma   |  |  |  |  |  |
|           |  | ceutica  |  |  |  |  |  |
|           |  | 1        |  |  |  |  |  |
|           |  | produc   |  |  |  |  |  |
|           |  | ts.      |  |  |  |  |  |
|           |  |          |  |  |  |  |  |

| BP 103T                    | Pharmaceutics-I (Theory) | L   | Т | P | C |
|----------------------------|--------------------------|-----|---|---|---|
| Version 2.0                |                          | 3   | 1 | 0 | 4 |
| <b>Total Contact Hours</b> | 45 Hours                 | 1   |   |   |   |
| Pre-requisites/Exposure    | Pharmaceutics            |     |   |   |   |
| Co-requisites              | Posology                 |     |   |   |   |
|                            | Course Object            | VAC |   |   |   |

#### **Course Objectives**

# Upon completion of this course the student should be able to

- 1. Know the history of profession of pharmacy
- 2. Understand the basics of different dosage forms, pharmaceutical incompatibilities and pharmaceutical calculations
- 3. Understand the professional way of handling the prescription

- 4. Preparation of various conventional dosage
- 5. Introduction about novel drug delivery system

# **Course Outcomes (CO)**

### On completion of this course, the student will be able to:

- CO1. This subject is designed to impart fundamental knowledge on pharmaceutical preparations.
- CO2. The subject provides the basic knowledge required to understand the various disciplines of pharmacy.
- CO3. It enlightens the students about the dosage, various types of dosage form, NDDS, depot preparation.
- CO4. Provide Knowledge about Indian Pharmacopoeia, British Pharmacopeia and other Regulatory agencies
- CO5. Provide Knowledge about metric system and calculation of dosages.

### **Programme and Course Mapping**

| СО  | PO1 | PO2 | PO3 | PO4     | PO5     | PO6 | PO7 | PO8    | PO9      | PO<br>10 | PO11 | PO12 | PSO<br>1 | PSO 2    |
|-----|-----|-----|-----|---------|---------|-----|-----|--------|----------|----------|------|------|----------|----------|
| CO1 | 2   | 1   | -   | -       | 2       | 3   | 1   | 2      | 1        | -        | 2    | 3    | 3        | -        |
| CO2 | 3   | 2   | -   | -       | 2       | 3   | -   | 1      | 1        | -        | 2    | 3    | 2        | -        |
| CO3 | 3   | 1   | -   | -       | 3       | 3   | -   | 2      | 1        | -        | 2    | 3    | 3        | -        |
| CO4 | 3   | 1   | -   | -       | 3       | 3   | -   | 2      | 1        | -        | 2    | 3    | 3        | -        |
| CO5 | 3   | -   | -   | -       | 3       | 3   | -   | 1      | -        | -        | 3    | 3    | 2        | -        |
|     |     |     | ı   | 1=light | tly map | ped | ı   | 2= mod | derately | map      | ped  | 3=   | strongl  | y mapped |

| Unit | Relevance to the local, national, regional and global  | developmental<br>needs   |   |          | Relevance To<br>the<br>Employability/<br>Entrepreneursh  | ip/ Skill<br>Development | a computation of  | Relevance to the    | Professional Ethics, Gender. | Human Values, | Sustainability               | SDG   | NEP                                      | POE/4 <sup>th</sup> IR  |
|------|--|--|---|----------|--|--------------------------|-------------------|---------------------|------------------------------|---------------|------------------------------|---|--|---|
| Unit | It allows pharmacists to provide culturally sensitive care, comply with local regulations, address local healthcare needs, and | This enhances their ability to provide patient-centered care, collaborate with healthcare stakeholders, and contribute to the overall health and well-being of the local | Provides pharmacists with a solid foundation in the evolution of their field, enhances their professional identity, and equips them with the knowledge and skills | ! Global | Atilique Ati | Entrepreneurship         | Skill Development | Professional Ethics | Gender                       | Human Values  | Environment & Sustainability | Skills<br>for<br>Decent<br>Work<br>(SDG<br>4.4) | Professional<br>Education<br>(17.1-17.5) | Focus on<br>Employab<br>ility Skills<br>(Local/Re<br>gional<br>and<br>Global) |

|      | actively    | population | necessary for  |              | patient care. |      |      |      |        |              |              |
|------|-------------|------------|----------------|--------------|---------------|------|------|------|--------|--------------|--------------|
|      | engage with |            | safe and       |              |               |      |      |      |        |              |              |
|      | the local   |            | effective      |              |               |      |      |      |        |              |              |
|      | community   |            | pharmaceutical |              |               |      |      |      |        |              |              |
|      | to improve  |            | practice.      |              |               |      |      |      |        |              |              |
|      | healthcare  |            | practice.      |              |               |      |      |      |        |              |              |
|      | outcomes.   |            |                |              |               |      |      |      |        |              |              |
|      | outcomes.   |            |                |              |               |      |      |      |        |              |              |
| Unit |             |            |                | Promote      | Enhances      | <br> | <br> | <br> | Skills | Professional | Focus on     |
| II   |             |            |                | harmonizati  | employabilit  |      |      |      | for    | Education    | Employab     |
|      |             |            |                | on of        | y in various  |      |      |      | Decent | (17.1-17.5)  | ility Skills |
|      |             |            |                | pharmaceut   | sectors of    |      |      |      | Work   |              | (Local/Re    |
|      |             |            |                | ical         | the           |      |      |      | (SDG   |              | gional       |
|      |             |            |                | practices,   | pharmaceuti   |      |      |      | 4.4)   |              | and          |
|      |             |            |                | improve      | cal industry, |      |      |      |        |              | Global)      |
|      |             |            |                | patient      | including     |      |      |      |        |              |              |
|      |             |            |                | outcomes     | manufacturi   |      |      |      |        |              |              |
|      |             |            |                | on a global  | ng, quality   |      |      |      |        |              |              |
|      |             |            |                | scale, and   | control,      |      |      |      |        |              |              |
|      |             |            |                | advance the  | research and  |      |      |      |        |              |              |
|      |             |            |                | developme    | development   |      |      |      |        |              |              |
|      |             |            |                | nt and       | , regulatory  |      |      |      |        |              |              |
|      |             |            |                | accessibilit | affairs,      |      |      |      |        |              |              |
|      |             |            |                | y of         | education,    |      |      |      |        |              |              |
|      |             |            |                | medication   | and           |      |      |      |        |              |              |
|      |             |            |                | s            | consultancy.  |      |      |      |        |              |              |
|      |             |            |                | worldwide.   | It provides a |      |      |      |        |              |              |
|      |             |            |                |              | competitive   |      |      |      |        |              |              |
|      |             |            |                |              | edge and      |      |      |      |        |              |              |
|      |             |            |                |              | opens up      |      |      |      |        |              |              |
|      |             |            |                |              | opportunitie  |      |      |      |        |              |              |

|      |      |              | s for career  |      |      |      |        |              |              |
|------|------|--------------|---------------|------|------|------|--------|--------------|--------------|
|      |      |              | advancemen    |      |      |      |        |              |              |
|      |      |              | t and         |      |      |      |        |              |              |
|      |      |              | specializatio |      |      |      |        |              |              |
|      |      |              | n in the      |      |      |      |        |              |              |
|      |      |              | global        |      |      |      |        |              |              |
|      |      |              | pharmaceuti   |      |      |      |        |              |              |
|      |      |              | cal           |      |      |      |        |              |              |
|      |      |              | landscape.    |      |      |      |        |              |              |
| Unit | <br> | <br>This     | Various       | <br> | <br> | <br> | Skills | Professional | Focus on     |
| III  |      | knowledge    | sectors of    |      |      |      | for    | Education    | Employab     |
| 111  |      | facilitates  | the           |      |      |      | Decent | (17.1-17.5)  | ility Skills |
|      |      | the          | pharmaceuti   |      |      |      | Work   | (17.1-17.5)  | (Local/Re    |
|      |      | selection of | cal industry, |      |      |      | (SDG   |              | gional       |
|      |      | appropriate  | including     |      |      |      | 4.4)   |              | and          |
|      |      | excipients,  | formulation   |      |      |      | 1.1)   |              | Global)      |
|      |      | manufactur   | development   |      |      |      |        |              | Gloodij      |
|      |      | ing          | , quality     |      |      |      |        |              |              |
|      |      | processes,   | control,      |      |      |      |        |              |              |
|      |      | and quality  | manufacturi   |      |      |      |        |              |              |
|      |      | control      | ng,           |      |      |      |        |              |              |
|      |      | measures to  | regulatory    |      |      |      |        |              |              |
|      |      | meet         | affairs,      |      |      |      |        |              |              |
|      |      | regulatory   | research and  |      |      |      |        |              |              |
|      |      | requiremen   | development   |      |      |      |        |              |              |
|      |      | ts and       | and           |      |      |      |        |              |              |
|      |      | deliver safe | pharmacy      |      |      |      |        |              |              |
|      |      | and          | practice.     |      |      |      |        |              |              |
|      |      | efficacious  | 1             |      |      |      |        |              |              |
|      |      | pharmaceut   |               |      |      |      |        |              |              |

|      |      | ical products to patients.   |   |   |      |      |   |  |   |
|------|------|--|---|---|------|------|---|--|---|
| Unit |      | Helps in optimizing drug delivery, formulation stability, patient compliance, and ensuring the safety and efficacy of pharmaceut ical products | Various sectors of the pharmaceuti cal industry, including formulation and development , quality control, regulatory affairs, research and development , clinical practice, and pharmaceuti cal education and training. | - |      | <br> | <br>Skills<br>for<br>Decent<br>Work<br>(SDG<br>4.4) | Professional<br>Education<br>(17.1-17.5) | Focus on Employab ility Skills (Local/Re gional and Global) |
| Unit | <br> | <br>It provides  | Opens up  |   | <br> | <br> | <br>Skills<br>for                                   | Professional                             | Focus on  |
| V    |      | experts with the   | diverse<br>career   |   |      |      | Decent  | Education (17.1-17.5)                    | Employab ility Skills                                       |
|      |      | knowledge  | opportunitie  |   |      |      | Work  | (17.1 17.3)                              | (Local/Re   |

|  |  | and         | s in          |  |  | (SDG | gional  |
|--|--|-------------|---------------|--|--|------|---------|
|  |  | abilities   | formulation   |  |  | 4.4) | and     |
|  |  |             |               |  |  | 4.4) |         |
|  |  | required to | development   |  |  |      | Global) |
|  |  | create      | , quality     |  |  |      |         |
|  |  | stable and  | control,      |  |  |      |         |
|  |  | effective   | research and  |  |  |      |         |
|  |  | semisolid   | development   |  |  |      |         |
|  |  | dosage      | , regulatory  |  |  |      |         |
|  |  | forms for a | affairs,      |  |  |      |         |
|  |  | range of    | manufacturi   |  |  |      |         |
|  |  | therapeutic | ng,           |  |  |      |         |
|  |  | purposes.   | dermatology   |  |  |      |         |
|  |  |             | , cosmetics,  |  |  |      |         |
|  |  |             | academia,     |  |  |      |         |
|  |  |             | and research  |  |  |      |         |
|  |  |             | institutions  |  |  |      |         |
|  |  |             | within the    |  |  |      |         |
|  |  |             | pharmaceuti   |  |  |      |         |
|  |  |             | cal industry. |  |  |      |         |
|  |  |             |               |  |  |      |         |

| BP104T      | Pharmaceutical Inorganic<br>Chemistry (Theory) | L | Т | P | C |
|-------------|--|---|---|---|---|
| Version 2.0 |  | 3 | 1 | 0 | 4 |

| Co-requisites  Corequisites  Chemistry  Course Objectives  Upon completion of this course the student should be able to  1. To Know the history of Pharmacopoeia  2. To know the sources of impurities and methods to determine the impurities in inorganic drugs and pharmaceuticals.  3. Understand the medicinal and pharmaceutical importance of inorganic compounds |  |  |  |  |  |  |  |  |
|--|--|--|--|--|--|--|--|--|
| Course Objectives  Upon completion of this course the student should be able to  1. To Know the history of Pharmacopoeia  2. To know the sources of impurities and methods to determine the impurities in inorganic drugs and pharmaceuticals.   |  |  |  |  |  |  |  |  |
| Upon completion of this course the student should be able to  1. To Know the history of Pharmacopoeia  2. To know the sources of impurities and methods to determine the impurities in inorganic drugs and pharmaceuticals.  |  |  |  |  |  |  |  |  |
| <ol> <li>To Know the history of Pharmacopoeia</li> <li>To know the sources of impurities and methods to determine the impurities in inorganic drugs and pharmaceuticals.</li> </ol>  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |
| 3 Understand the medicinal and pharmaceutical importance of inorganic compounds  |  |  |  |  |  |  |  |  |
| 5. Orderstand the medicinal and pharmaceutical importance of morganic compounds  |  |  |  |  |  |  |  |  |
| 4. Preparation of various radio pharmaceutical dosage  |  |  |  |  |  |  |  |  |
| 5. Introduction about Antidotes  |  |  |  |  |  |  |  |  |
| Course Outcomes (CO)   |  |  |  |  |  |  |  |  |
| On completion of this course, the student will be able to:   |  |  |  |  |  |  |  |  |

- CO1. This subject is designed to impart fundamental knowledge on pharmaceutical preparations.
- CO2. The subject provides the basic knowledge required to understand the various disciplines of pharmacy.
- CO3. This subject deals with the monographs of inorganic drugs and pharmaceuticals.
- CO4. Provide Knowledge about Indian Pharmacopoeia, British Pharmacopeia and other Regulatory agencies.
- CO5. Provide Knowledge about metric system and calculation of dosages to understand.

| CO  | PO1 | PO2 | PO3 | PO4 | PO5    | PO6     | PO7 | PO8 | PO9    | PO<br>10 | PO11    | PO12 | PSO<br>1 | PSO 2          |
|-----|-----|-----|-----|-----|--------|---------|-----|-----|--------|----------|---------|------|----------|----------------|
| CO1 | 3   | 1   | -   | -   | 3      | 2       | -   | 2   | 1      | -        | 2       | 3    | 3        | -              |
| CO2 | 3   | 2   | -   | -   | 2      | 3       | -   | 1   | 1      | -        | 2       | 3    | 3        | -              |
| CO3 | 3   | 1   | -   | -   | 3      | 3       | -   | 2   | 1      | -        | 2       | 3    | 3        | -              |
| CO4 | 3   | 1   | -   | -   | 3      | 3       | -   | 2   | 1      | -        | 2       | 3    | 3        | -              |
| CO5 | 3   | -   | -   | -   | 3      | 3       | -   | 1   | -      | -        | 3       | 3    | 3        | -              |
|     |     | ı   | 1   | ı   | 1=ligh | tly map | ped |     | 2= mod | erately  | y mappe | d    | 3=st     | trongly mapped |

| Unit | tional, and global nental                 | ce To the<br>ability/<br>eneurship/<br>velopment | ce to the onal Ethics, Human ment & hillity                      |     | IR                  |
|------|---|--|--|-----|---------------------|
|      | Relevan<br>local, na<br>developi<br>needs | Relevan<br>Employ<br>Entrepr<br>Skill De         | Relevan<br>Professi<br>Gender,<br>Values,<br>Environ<br>Sustaina | SDG | POE/4 <sup>th</sup> |

|      | Local | Regional | National   | Global   | Employability  | Entrepreneurship | Skill Development  | Professional Ethics | Gender | Human Values | Environment & Sustainability |  |                                    |  |
|------|-------|----------|--|--|--|------------------|--|---------------------|--------|--------------|------------------------------|--|------------------------------------|--|
| Unit |       |          | Impurities in pharmaceuti cal substances: History of Pharmacopo eia, Sources and types of impurities | Impurit ies in pharma ceutica l substan ces: History of Pharm acopoe ia, Source s and types of impurit ies | Deter mina tion of impu rities in phar maco poeia l subst ance gener ate empl oyme nt. | -                | Determina tion of impurities in pharmaco peial substance. Which develop skills | -                   | )      |              | <b>T</b>                     | Skil<br>l for<br>dece<br>nt<br>wor<br>k<br>SD<br>G4.<br>4. | Professional Education (17.1-17.5) | It helps in develop ing technic al skills that industr y require s .And thus helps in creatin g employ ment. |

| Unit<br>II | - | - | Acids, Bases and Buffers  2.Major extra and intracellular electrolytes  3. Dental products | Acids, Bases and Buffers  2.Majo r extra and intracel lular electrol | Prod<br>uctio<br>n of<br>acid<br>base,<br>Elect<br>rolyt<br>e<br>soluti<br>on,<br>denti | Produ ction of acid base, Electr olyte solutio n, dentifr ices the | - | - | - | - | - | Skil<br>ls<br>for<br>Dec<br>ent<br>Wor<br>k<br>(SD<br>G<br>4.4) | Professional Education (17.1-17.5) | Skill Develo pment It helps in develop ing technic al skills that |
|------------|---|---|--|--|---|--|---|---|---|---|---|---|------------------------------------|---|
|            |   |   |  | ytes 3. Dental produc ts   | frices<br>the<br>globe<br>provi<br>des a<br>lot of<br>empl<br>oyme<br>nt.               | globe<br>provid<br>es a<br>lot of<br>emplo<br>yment.               |   |   |   |   |   |   |                                    | industr y require sand thus helps in creatin g employ ment        |

| Unit |  | Synthesis, reactions and medicinal uses of following compounds/ derivatives  Gastric acidifiers, antacid and and cathartics | Synthe sis, reactio ns and medici nal uses of followi ng compo unds/d erivati ves  Gastric acidifie rs, antacid and and | hesis, reacti ons and medi cinal uses of follo wing comp ound s/deri vativ es Gastr ic acidi | Synthesis of HCl, Magnesiu m sulphate, Sodium hydrogen carbonate, combined antacid preparatio n helps in honing the technical skill and expertise in production |  | - | Skil<br>ls<br>for<br>Dec<br>ent<br>Wor<br>k<br>(SD<br>G<br>4.4) | Prof<br>essi<br>onal<br>Edu<br>cati<br>on<br>(17.<br>1-<br>17.5<br>) | Skill Develo pment  It helps in develop ing technic al skills that industr y require sand thus helps in creatin g employ |
|------|--|---|---|--|---|--|---|---|--|--|
|      |  | antacid and and   | unds/d erivati ves  Gastric acidifie rs, antacid and  | wing comp ound s/deri vativ es Gastr ic  | preparatio<br>n helps in<br>honing the<br>technical<br>skill and<br>expertise<br>in   |  |   |   |  | industr<br>y<br>require<br>sand<br>thus<br>helps in<br>creatin<br>g  |

| Unit | - | - | Synthesis,            | Synthe  | Synt    | - | Synthesis  | - | - | - | Skil | Prof | Skill           |
|------|---|---|-----------------------|---------|---------|---|------------|---|---|---|------|------|-----------------|
| IV   |   |   | reactions             | sis,    | hesis,  |   | of         |   |   |   | ls   | essi | Develo          |
|      |   |   | and                   | reactio | reacti  |   | Haematini  |   |   |   | for  | onal | pment           |
|      |   |   | medicinal             | ns and  | ons     |   | cs, Anti   |   |   |   | Dec  | Edu  |                 |
|      |   |   | uses of               | medici  | and     |   | dotes,     |   |   |   | ent  | cati | It helps        |
|      |   |   | following             | nal     | medi    |   | expectoran |   |   |   | Wor  | on   | in              |
|      |   |   | compounds/            | uses of | cinal   |   | ts         |   |   |   | k    | (17. | develop         |
|      |   |   | derivatives           | followi | uses    |   | preparatio |   |   |   | (SD  | 1-   | ing             |
|      |   |   | F                     | ng      | of      |   | n helps in |   |   |   | G    | 17.5 | technic         |
|      |   |   | Expectorants          | compo   | follo   |   | honing the |   |   |   | 4.4) | )    | al skills       |
|      |   |   | , emetics, antidotes, | unds/d  | wing    |   | technical  |   |   |   |      |      | that<br>industr |
|      |   |   | Haematinics           | erivati | comp    |   | skill and  |   |   |   |      |      |                 |
|      |   |   | Haemaumes             | ves     | ound    |   | expertise  |   |   |   |      |      | y<br>require    |
|      |   |   |                       | Expect  | s/deri  |   | in         |   |   |   |      |      | s and           |
|      |   |   |                       | orants, | vativ   |   | production |   |   |   |      |      | thus            |
|      |   |   |                       | emetic  | es      |   |            |   |   |   |      |      | helps in        |
|      |   |   |                       | s,      | Expe    |   |            |   |   |   |      |      | creatin         |
|      |   |   |                       | antidot | ctora   |   |            |   |   |   |      |      | g               |
|      |   |   |                       | es,     | nts,    |   |            |   |   |   |      |      | employ          |
|      |   |   |                       | Haema   | emeti   |   |            |   |   |   |      |      | ment            |
|      |   |   |                       | tinics  | cs,     |   |            |   |   |   |      |      |                 |
|      |   |   |                       |         | antid   |   |            |   |   |   |      |      |                 |
|      |   |   |                       |         | otes,   |   |            |   |   |   |      |      |                 |
|      |   |   |                       |         | Hae     |   |            |   |   |   |      |      |                 |
|      |   |   |                       |         | mitin   |   |            |   |   |   |      |      |                 |
|      |   |   |                       |         | ics     |   |            |   |   |   |      |      |                 |
|      |   |   |                       |         | 1 1     |   |            |   |   |   |      |      |                 |
|      |   |   |                       |         | globe . |   |            |   |   |   |      |      |                 |
|      |   |   |                       |         | provi   |   |            |   |   |   |      |      |                 |
|      |   |   |                       |         | des a   |   |            |   |   |   |      |      |                 |

| Unit | - | - | Radiopharm aceuticals | Radiop<br>harmac<br>eutical<br>s<br>Produc<br>tions | lot of empl oyme nt.  Radi opha rmac eutic als | - | - | : | - | - | Skil<br>ls<br>for<br>Dec<br>ent<br>Wor<br>k<br>(SD<br>G<br>4.4) | Prof<br>essi<br>onal<br>Edu<br>cati<br>on<br>(17.<br>1-<br>17.5) | Skill Develo pment It helps in develop ing technic al skills that industr y require s and thus helps in creatin |
|------|---|---|-----------------------|---|--|---|---|---|---|---|---|--|---|
|      |   |   |                       |   |  |   |   |   |   |   |   |  | g<br>employ<br>ment   |

| BP-105T   | Communication Skills (Theory) | L | Т | P | С |  |  |  |  |  |  |  |
|---|-------------------------------|---|---|---|---|--|--|--|--|--|--|--|
| Version 2.0 3 0 0 2   |                               |   |   |   |   |  |  |  |  |  |  |  |
| Total Contact Hours 30 Hours  |                               |   |   |   |   |  |  |  |  |  |  |  |
| Pre-requisites/Exposure Communication Skills  |                               |   |   |   |   |  |  |  |  |  |  |  |
| Co-requisites Communication Skills  |                               |   |   |   |   |  |  |  |  |  |  |  |
| Course Objectives   |                               |   |   |   |   |  |  |  |  |  |  |  |
| Upon completion of this course the student should be able to 1. Communicate effectively (Verbal and Non-Verbal) 2. Effectively manage the team as a team player |                               |   |   |   |   |  |  |  |  |  |  |  |

# Course Outcomes (CO)

### On completion of this course, the student will be able to:

- CO1. Understand the behavioural needs for a pharmacist to function effectively in the areas of pharmaceutical operation
- CO2. Develop interview skills
- CO3. Develop Leadership qualities and essentials
- CO4. Develop confidence in pursuing interdisciplinary

| CO  | PO1 | PO2 | PO3 | PO4 | PO5    | PO6    | PO7  | PO8 | PO9   | PO<br>10 | PO11     | PO12 | PSO<br>1 | PSO 2            |
|-----|-----|-----|-----|-----|--------|--------|------|-----|-------|----------|----------|------|----------|------------------|
| CO1 | 3   | 1   | 3   | 2   | 1      | 3      | 1    | 1   | 3     | 3        | 1        | 2    | -        | -                |
| CO2 | 3   | 1   | 2   | 2   | 1      | 3      | 1    | 1   | 2     | 3        | 1        | 2    | -        | -                |
| CO3 | 1   | 1   | 2   | 2   | 1      | 3      | 1    | 1   | 2     | 3        | 1        | 2    | -        | -                |
| CO4 | 1   | 1   | 1   | 2   | 1      | 3      | 1    | 1   | 1     | 3        | 1        | 2    | -        | -                |
|     |     |     |     |     | 1=ligh | tly ma | pped |     | 2= mo | derate   | ely mapp | ed   | 3=       | estrongly mapped |

| Unit | Relevance to the local, national, regional and global developmental | needs    |          |        | Relevance To the | Entrepreneurship/<br>Skill Development |                   | Relevance to the Professional Ethics, | Values, | Environment & | Sustainability               | SDG | NEP | POE/4 <sup>th</sup> IR |
|------|---|----------|----------|--------|------------------|--|-------------------|---------------------------------------|---------|---------------|------------------------------|-----|-----|------------------------|
|      | Local   | Regional | National | Global | Employability    | Entrepreneurship                       | Skill Development | Professional Ethics                   | Gender  | Human Values  | Environment & Sustainability |     |     |                        |

| Unit | - | - | - | Awarin     | - | - | Knowledge    | - | - | - | - | Skill     | Profes      | Skill |
|------|---|---|---|------------|---|---|--------------|---|---|---|---|-----------|-------------|-------|
| I &  |   |   |   | g          |   |   | of different |   |   |   |   | s for     | sional      | Devel |
| II   |   |   |   | student    |   |   | communicat   |   |   |   |   | Dece      | Educat      | opmen |
|      |   |   |   | s about    |   |   | ion styles,  |   |   |   |   | nt        | ion         | t     |
|      |   |   |   | commu      |   |   | barrier,     |   |   |   |   | Wor       | (17.1-      |       |
|      |   |   |   | nicatio    |   |   | elements     |   |   |   |   | k         | 17.5)       |       |
|      |   |   |   | n skill,   |   |   | (face to     |   |   |   |   | (SD       |             |       |
|      |   |   |   | barrier    |   |   | face, verbal |   |   |   |   | G         |             |       |
|      |   |   |   | in         |   |   | ,nonverbal   |   |   |   |   | 4.4)      |             |       |
|      |   |   |   | commu      |   |   | communicat   |   |   |   |   |           |             |       |
|      |   |   |   | nicatio    |   |   | ion will     |   |   |   |   |           |             |       |
|      |   |   |   | ns and     |   |   | help in      |   |   |   |   |           |             |       |
|      |   |   |   | styles     |   |   | communicat   |   |   |   |   |           |             |       |
|      |   |   |   |            |   |   | ing to the   |   |   |   |   |           |             |       |
|      |   |   |   |            |   |   | world        |   |   |   |   |           |             |       |
| Unit | _ | - | _ | Globall    | _ |   | Knowledge    | _ | _ | _ | _ | Tech      | Focus       | Skill |
| III  | _ | - | _ |            | _ |   | of writing   | _ | _ | - | _ | nolo      | on          | Devel |
| 1111 |   |   |   | y<br>aware |   |   | emails and   |   |   |   |   |           | Emplo       | opmen |
|      |   |   |   | student    |   |   | listening    |   |   |   |   | gy<br>Use | yabilit     | t     |
|      |   |   |   | s about    |   |   | will help    |   |   |   |   | &         | уаотт       | ι     |
|      |   |   |   | listenin   |   |   | students in  |   |   |   |   | Integ     | y<br>Skills |       |
|      |   |   |   | g skills   |   |   | expression   |   |   |   |   | ratio     | (Local      |       |
|      |   |   |   | and        |   |   | their        |   |   |   |   | n         | /Regio      |       |
|      |   |   |   | writing    |   |   | views/com    |   |   |   |   | (23.1     | nal         |       |
|      |   |   |   | emails     |   |   | municating   |   |   |   |   | -         | and         |       |
|      |   |   |   | Cilialis   |   |   | through      |   |   |   |   | 23.1      | Global      |       |
|      |   |   |   |            |   |   | writing      |   |   |   |   | 3)        | )           |       |
|      |   |   |   |            |   |   | witting      |   |   |   |   | 3)        | ,           |       |
|      |   |   |   |            |   |   |              |   |   |   |   |           |             |       |
|      |   |   |   |            |   |   |              |   |   |   |   |           |             |       |

| Unit<br>IV | - | - | - | Fulfils<br>the<br>need<br>for<br>intervi<br>ew<br>skills               | - | Knowledge<br>of interview<br>skills will<br>help in<br>building<br>confidence<br>to face<br>interview | - | - | - | - | Skill<br>s for<br>Dece<br>nt<br>Wor<br>k<br>(SD<br>G<br>4.4) | Focus on Emplo yabilit y Skills (Local /Regio nal and Global   | Skill<br>Devel<br>opmen<br>t                           |
|------------|---|---|---|--|---|---|---|---|---|---|--|--|--|
| Unit       | - | - | - | Globall y aware about commu nicatio n skills used in group discuss ion | - | Knowledge of group methods, their do's and don'ts will help in facing interview rounds                | - | - |   | - | Tech nolo gy Use & Integ ratio n (23.1 - 23.1 3)             | Focus on Emplo yabilit y Skills (Local /Regio nal and Global ) | Emplo<br>yabilit<br>y,<br>Skill<br>Devel<br>opmen<br>t |

| BP106 RBT                  | Remedial Biology (Theory) | L     | Т | P | С |
|----------------------------|---------------------------|-------|---|---|---|
| Version 2.0                |                           | 2     | 0 | 0 | 2 |
| <b>Total Contact Hours</b> | 30 Hours                  |       |   |   |   |
| Pre-requisites/Exposure    | Biology                   |       |   |   |   |
| Co-requisites              | Biology                   | 011 4 |   |   |   |

#### **Course Objectives**

#### Upon completion of this course the student should be able to

- 1. know the classification and salient features of five kingdoms of life
- 2. understand the basic components of anatomy & physiology of plant
- 3. know understand the basic components of anatomy & physiology animal with special reference to human

# Course Outcomes (CO)

#### On completion of this course, the student will be able to:

- CO1. To learn and understand the components of living world, structure and functional system of plant kingdom (leaf, root, stem).
- CO2. To learn and understand the components Composition of blood, blood groups, coagulation of blood.
- CO3. It provides knowledge about structure and function of heart.
- CO4. It provides knowledge about Digestive system, Reproductive system.
- CO5. It helps in understanding the concept of Respiration system.

| СО  | PO1 | PO2 | PO3 | PO4 | PO5   | PO6     | PO7   | PO8 | PO9  | PO<br>10 | PO11    | PO12 | PSO<br>1 | PSO 2            |
|-----|-----|-----|-----|-----|-------|---------|-------|-----|------|----------|---------|------|----------|------------------|
| CO1 | 3   | 2   | -   | -   | 3     | 2       | -     | -   | -    | -        | 2       | 3    | 3        | 3                |
| CO2 | 3   | 2   | •   | -   | 2     | 3       | -     | -   | -    | •        | 2       | 3    | 3        | 3                |
| CO3 | 3   | 2   | -   | -   | 3     | 3       | -     | -   | -    | -        | 2       | 3    | 3        | 3                |
| CO4 | 3   | 2   | -   | -   | 3     | 3       | -     | -   | -    | -        | 2       | 3    | 3        | 3                |
| CO5 | 3   | 2   | -   | -   | 3     | 3       | -     | -   | -    | -        | 3       | 3    | 3        | 3                |
|     |     |     |     | •   | 1=lig | htly ma | apped |     | 2= m | oderat   | ely map | ped  | 3        | =strongly mapped |

| Unit | Relevance to the local, national, regional and global | Relevance To the        | Relevance to the             | SD | NE | POE/4 <sup>t</sup> |
|------|---|-------------------------|------------------------------|----|----|--------------------|
|      | developmental needs                                   | Employability/          | <b>Professional Ethics</b> , | G  | P  | <sup>h</sup> IR    |
|      |   | Entrepreneurship/ Skill | Gender, Human Values,        |    |    |                    |
|      |   | Development             | Environment &                |    |    |                    |
|      |   |                         | Sustainability               |    |    |                    |
|      |   |                         |                              |    |    |                    |

|        | Local | Regi | National | Global                   | Em   | Entrepr | Skill       | Pr  | Gender   | Н  | Enviro  |      |      |         |
|--------|-------|------|----------|--------------------------|------|---------|-------------|-----|----------|----|---------|------|------|---------|
|        |       | onal |          |                          | plo  | eneursh | Developm    | ofe |          | u  | nment   |      |      |         |
|        |       |      |          |                          | yabi | ip      | ent         | ssi |          | m  | &       |      |      |         |
|        |       |      |          |                          | lity | 1       |             | on  |          | an | Sustai  |      |      |         |
|        |       |      |          |                          |      |         |             | al  |          | V  | nabilit |      |      |         |
|        |       |      |          |                          |      |         |             | Et  |          | al | y       |      |      |         |
|        |       |      |          |                          |      |         |             | hic |          | ue |         |      |      |         |
|        |       |      |          |                          |      |         |             | S   |          | S  |         |      |      |         |
|        |       |      |          |                          |      |         |             |     |          |    |         |      |      |         |
|        |       |      |          |                          |      |         |             |     |          |    |         |      |      |         |
|        |       |      |          |                          |      |         |             |     |          |    |         |      |      |         |
|        |       |      |          |                          |      |         |             |     |          |    |         |      |      |         |
| Unit I |       |      |          | Student will be able to  |      |         | Remedial    |     | Remedi   |    |         | (SD  | (9.1 | Global  |
|        |       |      |          | understand importance    |      |         | Biology     |     | al       |    |         | G    | -    | Educati |
|        |       |      |          | of the living world on a |      |         | Remedial    |     | Biology  |    |         | 4.4) | 9.3) | on      |
|        |       |      |          | global scale allows for  |      |         | Biology     |     | provide  |    |         |      |      | Knowle  |
|        |       |      |          | informed decision-       |      |         | provides a  |     | s a      |    |         |      |      | dge,    |
|        |       |      |          | making and actions       |      |         | strong      |     | foundat  |    |         |      |      | Skill   |
|        |       |      |          | aimed at promoting the   |      |         | foundation  |     | ional    |    |         |      |      | Develo  |
|        |       |      |          | coexistence of humans    |      |         | for various |     | underst  |    |         |      |      | pment,  |
|        |       |      |          | and nature while         |      |         | careers     |     | anding   |    |         |      |      | Employ  |
|        |       |      |          | preserving the planet's  |      |         | and areas   |     | of the   |    |         |      |      | ability |
|        |       |      |          | ecological integrity.    |      |         | related to  |     | human    |    |         |      |      |         |
|        |       |      |          |                          |      |         | health,     |     | body,    |    |         |      |      |         |
|        |       |      |          |                          |      |         | fitness,    |     | includi  |    |         |      |      |         |
|        |       |      |          |                          |      |         | and         |     | ng its   |    |         |      |      |         |
|        |       |      |          |                          |      |         | medical     |     | structur |    |         |      |      |         |
|        |       |      |          |                          |      |         | sciences.   |     | es and   |    |         |      |      |         |
|        |       |      |          |                          |      |         | The         |     | functio  |    |         |      |      |         |
|        |       |      |          |                          |      |         | knowledge   |     | n for    |    |         |      |      |         |

| Unit        | - |   | Student will be able to know Body fluids and circulation, as well as digestion and absorption, have broad implications for global water resources, nutrient cycling, agricultural practices, food security, and waste management. By understanding and managing these processes sustainably, we can contribute to a more balanced and environmentally conscious global system. | gained can enhance critical thinking, problem- solving skills, and the ability to apply scientific principles to practical situations, contributin g to skill developme nt in these fields. | both gender |  | (SD G 4.4) | (9.1 - 9.3) | Global Educati on Knowle dge, Skill Develo pment, Employ ability |
|-------------|---|---|--|---|-------------|--|------------|-------------|--|
| Unit<br>III | - | - | Knowledge of respiratory mechanisms,   |   |             |  | (SD<br>G   | (9.1        | Global<br>Educati  |
|             |   |   | urinary system   |   |             |  | 4.4)       | 9.3)        | on   |
|             |   |   | functions, endocrine   |   |             |  |            |             | Knowle   |
|             |   |   | system basics, and   |   |             |  |            |             | dge,   |
|             |   |   | reproductive system  |   |             |  |            |             | Skill  |
|             |   |   | disorders, students can play a significant role in   |   |             |  |            |             | Develo   |
|             |   |   | analysing, addressing,   |   |             |  |            |             | pment,<br>Employ   |

|            | and finding solutions to global issues related to respiratory disorders, urinary disorders, endocrine disorders like diabetes, and reproductive system-related disorders. |  |  |                  |                   | ability  |
|------------|---|--|--|------------------|-------------------|--|
| Unit<br>IV | By understanding and managing the mineral nutrition of plants, we can enhance these global impacts and promote a sustainable and thriving planet.                         |  |  | (SD<br>G<br>4.4) | (9.1<br>-<br>9.3) | Global Educati on Knowle dge, Skill Develo pment, Employ ability |
| Unit       | Understanding and harnessing the potential of these processes is essential for addressing global challenges and promoting a sustainable future.                           |  |  | (SD<br>G<br>4.4) | (9.1<br>-<br>9.3) | Global Educati on Knowle dge, Skill Develo pment, Employ ability |

| BP106 RMT                  | Remedial Mathematics (Theory) | L        | Т     | P | С |
|----------------------------|-------------------------------|----------|-------|---|---|
| Version 2.0                |                               | 2        | 0     | 0 | 2 |
| <b>Total Contact Hours</b> | 30 Hours                      |          |       |   |   |
| Pre-requisites/Exposure    |                               |          |       |   |   |
| Co-requisites              |                               |          |       |   |   |
|                            | Course                        | Objectiv | ves . |   |   |
|                            |                               |          |       |   |   |

#### Upon completion of this course the student should be able to

- 1. Know the theory and their application in Pharmacy
- 2. Solve the different types of problems by applying
- 3. Appreciate the important application of mathematics in Pharmacy

# Course Outcomes (CO)

#### On completion of this course, the student will be able to:

CO1. To learn and understand the advance mathematics and its implementation in pharmacy

CO2. It provides knowledge of fraction and its implementation in pharmacy

CO3. It provides knowledge of analytical geometry and calculus

CO4. It helps in understanding the matrices and determinant

PO1

3

3

3

 $\mathbf{CO}$ 

CO1

CO<sub>2</sub>

**CO3** 

CO<sub>4</sub>

PO2 PO3

3

3

3

3

2

2

2

2

#### 

- - - - - 2 3 -- - - - 2 3 -

1=lightly mapped 2= moderately mapped 3=strongly mapped

| BP107P      | Human Anatomy and Physiology (HAP) –<br>Practical | L | Т | P | C |
|-------------|---|---|---|---|---|
| Version 2.0 |   | 0 | 0 | 4 | 2 |

| <b>Total Contact Hours</b> | 60 Hours                  |
|----------------------------|---------------------------|
| Pre-requisites/Exposure    | HAP-1 Practical           |
| Co-requisites              | Experimental Pharmacology |

# **Course Objectives**

#### Upon completion of this course the student should be able to

- 1. Practical physiology is complimentary to the theoretical discussions in Physiology.
- 2. Practical allows the verification of physiological processes discussed in theory classes through experiments on living tissue, intact animals or normal human beings.
- 3. This is helpful for developing an insight into human anatomy and physiology.

#### **Course Outcomes (CO)**

#### On completion of this course, the student will be able to:

- CO1. To learn and understand the components of living world, structure and functional system of plant kingdom.
- CO2. It provides knowledge about blood, their composition, function and coagulation factor.
- CO3. To learn the about bones with special reference to human.
- CO4. Provide practical knowledge of biological system and human anatomy

| СО  | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO 10 | PO11 | PO12 | PSO<br>1 | PSO 2 |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-------|------|------|----------|-------|
| CO1 | 3   | 3   | 2   | 2   | 3   | 2   | -   | 2   | 2   | 2     | 3    | 3    | 3        | 3     |

| Unit | Relevance to the | local, national,<br>recional and clobal | nental |   |          | Relevance To the | Employability/<br>Entrepreneurship/<br>Skill Develonment |      |         | Relevance to the<br>Professional Ethics,<br>Gender, Human | Values,<br>Environment & | Sustainability |          | 543   | 500 | NEP | POE/4 <sup>th</sup> IR |   |
|------|------------------|---|--------|---|----------|------------------|--|------|---------|---|--------------------------|----------------|----------|-------|-----|-----|------------------------|---|
| CO2  | 3                | 3                                       | 3      | 2 | 2        | 2                | -  | 1    | 2       | 2   | 3                        | 3              | 3        | 3     |     |     |                        | _ |
| CO3  | 3                | 3                                       | 2      | 2 | 3        | 2                | -  | 2    | 2       | 2   | 3                        | 3              | 3        | 3     |     |     |                        |   |
| CO4  | 3                | 2                                       | 2      | 2 | 3        | 2                | -  | 2    | 2       | 2   | 3                        | 3              | 3        | 3     |     |     |                        |   |
|      |                  |   | •      |   | 1=lightl | y mappe          | ed   | 2= m | oderate | ly mapped   |                          | 3=stro         | ongly ma | apped |     |     |                        |   |

| BP107P                     |       |          |  |        |               |                  |  |                     |        |              |                              |  |               |  |
|----------------------------|-------|----------|--|--------|---------------|------------------|--|---------------------|--------|--------------|------------------------------|--|---------------|--|
|                            | Local | Regional | National   | Global | Employability | Entrepreneurship | Skill Development  | Professional Ethics | Gender | Human Values | Environment & Sustainability |  |               |  |
| Unit I<br>Practica<br>11-3 |       | -        | The concepts once imbibed will help the students to use the practical information in providing better health services to the nation as a whole | -      | -             | -                | Enrichment of thinking ability and creativity. The practical knowledge of the topic will help them to understand the physiology of skin and diseases related to the system in a better | -                   | -      | -            | -                            | SDG 3: Ensure healthy lives and promote well- being for all at all ages.  SDG 4.4: Skills for Decent | NEP (9.1-9.3) | Student centric Technical Skills that match Industry Needs |

|                  |   |   |   |   |   |   | way and  |   |   |   |   | Work  |       |  |
|------------------|---|---|---|---|---|---|--|---|---|---|---|---|-------|--|
|                  |   |   |   |   |   |   | they will be   |   |   |   |   |   |       |  |
|                  |   |   |   |   |   |   | able to  |   |   |   |   |   |       |  |
|                  |   |   |   |   |   |   | correlate  |   |   |   |   |   |       |  |
|                  |   |   |   |   |   |   | the  |   |   |   |   |   |       |  |
|                  |   |   |   |   |   |   | knowledge  |   |   |   |   |   |       |  |
|                  |   |   |   |   |   |   | and  |   |   |   |   |   |       |  |
|                  |   |   |   |   |   |   | information  |   |   |   |   |   |       |  |
|                  |   |   |   |   |   |   | gathered in  |   |   |   |   |   |       |  |
|                  |   |   |   |   |   |   | their day-   |   |   |   |   |   |       |  |
|                  |   |   |   |   |   |   | to-day life  |   |   |   |   |   |       |  |
|                  |   |   |   |   |   |   | and future   |   |   |   |   |   |       |  |
|                  |   |   |   |   |   |   | job  |   |   |   |   |   |       |  |
|                  |   |   |   |   |   |   | prospective  |   |   |   |   |   |       |  |
|                  |   |   |   |   |   |   | also   |   |   |   |   |   |       |  |
|                  |   |   |   |   |   |   |  |   |   |   |   |   |       |  |
| Unit II          | _ | _ | The   | _ | _ | - | Enrichment   | _ | _ | _ | _ | SDG 3:  | NEP   | Student                                      |
| 1                |   |   |   | _ | _ |   |  | _ | _ |   |   |   |       |  |
| Practica         |   |   | concepts  | _ | _ |   | of thinking  |   | - |   |   | Ensure  | (9.1- | centric                                      |
| Practica<br>14-6 |   |   | concepts once   | _ | - |   | of thinking ability and  |   |   |   |   | Ensure healthy  |       | centric<br>Technical                         |
|                  |   |   | concepts<br>once<br>imbibed   |   | - |   | of thinking ability and creativity.  |   |   |   |   | Ensure healthy lives  | (9.1- | centric<br>Technical<br>Skills               |
|                  |   |   | concepts<br>once<br>imbibed<br>will help  |   | - |   | of thinking ability and creativity.  |   |   |   |   | Ensure<br>healthy<br>lives<br>and                           | (9.1- | centric Technical Skills that                |
|                  |   |   | concepts once imbibed will help the   |   | - |   | of thinking ability and creativity. The practical  |   |   |   |   | Ensure healthy lives and promote                            | (9.1- | centric Technical Skills that match          |
|                  |   |   | concepts once imbibed will help the students to   |   | - |   | of thinking ability and creativity. The practical knowledge  |   |   |   |   | Ensure healthy lives and promote well-                      | (9.1- | centric Technical Skills that match Industry |
|                  |   |   | concepts once imbibed will help the students to use the   |   |   |   | of thinking ability and creativity. The practical knowledge of the topic   |   |   |   |   | Ensure healthy lives and promote well- being                | (9.1- | centric Technical Skills that match          |
|                  |   |   | concepts once imbibed will help the students to use the practical                                 |   |   |   | of thinking ability and creativity. The practical knowledge of the topic will help                                   |   |   |   |   | Ensure healthy lives and promote well- being for all        | (9.1- | centric Technical Skills that match Industry |
|                  |   |   | concepts once imbibed will help the students to use the practical information                     |   |   |   | of thinking ability and creativity. The practical knowledge of the topic will help them to                           |   |   |   |   | Ensure healthy lives and promote well- being                | (9.1- | centric Technical Skills that match Industry |
|                  |   |   | concepts once imbibed will help the students to use the practical information in                  |   |   |   | of thinking ability and creativity. The practical knowledge of the topic will help them to understand                |   |   |   |   | Ensure healthy lives and promote well- being for all        | (9.1- | centric Technical Skills that match Industry |
|                  |   |   | concepts once imbibed will help the students to use the practical information in providing        |   |   |   | of thinking ability and creativity. The practical knowledge of the topic will help them to understand the            |   |   |   |   | Ensure healthy lives and promote well- being for all at all | (9.1- | centric Technical Skills that match Industry |
|                  |   |   | concepts once imbibed will help the students to use the practical information in providing better |   |   |   | of thinking ability and creativity. The practical knowledge of the topic will help them to understand the physiology |   |   |   |   | Ensure healthy lives and promote well- being for all at all | (9.1- | centric Technical Skills that match Industry |
|                  |   |   | concepts once imbibed will help the students to use the practical information in providing        |   |   |   | of thinking ability and creativity. The practical knowledge of the topic will help them to understand the            |   |   |   |   | Ensure healthy lives and promote well- being for all at all | (9.1- | centric Technical Skills that match Industry |

|          |   |   | the nation  |   |   |   | related to   |   |   |   |   | 4.4:    |       |           |
|----------|---|---|-------------|---|---|---|--------------|---|---|---|---|---------|-------|-----------|
|          |   |   | as a whole  |   |   |   | the system   |   |   |   |   | Skills  |       |           |
|          |   |   |             |   |   |   | in a better  |   |   |   |   | for     |       |           |
|          |   |   |             |   |   |   | way and      |   |   |   |   | Decent  |       |           |
|          |   |   |             |   |   |   | they will be |   |   |   |   | Work    |       |           |
|          |   |   |             |   |   |   | able to      |   |   |   |   |         |       |           |
|          |   |   |             |   |   |   | correlate    |   |   |   |   |         |       |           |
|          |   |   |             |   |   |   | the          |   |   |   |   |         |       |           |
|          |   |   |             |   |   |   | knowledge    |   |   |   |   |         |       |           |
|          |   |   |             |   |   |   | and          |   |   |   |   |         |       |           |
|          |   |   |             |   |   |   | information  |   |   |   |   |         |       |           |
|          |   |   |             |   |   |   | gathered in  |   |   |   |   |         |       |           |
|          |   |   |             |   |   |   | their day-   |   |   |   |   |         |       |           |
|          |   |   |             |   |   |   | to-day life  |   |   |   |   |         |       |           |
|          |   |   |             |   |   |   | and future   |   |   |   |   |         |       |           |
|          |   |   |             |   |   |   | job          |   |   |   |   |         |       |           |
|          |   |   |             |   |   |   | prospective  |   |   |   |   |         |       |           |
|          |   |   |             |   |   |   | also         |   |   |   |   |         |       |           |
| Unit III | _ | _ | The         | _ | _ | - | Enrichment   | _ | _ | _ | _ | SDG 3:  | NEP   | Student   |
| Practica | _ | _ |             | - | - | - | of thinking  | _ | _ | _ | _ | Ensure  | (9.1- | centric   |
| 17-9     |   |   | once        |   |   |   | ability and  |   |   |   |   | healthy | 9.3)  | Technical |
| 1 /-9    |   |   | imbibed     |   |   |   | creativity.  |   |   |   |   | lives   | 9.3)  | Skills    |
|          |   |   | will help   |   |   |   | The          |   |   |   |   | and     |       | that      |
|          |   |   | the         |   |   |   | practical    |   |   |   |   | promote |       | match     |
|          |   |   | students to |   |   |   | knowledge    |   |   |   |   | well-   |       | Industry  |
|          |   |   | use the     |   |   |   | of the topic |   |   |   |   | being   |       | Needs     |
|          |   |   | practical   |   |   |   | will help    |   |   |   |   | for all |       | 110005    |
|          |   |   | information |   |   |   | them to      |   |   |   |   | at all  |       |           |
|          |   |   | in          |   |   |   | understand   |   |   |   |   | ages.   |       |           |
|          |   |   | providing   |   |   |   | the          |   |   |   |   | ugos.   |       |           |
|          |   |   | providing   |   |   |   | шс           |   |   |   |   |         |       |           |

|          |   |   | better      |   |   |   | physiology   |   |                |   |   |         |       |           |
|----------|---|---|-------------|---|---|---|--------------|---|----------------|---|---|---------|-------|-----------|
|          |   |   | health      |   |   |   | of skin and  |   |                |   |   |         |       |           |
|          |   |   | services to |   |   |   | diseases     |   |                |   |   | SDG     |       |           |
|          |   |   | the nation  |   |   |   | related to   |   |                |   |   | 4.4:    |       |           |
|          |   |   | as a whole  |   |   |   | the system   |   |                |   |   | Skills  |       |           |
|          |   |   |             |   |   |   | in a better  |   |                |   |   | for     |       |           |
|          |   |   |             |   |   |   | way and      |   |                |   |   | Decent  |       |           |
|          |   |   |             |   |   |   | they will be |   |                |   |   | Work    |       |           |
|          |   |   |             |   |   |   | able to      |   |                |   |   |         |       |           |
|          |   |   |             |   |   |   | correlate    |   |                |   |   |         |       |           |
|          |   |   |             |   |   |   | the          |   |                |   |   |         |       |           |
|          |   |   |             |   |   |   | knowledge    |   |                |   |   |         |       |           |
|          |   |   |             |   |   |   | and          |   |                |   |   |         |       |           |
|          |   |   |             |   |   |   | information  |   |                |   |   |         |       |           |
|          |   |   |             |   |   |   | gathered in  |   |                |   |   |         |       |           |
|          |   |   |             |   |   |   | their day-   |   |                |   |   |         |       |           |
|          |   |   |             |   |   |   | to-day life  |   |                |   |   |         |       |           |
|          |   |   |             |   |   |   | and future   |   |                |   |   |         |       |           |
|          |   |   |             |   |   |   | job          |   |                |   |   |         |       |           |
|          |   |   |             |   |   |   | prospective  |   |                |   |   |         |       |           |
|          |   |   |             |   |   |   | also         |   |                |   |   |         |       |           |
|          |   |   |             |   |   |   | <b></b>      |   |                |   |   |         |       |           |
| Unit IV  | - | - | The         | - | - | - | Enrichment   | - | The practical  | - | - | SDG 3:  | NEP   | Student   |
| Practica |   |   | concepts    |   |   |   | of thinking  |   | knowledge      |   |   | Ensure  | (9.1- | centric   |
| 110-12   |   |   | once        |   |   |   | ability and  |   | of the         |   |   | healthy | 9.3)  | Technical |
|          |   |   | imbibed     |   |   |   | creativity.  |   | contraceptive  |   |   | lives   |       | Skills    |
|          |   |   | will help   |   |   |   | The          |   | methods and    |   |   | and     |       | that      |
|          |   |   | the         |   |   |   | practical    |   | related topics |   |   | promote |       | match     |
|          |   |   | students to |   |   |   | knowledge    |   | will enrich    |   |   | well-   |       | Industry  |
|          |   |   | use the     |   |   |   | of the topic |   | the            |   |   | being   |       | Needs     |
|          |   |   | practical   |   |   |   | will help    |   | knowledge      |   |   | for all |       |           |

|          |   |   | information |   |   |   | them to      |   | of the         |   |     | at all  |       |           |
|----------|---|---|-------------|---|---|---|--------------|---|----------------|---|-----|---------|-------|-----------|
|          |   |   | in          |   |   |   | understand   |   | students in    |   |     | ages.   |       |           |
|          |   |   | providing   |   |   |   | the          |   | the field      |   |     |         |       |           |
|          |   |   | better      |   |   |   | physiology   |   |                |   |     |         |       |           |
|          |   |   | health      |   |   |   | of skin and  |   |                |   |     | SDG     |       |           |
|          |   |   | services to |   |   |   | diseases     |   |                |   |     | 4.4:    |       |           |
|          |   |   | the nation  |   |   |   | related to   |   |                |   |     | Skills  |       |           |
|          |   |   | as a whole  |   |   |   | the system   |   |                |   |     | for     |       |           |
|          |   |   |             |   |   |   | in a better  |   |                |   |     | Decent  |       |           |
|          |   |   |             |   |   |   | way and      |   |                |   |     | Work    |       |           |
|          |   |   |             |   |   |   | they will be |   |                |   |     |         |       |           |
|          |   |   |             |   |   |   | able to      |   |                |   |     |         |       |           |
|          |   |   |             |   |   |   | correlate    |   |                |   |     |         |       |           |
|          |   |   |             |   |   |   | the          |   |                |   |     |         |       |           |
|          |   |   |             |   |   |   | knowledge    |   |                |   |     |         |       |           |
|          |   |   |             |   |   |   | and          |   |                |   |     |         |       |           |
|          |   |   |             |   |   |   | information  |   |                |   |     |         |       |           |
|          |   |   |             |   |   |   | gathered in  |   |                |   |     |         |       |           |
|          |   |   |             |   |   |   | their day-   |   |                |   |     |         |       |           |
|          |   |   |             |   |   |   | to-day life  |   |                |   |     |         |       |           |
|          |   |   |             |   |   |   | and future   |   |                |   |     |         |       |           |
|          |   |   |             |   |   |   | job          |   |                |   |     |         |       |           |
|          |   |   |             |   |   |   | prospective  |   |                |   |     |         |       |           |
|          |   |   |             |   |   |   | also         |   |                |   |     |         |       |           |
| Unit V   | _ | _ | The         | _ | - | _ | Enrichment   | _ | The practical  | - | _   | SDG 3:  | NEP   | Student   |
| Practica |   |   | concepts    |   | = |   | of thinking  |   | knowledge      |   | , i | Ensure  | (9.1- | centric   |
| 113-15   |   |   | once        |   |   |   | ability and  |   | of the         |   |     | healthy | 9.3)  | Technical |
|          |   |   | imbibed     |   |   |   | creativity.  |   | contraceptive  |   |     | lives   | 7.57  | Skills    |
|          |   |   | will help   |   |   |   | The          |   | methods and    |   |     | and     |       | that      |
|          |   |   | the         |   |   |   | practical    |   | related topics |   |     | promote |       | match     |
|          |   |   |             |   |   |   | ractions     |   | 151atea topies |   |     | Promote |       |           |

|  | students to | knowledge    | will enrich | well-   | Industry |
|--|-------------|--------------|-------------|---------|----------|
|  | use the     | of the topic | the         | being   | Needs    |
|  | practical   | will help    | knowledge   | for all |          |
|  | information | them to      | of the      | at all  |          |
|  | in          | understand   | students in | ages.   |          |
|  | providing   | the          | the field   |         |          |
|  | better      | physiology   |             |         |          |
|  | health      | of skin and  |             | SDG     |          |
|  | services to | diseases     |             | 4.4:    |          |
|  | the nation  | related to   |             | Skills  |          |
|  | as a whole  | the system   |             | for     |          |
|  |             | in a better  |             | Decent  |          |
|  |             | way and      |             | Work    |          |
|  |             | they will be |             |         |          |
|  |             | able to      |             |         |          |
|  |             | correlate    |             |         |          |
|  |             | the          |             |         |          |
|  |             | knowledge    |             |         |          |
|  |             | and          |             |         |          |
|  |             | information  |             |         |          |
|  |             | gathered in  |             |         |          |
|  |             | their day-   |             |         |          |
|  |             | to-day life  |             |         |          |
|  |             | and future   |             |         |          |
|  |             | job          |             |         |          |
|  |             | prospective  |             |         |          |
|  |             | also         |             |         |          |
|  |             |              |             |         |          |

| BP 108P                    | Pharmaceutical Analysis (Practical)                | L        | Т  | P | C |  |  |  |  |  |  |  |
|----------------------------|--|----------|----|---|---|--|--|--|--|--|--|--|
| Version 2.0                |  | 0        | 0  | 4 | 2 |  |  |  |  |  |  |  |
| <b>Total Contact Hours</b> | 60 hrs   | L        |    |   |   |  |  |  |  |  |  |  |
| Pre-requisites/Exposure    | Pharmaceutical Analysis                            |          |    |   |   |  |  |  |  |  |  |  |
| Co-requisites              | Pharmaceutical Chemistry  Pharmaceutical Chemistry |          |    |   |   |  |  |  |  |  |  |  |
|                            | Course (   | Objectiv | es |   |   |  |  |  |  |  |  |  |

# Upon completion of this course the student should be able to

- 1. To Know the history of Pharmacopoeia
- 2. Understand the principles of volumetric and electro chemical analysis
- 3. Carryout various volumetric and electrochemical titrations
- 4. Develop analytical skills

# Course Outcomes (CO)

# On completion of this course, the student will be able to:

- CO1. This subject is designed to impart fundamental knowledge on pharmaceutical preparations.
- CO2. The subject provides the basic knowledge required to understand the various disciplines of Analysis.
- CO3. This subject deals with the monographs of inorganic drugs and pharmaceuticals.
- CO4. Provide Knowledge about Indian Pharmacopoeia, British Pharmacopeia and other Regulatory agencies.
- CO5. Provide Knowledge about metric system and calculation of dosages.

| СО  | PO1 | PO2 | PO3 | PO4 | PO5    | PO6     | <b>PO7</b> | PO8 | PO9   | PO<br>10 | PO11    | PO12 | PSO<br>1 | PSO 2           |
|-----|-----|-----|-----|-----|--------|---------|------------|-----|-------|----------|---------|------|----------|-----------------|
| CO1 | 3   | 3   | 2   | 2   | 3      | 2       |            | 2   | 2     | 2        | 3       | 3    | 3        | -               |
| CO2 | 3   | 3   | 3   | 2   | 2      | 2       | •          | 1   | 2     | 2        | 3       | 3    | 3        | -               |
| CO3 | 3   | 3   | 2   | 2   | 3      | 2       |            | 2   | 2     | 2        | 3       | 3    | 3        | -               |
| CO4 | 3   | 3   | 2   | 2   | 3      | 2       |            | 2   | 2     | 2        | 3       | 3    | 3        | -               |
| CO5 | 3   | 3   | 2   | 2   | 3      | 2       | -          | 1   | 2     | 2        | 3       | 3    | 3        | -               |
|     | •   | •   | •   |     | 1=ligl | ntly ma | pped       | •   | 2= mo | oderate  | ly mapp | ed   | 3=       | strongly mapped |

| Unit | the ll, global al                   | y/ rship/ ment                               | the Ethics, nan &                                 |                    |          |
|------|-------------------------------------|--|---|--------------------|----------|
|      | ance to nationa opments             | ance To<br>loyability<br>spreneur<br>Develop | ance to ssional ] er, Hun ss, onment inability    | 4 <sup>th</sup> IR | <b>:</b> |
|      | Relev<br>local,<br>develon<br>needs | Relev<br>Empl<br>Entre<br>Skill ]            | Relev<br>Profe<br>Gend<br>Value<br>Envir<br>Susta | SDG<br>NEP<br>POE/ | ì        |

| Unit I | ' Local | Regional | To Perform Quality control of marketed formulations | To analyse the impurit y in API by limit test | ' Employability | Entrepreneurship | Analysis of impurities helps in quality control of Drugs | Professional Ethics | Gender | Human Values | Environment & Sustainability | Skil<br>ls<br>for<br>Dec<br>ent<br>Wor<br>k<br>(SD<br>G<br>4.4) | Pro mot ing Hig h-qual ity rese arch (18. 1-18.9), | Skill<br>Develo<br>pment,<br>Employ<br>ability |
|--------|---------|----------|---|---|-----------------|------------------|--|---------------------|--------|--------------|------------------------------|---|--|--|
| Unit   | -       | -        | To Perform  | То  | -               | -                | Standardiz   | -                   | -      | -            | -                            | Skil  | Pro  | Skill  |
| II     |         |          | the   | determ  |                 |                  | ation of   |                     |        |              |                              | ls  | mot  | Develo   |
|        |         |          | standardizati                                       | ine the                                       |                 |                  | solution   |                     |        |              |                              | for   | ing  | pment,   |
|        |         |          | on of different                                     | concen  |                 |                  | will help  |                     |        |              |                              | Dec   | Hig  | Employ   |
|        |         |          |   | tration<br>of                                 |                 |                  | in assay of  |                     |        |              |                              | ent   | h-   | ability  |
|        |         |          | solutions for                                       |   |                 |                  | Drugs  |                     |        |              |                              | Wor   | qual   |  |
|        |         |          | further   | solutio                                       |                 |                  |  |                     |        |              |                              | k   | ity  |  |
|        |         |          | synthesis   |   |                 |                  |  |                     |        |              |                              | (SD   | rese   |  |

|      |   |   | use and      | n       |   |   |             |  |   | G    | arch |         |
|------|---|---|--------------|---------|---|---|-------------|--|---|------|------|---------|
|      |   |   | analysis     |         |   |   |             |  |   | 4.4) | (18. |         |
|      |   |   |              |         |   |   |             |  |   |      | 1-   |         |
|      |   |   |              |         |   |   |             |  |   |      | 18.9 |         |
|      |   |   |              |         |   |   |             |  |   |      | ),   |         |
| Unit | _ | _ | To Perform   | То      | _ | _ | Assay of    |  |   | Skil | Tec  | Skill   |
| III  |   |   | Quality      | analyse |   |   | Drugs       |  |   | ls   | hnic | Develo  |
|      |   |   | control of   | the     |   |   | helps in    |  |   | for  | al   | pment,  |
|      |   |   | marketed     | import  |   |   | Quality     |  |   | Dec  | Skil | Employ  |
|      |   |   | formulations | sample  |   |   | control of  |  |   | ent  | ls   | ability |
|      |   |   |              | by      |   |   | Drugs       |  |   | Wor  | that |         |
|      |   |   |              | followi |   |   |             |  |   | k    | mat  |         |
|      |   |   |              | ng      |   |   |             |  |   | (SD  | ch   |         |
|      |   |   |              | differe |   |   |             |  |   | G    | Ind  |         |
|      |   |   |              | nt      |   |   |             |  |   | 4.4) | ustr |         |
|      |   |   |              | assay   |   |   |             |  |   |      | У    |         |
|      |   |   |              | method  |   |   |             |  |   |      | Nee  |         |
|      |   |   |              | S       |   |   |             |  |   |      | ds   |         |
| Unit | - | - | То           | То      | _ | _ | Standardiz  |  | - | Skil | Tec  | Hands-  |
| IV   |   |   | determine    | determ  |   |   | ation of    |  |   | ls   | hnic | on      |
|      |   |   | the          | ine the |   |   | solution    |  |   | for  | al   | Experie |
|      |   |   | normality of | concen  |   |   | will help   |  |   | Dec  | Skil | nce     |
|      |   |   | drugs during | tration |   |   | in assay of |  |   | ent  | ls   |         |
|      |   |   | quality      | of      |   |   | Drugs       |  |   | Wor  | that |         |
|      |   |   | check of     | solutio |   |   |             |  |   | k    | mat  |         |
|      |   |   | product      | n       |   |   |             |  |   | (SD  | ch   |         |
|      |   |   |              |         |   |   |             |  |   | G    | Ind  |         |
|      |   |   |              |         |   |   |             |  |   | 4.4) | ustr |         |
|      |   |   |              |         |   |   |             |  |   |      | У    |         |

|  |  |  |  |  |  | Nee |  |
|--|--|--|--|--|--|-----|--|
|  |  |  |  |  |  | ds  |  |
|  |  |  |  |  |  |     |  |

| BP 109P                    | Pharmaceutics-I (Practical) | L          | Т   | P | С |
|----------------------------|-----------------------------|------------|-----|---|---|
| Version 2.0                |                             | 0          | 0   | 4 | 2 |
| <b>Total Contact Hours</b> | 60 Hours                    |            |     |   |   |
| Pre-requisites/Exposure    | Pharmaceutics               |            |     |   |   |
| Co-requisites              | Pharmaceutics               |            |     |   |   |
|                            | Course                      | e Objectiv | /es |   |   |

#### Upon completion of this course the student should be able to

- Know the history of profession of pharmacy
- Understand the basics of different dosage forms, pharmaceutical incompatibilities and pharmaceutical calculations
- Understand the professional way of handling the prescription
- Preparation of various conventional dosage

### **Course Outcomes (CO)**

### On completion of this course, the student will be able to:

CO1. This subject is designed to impart fundamental knowledge on pharmaceutical preparations.

CO2. The subject provides the basic knowledge required to understand the various disciplines of Pharmacy.

CO3. It enlightens the students about the dosage, various types of dosage form, NDDS, depot preparation.

CO4. Provide Knowledge about Indian Pharmacopoeia, British Pharmacopeia and other Regulatory Agencies.

CO5. Provide Knowledge about metric system and calculation of dosages.

# **Programme and Course Mapping**

| СО  | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO<br>10 | PO11 | PO12 | PSO<br>1 | PSO 2 |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|----------|------|------|----------|-------|
| CO1 | 3   | 3   | 2   | 2   | 3   | 2   | -   | 2   | 2   | 2        | 3    | 3    | 3        | -     |
| CO2 | 3   | 2   | 3   | 2   | 2   | 2   | 1   | 1   | 2   | 2        | 3    | 3    | 3        | -     |
| CO3 | 3   | 3   | 2   | 2   | 3   | 2   | •   | 2   | 2   | 2        | 3    | 3    | 3        | -     |
| CO4 | 3   | 2   | 2   | 2   | 3   | 2   | •   | 2   | 2   | 2        | 3    | 3    | 3        | -     |
| CO5 | 3   | 3   | 2   | 2   | 3   | 2   | -   | 1   | 2   | 2        | 3    | 3    | 3        | -     |

1=lightly mapped

2= moderately mapped

3=strongly mapped

| Unit   | Relevance to the local, national, | regional and global | developmental | Singa   | Relevance To the | Entrepreneurship/<br>Entrepreneurship/<br>Skill Development  |                   | Relevance to the    | Professional Ethics, | Gender, Human<br>Values | Environment & Sustainability | SDG  | NEP  | POE/4 <sup>th</sup> IR                                       |
|--------|-----------------------------------|---------------------|---------------|---|------------------|--|-------------------|---------------------|----------------------|-------------------------|------------------------------|--|--|--|
| Unit I | Local                             | Regional            | National      | Syrups and elixirs contribute globally by offering a palatable and easily administered liquid dosage form, ensuring widespread accessibility to medications, particularly for children and individuals with swallowing difficulties. They enhance patient compliance and contribute to improved global healthcare outcomes. | Employability    | Syrups and elixirs contribute to entrepreneurship by providing opportunities for formulation innovation and niche market creation in the pharmaceutical industry. Entrepreneurs can leverage these liquid dosage forms to develop unique and specialized medication solutions, | Skill Development | Professional Ethics | Gender               | Human Values            | Environment & Sustainability | Ski<br>lls<br>for<br>De<br>cen<br>t<br>Wo<br>rk<br>(S<br>DG<br>4.4 | Pro mot ing Hig h-qual ity rese arch (18. 1-18.9 | Focus on Employ ability Skills (Local/ Region al and Global) |

|          |   |   |   |   |   | catering to specific patient<br>needs and establishing<br>their own successful<br>ventures.   |   |   |   |   |   | )  | )   |  |
|----------|---|---|---|---|---|---|---|---|---|---|---|--|---|--|
| Unit II  | - | - | - | Linctus and solutions contribute globally by offering convenient and precise delivery of medications, improving patient compliance and access to treatment. They play a crucial role in global healthcare, particularly in the management of respiratory conditions, cough, and other ailments.                       |   | Linctus and solutions provide entrepreneurial opportunities by enabling the development of unique formulations and specialized products for specific market segments. Entrepreneurs can capitalize on these liquid medication options to address specific patient needs and create innovative solutions, establishing successful ventures in the pharmaceutical industry. | - |   | - | - | - | Ski<br>lls<br>for<br>De<br>cen<br>t<br>Wo<br>rk<br>(S<br>DG<br>4.4 | Pro mot ing Hig h-qual ity rese arch (18. 1-18.9) | Focus on Employ ability Skills (Local/ Region al and Global) |
| Unit III | - | - | - | Suspensions and emulsions contribute globally by providing versatile formulations for the delivery of poorly soluble drugs, enhancing their bioavailability and therapeutic effectiveness. They offer diverse applications in pharmaceuticals, food, and cosmetic industries, driving innovation and improving global | - | Suspensions and emulsions offer entrepreneurial opportunities by enabling the development of unique formulations and product lines, catering to specific market needs. Entrepreneurs can  | - | - | - | - | - | Ski<br>lls<br>for<br>De<br>cen<br>t<br>Wo<br>rk<br>(S              | Pro mot ing Hig h- qual ity rese arch             | Focus on Employ ability Skills (Local/ Region al and         |

|         |   |   |   | access to effective medications and     |   | leverage these versatile    |   |   |   |   |   | DG  | (18. | Global) |
|---------|---|---|---|---|---|-----------------------------|---|---|---|---|---|-----|------|---------|
|         |   |   |   | consumer products.                      |   | dosage forms to create      |   |   |   |   |   | 4.4 | 1-   |         |
|         |   |   |   | _                                       |   | innovative solutions,       |   |   |   |   |   | )   | 18.9 |         |
|         |   |   |   |   |   | establish niche brands, and |   |   |   |   |   |     | )    |         |
|         |   |   |   |   |   | tap into the growing        |   |   |   |   |   |     |      |         |
|         |   |   |   |   |   | demand for specialized      |   |   |   |   |   |     |      |         |
|         |   |   |   |   |   | suspensions and emulsion-   |   |   |   |   |   |     |      |         |
|         |   |   |   |   |   | based products.             |   |   |   |   |   |     |      |         |
| Unit IV | - | - | - | Powders and granules, suppositories,    | - | Powders and granules,       | - | - | - | - | - | Ski | Pro  | Focus   |
|         |   |   |   | gargles, and mouthwashes contribute     |   | suppositories, gargles, and |   |   |   |   |   | lls | mot  | on      |
|         |   |   |   | globally by offering versatile and      |   | mouthwashes offer           |   |   |   |   |   | for | ing  | Employ  |
|         |   |   |   | accessible dosage forms for             |   | entrepreneurial             |   |   |   |   |   | De  | Hig  | ability |
|         |   |   |   | medication administration, providing    |   | opportunities through the   |   |   |   |   |   | cen | h-   | Skills  |
|         |   |   |   | convenience, targeted treatment, and    |   | development of              |   |   |   |   |   | t   | qual | (Local/ |
|         |   |   |   | improved patient outcomes in diverse    |   | specialized formulations    |   |   |   |   |   | Wo  | ity  | Region  |
|         |   |   |   | healthcare settings worldwide. They     |   | and niche product lines.    |   |   |   |   |   | rk  | rese | al and  |
|         |   |   |   | address specific needs such as ease of  |   | Entrepreneurs can           |   |   |   |   |   | (S  | arch | Global) |
|         |   |   |   | administration, localized therapy, and  |   | leverage these unique       |   |   |   |   |   | DG  | (18. |         |
|         |   |   |   | oral hygiene, contributing to global    |   | dosage forms to create      |   |   |   |   |   | 4.4 | 1-   |         |
|         |   |   |   | healthcare accessibility and improved   |   | innovative healthcare       |   |   |   |   |   | )   | 18.9 |         |
|         |   |   |   | quality of life.                        |   | products, cater to specific |   |   |   |   |   |     | )    |         |
|         |   |   |   |   |   | market segments, and        |   |   |   |   |   |     |      |         |
|         |   |   |   |   |   | establish successful        |   |   |   |   |   |     |      |         |
|         |   |   |   |   |   | ventures in the             |   |   |   |   |   |     |      |         |
|         |   |   |   |   |   | pharmaceutical and          |   |   |   |   |   |     |      |         |
|         |   |   |   |   |   | personal care industries.   |   |   |   |   |   |     |      |         |
| Unit v  | - | - | - | Suppositories, semisolids, gargles,     | - | Entrepreneurs may explore   | - | - | - | - | - | Ski | Pro  | Focus   |
|         |   |   |   | and mouthwashes have global             |   | the development and         |   |   |   |   |   | lls | mot  | on      |
|         |   |   |   | significance as they play crucial roles |   | manufacturing of            |   |   |   |   |   | for | ing  | Employ  |

| in healthcare by delivering         | innovative suppository      | De  | Hig  | ability |
|-------------------------------------|-----------------------------|-----|------|---------|
| medications rectally, providing     | formulations, semisolid     | cen | h-   | Skills  |
| topical treatments for various skin | products, or oral hygiene   | t   | qual | (Local/ |
| conditions, and promoting oral      | solutions, aiming to        | Wo  | ity  | Region  |
| hygiene, respectively, thereby      | address unmet needs,        | rk  | rese | al and  |
| improving patient outcomes and      | improve existing            | (S  | arch | Global) |
| enhancing overall well-being.       | formulations, or introduce  | DG  | (18. |         |
|                                     | novel approaches to         | 4.4 | 1-   |         |
|                                     | medication delivery and     | )   | 18.9 |         |
|                                     | personal care. By           |     | )    |         |
|                                     | leveraging their            |     |      |         |
|                                     | knowledge of these          |     |      |         |
|                                     | healthcare products,        |     |      |         |
|                                     | entrepreneurs can create    |     |      |         |
|                                     | businesses that contribute  |     |      |         |
|                                     | to the advancement of       |     |      |         |
|                                     | medical treatments, patient |     |      |         |
|                                     | care, and overall wellness. |     |      |         |
|                                     |                             |     |      |         |

| BP 110P                    | Pharmaceutical Inorganic Chemistry (Practical) | L | Т | P | С |
|----------------------------|--|---|---|---|---|
| Version 2.0                |  | 0 | 0 | 4 | 2 |
| <b>Total Contact Hours</b> | 60 Hours                                       | • | • |   |   |

| Pre-re  | equisit | es/Exp   | osure    |          | Inorga     | nic che  | mistry    |           |          |           |          |                |          |         |
|---|---------|----------|----------|----------|------------|----------|-----------|-----------|----------|-----------|----------|----------------|----------|---------|
| Co-re   | quisite | es       |          |          | Pharm      | aceutic  | al chem   | istry     |          |           |          |                |          |         |
|   |         |          |          |          |            |          |           |           | Cours    | se Obje   | ctives   |                |          |         |
| 1   |         |          |          |          |            |          | lent sho  | ould be   | able to  |           |          |                |          |         |
| 1. To Know the history of Pharmacopoeia   |         |          |          |          |            |          |           |           |          |           |          |                |          |         |
| 2. To know the sources of impurities and methods to determine the impurities in pharmaceuticals |         |          |          |          |            |          |           |           |          |           |          |                |          |         |
| 3.  | Unde    | rstand   | the me   | dicinal  | and pha    | rmaceu   | tical im  | portanc   | e of ino | rganic c  | ompoun   | ds             |          |         |
| 4.  | Prepa   | ration   | of diffe | erent ca | tegory o   | of pharm | naceutic  | al inorg  | ganic co | mpound    | ls       |                |          |         |
| 5.  | Analy   | ysis of  | pharma   | aceutica | l comp     | ounds    |           |           |          |           |          |                |          |         |
|   |         |          |          |          |            |          |           | (         | Course   | Outcom    | es (CO)  | )              |          |         |
| On co   | mnleti  | ion of t | his cor  | ırse th  | e stude    | nt will  | be able   | to:       |          |           |          |                |          |         |
|   |         |          |          |          |            |          |           |           | on pha   | rmaceut   | ical pre | arations       |          |         |
|   |         | J        | υ        |          | 1          |          |           | δ         | 1        |           | 1 1      |                |          |         |
| CO2.  | Provid  | e Knov   | vledge   | about I  | ndian P    | harmaco  | opoeia, l | British 1 | Pharma   | copeia a  | nd other | Regulat        | ory Age  | encies. |
|   |         | _        |          |          |            |          |           |           |          |           |          |                |          |         |
| CO3.  | Provid  | de pract | ical lea | arning o | of impur   | ity test | in pharr  | naceuti   | cals     |           |          |                |          |         |
| CO4   | Drovid  | o Vnov   | uladaa   | of color | ilotion i  | nyolyo   | d pharm   | occutica  | al ahami | atry auh  | vioot    |                |          |         |
| CO4.  | FIOVIG  | e Kilov  | vieuge   | or carci | 11411011 1 | 11001060 | т рнанн   | aceunca   | ai Cheim | ish y suc | ect .    |                |          |         |
|   |         |          |          |          |            |          |           | Pro       | gramm    | e and C   | Course N | <b>Tapping</b> | <u> </u> |         |
|   |         |          |          |          |            |          |           |           |          | PO        |          |                | PSO      |         |
| CO  | PO1     | PO2      | PO3      | PO4      | PO5        | PO6      | PO7       | PO8       | PO9      | 10        | PO11     | PO12           | 1        | PSO 2   |
| CO1   | 3       | 3        | 2        | 2        | 3          | 2        |           | 2         | 2        | 2         | 3        | 3              | 3        |         |

| CO2 | 3 | 2 | 3 | 2 | 2      | 2       | -    | 1 | 2      | 2        | 3     | 3 | 3       | -          |
|-----|---|---|---|---|--------|---------|------|---|--------|----------|-------|---|---------|------------|
| CO3 | 3 | 3 | 2 | 2 | 3      | 2       | -    | 2 | 2      | 2        | 3     | 3 | 3       | -          |
| CO4 | 3 | 2 | 2 | 2 | 3      | 2       | -    | 2 | 2      | 2        | 3     | 3 | 3       | -          |
|     |   | • | • |   | 1=ligh | tly map | pped | 2 | = mode | rately m | apped |   | 3=stron | gly mapped |

| Unit   | Relevance to the local, national, regional and global | developmental<br>needs |  |  | Relevance To the<br>Employability/<br>Entrepreneurship/ | Skill Development |  | Relevance to the    |        | Gender, riuman<br>Values | Environment &             | SDG   | NEP  | POE/4 <sup>th</sup> IR |
|--------|---|------------------------|--|--|---|-------------------|--|---------------------|--------|--------------------------|---------------------------|---|--|------------------------|
| Unit I | ' Local   | ' Regional             | Limit tests for following ions Chloride, Sulphate, Iron, | Limit tests for following ions Chloride, Sulphate, Iron, | • Employability   | Entrepreneurship  | Limit test helps to meet industry demand in production of pure API | Professional Ethics | Gender | Human Values             | h s s b n d Environment & | Skills for<br>Decent<br>Work<br>(SDG 4.4),<br>Ensure<br>sustainable<br>consumptio | Technical Skills<br>that match<br>Industry Needs | Employ ability         |

|         |   | Arsenic    | Arsenic    |   |   |                |   |   |   | О  | n          |                |         |
|---------|---|------------|------------|---|---|----------------|---|---|---|----|------------|----------------|---------|
|         |   |            |            |   |   |                |   |   |   | u  |            |                |         |
|         |   |            |            |   |   |                |   |   |   | 1  | and        |                |         |
|         |   |            |            |   |   |                |   |   |   | d  | production |                |         |
|         |   |            |            |   |   |                |   |   |   |    | patterns   |                |         |
|         |   |            |            |   |   |                |   |   |   | b  | (SDG 12)   |                |         |
|         |   |            |            |   |   |                |   |   |   | e  | (523 12)   |                |         |
|         |   |            |            |   |   |                |   |   |   | m  |            |                |         |
|         |   |            |            |   |   |                |   |   |   | i  |            |                |         |
|         |   |            |            |   |   |                |   |   |   | n  |            |                |         |
|         |   |            |            |   |   |                |   |   |   | i  |            |                |         |
|         |   |            |            |   |   |                |   |   |   | m  |            |                |         |
|         |   |            |            |   |   |                |   |   |   | u  |            |                |         |
|         |   |            |            |   |   |                |   |   |   |    |            |                |         |
|         |   |            |            |   |   |                |   |   |   | m  |            |                |         |
|         |   |            |            |   |   |                |   |   |   |    |            |                |         |
|         |   |            |            |   |   |                |   |   |   | О  |            |                |         |
|         |   |            |            |   |   |                |   |   |   | f  |            |                |         |
|         |   |            |            |   |   |                |   |   |   | i  |            |                |         |
|         |   |            |            |   |   |                |   |   |   | m  |            |                |         |
|         |   |            |            |   |   |                |   |   |   | p  |            |                |         |
|         |   |            |            |   |   |                |   |   |   | u  |            |                |         |
|         |   |            |            |   |   |                |   |   |   | r  |            |                |         |
|         |   |            |            |   |   |                |   |   |   | it |            |                |         |
|         |   |            |            |   |   |                |   |   |   |    |            |                |         |
|         |   |            |            |   |   |                |   |   |   | y  |            |                |         |
| Unit II | _ | Identifica | Identifica | _ | - | Identification | _ | - | - | _  | Skills for | Practical      | Skill   |
|         |   | tion test  | tion test  |   |   | test helps to  |   |   |   |    | Decent     | Courses from   | Develo  |
|         |   |            |            |   |   | meet industry  |   |   |   |    | Work       | Industry/Alumn | pment,  |
|         |   |            |            |   |   | demand in      |   |   |   |    | (SDG 4.4)  | i              | Employ  |
|         |   | Magnesiu   | Magnesiu   |   |   | production of  |   |   |   |    | (520 7.7)  | 1              | ability |
|         |   | m          | m          |   |   |                |   |   |   |    |            |                | aumty   |
|         |   |            |            |   |   | pure API       |   |   |   |    |            |                |         |
|         |   |            |            |   |   |                |   |   |   |    |            |                |         |

|      |   | hydroxide Ferrous sulphate Sodium bicarbonat e  Calcium gluconate Copper sulphate           | hydroxide Ferrous sulphate Sodium bicarbonat e  Calcium gluconate Copper sulphate           |   |   |  |   |   |   |   |   |                                    |
|------|---|---|---|---|---|--|---|---|---|---|---|------------------------------------|
| Unit | - | Test for purity  Swelling power of Bentonite  Neutralizi ng capacity of aluminium hydroxide | Test for purity  Swelling power of Bentonite  Neutralizi ng capacity of aluminium hydroxide | - | - | Determination of physicochemic al properties of Drugs assist in Preformulation studies | - | - | - | Skills for<br>Decent<br>Work<br>(SDG 4.4) | Promoting High-quality research (18.1- 18.9), Practical Courses from Industry/Alumn i | Skill Develo pment, Employ ability |

|      | gel  | gel   |  |  |   |   |  |
|------|--|---|--|--|---|---|--|
| Unit | on of inorganic pharmace uticals  Boric acid  Potash | Preparati on of inorganic pharmace uticals  Boric acid  Potash alum |  |  | Skills for<br>Decent<br>Work<br>(SDG 4.4) | Promoting High-quality research (18.1- 18.9), Practical Courses from Industry/Alumn i | Skill<br>Develo<br>pment,<br>Employ<br>ability |

| BP111P                     | Communication skills (Practical) | L | Т | P | C |  |  |  |
|----------------------------|----------------------------------|---|---|---|---|--|--|--|
| Version 2.0                |                                  | 0 | 0 | 2 | 1 |  |  |  |
| <b>Total Contact Hours</b> | 30 Hours                         | I |   |   |   |  |  |  |
| Pre-requisites/Exposure    | Communication Skills             |   |   |   |   |  |  |  |
| Co-requisites              | Communication Skills             |   |   |   |   |  |  |  |

## Upon completion of this course the student should be able to

- 1. Communicate effectively (Verbal and Non-Verbal)
- 2. Effectively manage the team as a team player

## Course Outcomes (CO)

## On completion of this course, the student will be able to:

CO1. Understand the behavioral needs for a pharmacist to function effectively in the areas of pharmaceutical operation

CO2. Develop interview skills

# **Programme and Course Mapping**

| СО  | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO<br>10 | PO11 | PO12 | PSO<br>1 | PSO 2 |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|----------|------|------|----------|-------|
| CO1 | 3   | 3   | 2   | 2   | 3   | 2   | -   | 2   | 2   | 2        | 3    | 3    | 3        | -     |
| CO2 | 3   | 2   | 3   | 2   | 2   | 2   | -   | 1   | 2   | 2        | 3    | 3    | 3        | -     |

1=lightly mapped

2= moderately mapped

3=strongly mapped

| Unit | o the nal, d global ttal                                 | o the ity/<br>urship/<br>pment                            | the man man tt & tt  |                                |
|------|--|---|--|--------------------------------|
|      | Relevance to local, nation regional and developmen needs | Relevance T<br>Employabili<br>Entrepreneu<br>Skill Develo | Relevance to<br>Professional<br>Gender, Hus<br>Values,<br>Environmer<br>Sustainabili | SDG NEP POE/4 <sup>th</sup> IR |

| BP111<br>P | This course is            | This course is       | National Indicates the Course is | Global This         | me Employability | Entrepreneurship | Skill Development | g Professional Ethics | ' Gender | Human Values | Environment & Sustainability | 1.a           | - | Techni          |
|------------|---------------------------|----------------------|----------------------------------|---------------------|------------------|------------------|-------------------|-----------------------|----------|--------------|------------------------------|---------------|---|-----------------|
|            | designed to               | designed to give     | designed to                      | course is           | to               | to               | ve                | •                     |          |              |                              | Ens           |   | cal             |
|            | give basic communicati    | basic communication  | give basic communicatio          | designed<br>to give | teach<br>effecti | teach<br>effecti | Comm unicati      |                       |          |              |                              | ure<br>sign   |   | Skills<br>that  |
|            | on skills with            | skills with a        | n skills with a                  | basic               | ve               | ve               | on                |                       |          |              |                              | ifica         |   | match           |
|            | a focus on                | focus on regional    | focus on                         | commun              | comm             | comm             | /Writi            |                       |          |              |                              | nt            |   | Industr         |
|            | local                     | relevance and        | national                         | ication             | unicat           | unicat           | ng                |                       |          |              |                              | mob           |   | y&osul          |
|            | relevance and development | developmental needs. | relevance and developmenta       | skills<br>with a    | ion<br>skills,   | ion<br>skills,   | Skills<br>/Effect |                       |          |              |                              | iliza<br>tion |   | tancy<br>Needs/ |
|            | al needs.                 | necus.               | l needs.                         | focus on            | which            | which            | ive               |                       |          |              |                              | of            |   | Soft            |
|            |                           |                      |                                  | global              | are              | are              | Writin            |                       |          |              |                              | reso          |   | Skills/S        |
|            |                           |                      |                                  | relevanc            | essent           | essent           | g                 |                       |          |              |                              | urce          |   | kill            |
|            |                           |                      |                                  | e and               | ial for          | ial for          | /Interv           |                       |          |              |                              | S             |   | Develo          |
|            |                           |                      |                                  | develop             | emplo            | Entre            | iew               |                       |          |              |                              | fro           |   | pment           |
|            |                           |                      |                                  | mental needs.       | yment            | prene<br>urship  | Handli<br>ng      |                       |          |              |                              | m a<br>vari   |   |                 |
|            |                           |                      |                                  | necus.              | •                | ursnip           | Skills            |                       |          |              |                              | ety           |   |                 |
|            |                           |                      |                                  |                     |                  |                  | /E-               |                       |          |              |                              | of            |   |                 |

|   | т т | <del></del> |
|---|-----|-------------|
| Mail   sou  | r   |             |
| Etique   ces  |     |             |
| tte .   |     |             |
| Presen  |     |             |
| tation  |     |             |
| Skills,   |     |             |
|   |     | T. 1 :      |
| Unit II This course is This course is This course is This meant Effecti yes 1.a |     | Techni      |
| designed to designed to teach designed to course is to to ve English            |     | cal         |
| teach Pronunciation, a teach designed teach teach Comm ure                      |     | Skills      |
| Pronunciatio fundamental Pronunciation to teach effecti effecti unicati sig     |     | that        |
| n, a communication , a Pronunci ve ve on ific                                   | a   | match       |
| fundamental skill with fundamental ation, a comm comm /Writi nt                 |     | Industr     |
| communicati regional communicatio fundame unicat unicat ng mo                   | b   | y&osul      |
| on skill with relevance and n skill with ntal ion ion Skills iliz               | a   | tancy       |
| local developmental national communi skills, skills, /Effect tion               | 1   | Needs/      |
| relevance and requirements. relevance and cation which which ive of             |     | Soft        |
| development developmenta skill with are are Writin res                          | )   | Skills/S    |
| al global essent g urc  | e   | kill        |
| requirements. relevanc ial for ial for /Interv s                                |     | Develo      |
| e and emplo Entre iew fro   |     | pment       |
| develop yment prene Handli ma   |     | _           |
| mental . urship ng var  | i   |             |
| requirem Skills ety   |     |             |
| ents. /E- of  |     |             |
|   | r   |             |
| Etique   ces  |     |             |
| tte .   |     |             |
|   |     |             |
| Presen   Presen   |     |             |

|          |                |                   |                |            |         |         | Skills, |     |   |   |   |       |   |          |
|----------|----------------|-------------------|----------------|------------|---------|---------|---------|-----|---|---|---|-------|---|----------|
|          |                |                   |                |            |         |         |         |     |   |   |   |       |   |          |
|          |                |                   |                |            |         |         |         |     |   |   |   |       |   |          |
| Unit III | This course is | This course is    | This course is | This       | meant   | meant   | Effecti | yes | _ | _ | _ | 1.a   | _ | Techni   |
|          | designed to    | designed to teach | designed to    | course is  | to      | to      | ve      | yes |   |   |   | Ens   |   | cal      |
|          | teach          | Effective         | teach          | designed   | teach   | teach   | Comm    |     |   |   |   | ure   |   | Skills   |
|          | Effective      | Communication     | Effective      | to teach   | effecti | effecti | unicati |     |   |   |   | sign  |   | that     |
|          | Communicati    | /Writing Skills   | Communicati    | Effective  | ve      | ve      | on      |     |   |   |   | ifica |   | match    |
|          | on /Writing    | /Effective        | on /Writing    | Commun     | comm    | comm    | /Writi  |     |   |   |   | nt    |   | Industr  |
|          | Skills         | Writing           | Skills         | ication    | unicat  | unicat  | ng      |     |   |   |   | mob   |   | y&       |
|          | /Effective     | /Interview        | /Effective     | /Writing   | ion     | ion     | Skills  |     |   |   |   | iliza |   | cosulta  |
|          | Writing        | Handling Skills   | Writing        | Skills     | skills, | skills, | /Effect |     |   |   |   | tion  |   | ncy      |
|          | /Interview     | /E-Mail Etiquette | /Interview     | /Effectiv  | which   | which   | ive     |     |   |   |   | of    |   | Needs/   |
|          | Handling       | Presentation      | Handling       | e Writing  | are     | are     | Writin  |     |   |   |   | reso  |   | Soft     |
|          | Skills /E-     | Skills, which are | Skills /E-Mail | /Intervie  | essent  | essent  | g       |     |   |   |   | urce  |   | Skills/S |
|          | Mail           | fundamental       | Etiquette      | w          | ial for | ial for | /Interv |     |   |   |   | s     |   | kill     |
|          | Etiquette      | communication     | Presentation   | Handling   | emplo   | Entre   | iew     |     |   |   |   | fro   |   | Develo   |
|          | Presentation   | skills with       | Skills, which  | Skills /E- | yment   | prene   | Handli  |     |   |   |   | m a   |   | pment    |
|          | Skills, which  | regional          | are            | Mail       |         | urship  | ng      |     |   |   |   | vari  |   |          |
|          | are            | relevance and     | fundamental    | Etiquette  |         |         | Skills  |     |   |   |   | ety   |   |          |
|          | fundamental    | development       | communicatio   | Presentat  |         |         | /E-     |     |   |   |   | of    |   |          |
|          | communicati    | requirements.     | n skills with  | ion        |         |         | Mail    |     |   |   |   | sour  |   |          |
|          | on skills with |                   | national       | Skills,    |         |         | Etique  |     |   |   |   | ces   |   |          |
|          | local          |                   | relevance and  | which      |         |         | tte     |     |   |   |   |       |   |          |
|          | relevance and  |                   | development    | are        |         |         | Presen  |     |   |   |   |       |   |          |
|          | development    |                   | requirements.  | fundame    |         |         | tation  |     |   |   |   |       |   |          |
|          | requirements.  |                   |                | ntal       |         |         | Skills, |     |   |   |   |       |   |          |
|          |                |                   |                | communi    |         |         |         |     |   |   |   |       |   |          |
|          |                |                   |                | cation     |         |         |         |     |   |   |   |       |   |          |

|         |  | skills with global relevanc e and develop ment requirem ents. |  |  |  |  |  |
|---------|--|---|--|--|--|--|--|
| Unit IV |  |   |  |  |  | 1.a Ens ure sign ifica nt mob iliza tion of reso urce s fro m a vari ety of sour ces | Techni cal Skills that match Industr y&osul tancy Needs/ Soft Skills/S kill Develo pment |

| Unit v  I.a Techni Ens ure Skills sign ifica nt Industr mob jiza tancy tion of reso Skills/S urce kill s Develo fro ma a vari ety of sour ces cal  Skills Skills Skills Soft reso urce kill s Obevelo fro ma ob sour ces cel cal match that selv of sour ces ces   |        |  |  |  |  |  | ·     |   |        |
|---|--------|--|--|--|--|--|-------|---|--------|
| Ens ure Skills sign that ifica match nt Industr mob y&osul iliza tancy tion Needs/ of Soft reso Skills/S urce kill s Develo fro m a vari ety of sour ces  |        |  |  |  |  |  |       |   |        |
| Ens ure Skills sign that ifica match nt Industr mob y&osul iliza tancy tion Needs/ of Soft reso Skills/S urce kill s Develo fro ma vari ety of sour ces   | Unit v |  |  |  |  |  | 1.a   | - | Techni |
| sign ifica match nt Industr mob y&osul iliza tancy tion Needs/ of Soft reso Skills/S urce kill s Develo fro ma a vari ety of sour ces   |        |  |  |  |  |  |       |   |        |
| ifica nt mob iliza tancy y&osul iliza tancy tion Needs/ of Soft reso urce kill s Develo fro ma vari ety of sour ces   |        |  |  |  |  |  | ure   |   | Skills |
| nt mob y&osul iliza tancy tion Needs/ of Soft reso Skills/S urce kill s Develo fro pment m a vari ety of sour ces   |        |  |  |  |  |  | sign  |   |        |
| mob iliza tancy tion Needs/ of Soft reso Skills/S urce kill s Develo fro ma a vari ety of sour ces  |        |  |  |  |  |  | ifica |   |        |
| iliza tancy Needs/ of Soft reso Skills/S urce kill s Develo fro pment m a vari ety of sour ces  |        |  |  |  |  |  |       |   |        |
| tion of Soft reso Skills/S urce kill s Develo fro pment ma vari ety of sour ces   |        |  |  |  |  |  |       |   |        |
| of reso wirce kill bevelo fro pment ma vari ety of sour ces   |        |  |  |  |  |  |       |   |        |
| reso urce kill s Develo pment m a vari ety of sour ces  |        |  |  |  |  |  |       |   |        |
| land the second |        |  |  |  |  |  |       |   |        |
| S S Develo pment  m a vari ety of sour ces  |        |  |  |  |  |  |       |   |        |
| fro ma vari ety of sour ces   |        |  |  |  |  |  | urce  |   |        |
| m a vari ety of sour ces  |        |  |  |  |  |  |       |   |        |
| vari ety of sour ces  |        |  |  |  |  |  |       |   | pment  |
| ety of sour ces   |        |  |  |  |  |  |       |   |        |
| of sour ces   |        |  |  |  |  |  |       |   |        |
| sour ces  |        |  |  |  |  |  |       |   |        |
| ces   |        |  |  |  |  |  |       |   |        |
|   |        |  |  |  |  |  |       |   |        |
|   |        |  |  |  |  |  | ces   |   |        |
|   |        |  |  |  |  |  | •     |   |        |

| BP 112RBP                  | Remedial Biology (Practical) | L        | Т | P | С |
|----------------------------|------------------------------|----------|---|---|---|
| Version 2.0                |                              | 0        | 0 | 2 | 1 |
| <b>Total Contact Hours</b> | 30 Hours                     | <b>'</b> |   |   |   |
| Pre-requisites/Exposure    | Remedial Biology             |          |   |   |   |
| Co-requisites              | Biology                      |          |   |   |   |

## Upon completion of this course the student should be able to

- 1. Microscopic study and identification of tissues pertinent to Stem, Root Leaf, seed, fruit and flower
- 2. To knowledge of blood, their function and study of bones with special reference to human
- 3. Understand the basic components of anatomy & physiology of plant
- 4. Know understand the basic components of anatomy & physiology animal with special reference to human.

# Course Outcomes (CO)

- CO1. To learn and understand the components of living world, structure and functional system of plant kingdom.
- CO2. It provides knowledge about blood, their composition, function and coagulation factor.
- CO3. To learn the about bones with special reference to human.

|     |     |     |     |     |     |     |     | Pı  | rogran | ıme a    | nd Cou | rse Map | ping     |       |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|--------|----------|--------|---------|----------|-------|
| со  | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9    | PO<br>10 | PO11   | PO12    | PSO<br>1 | PSO 2 |
| CO1 | 3   | 3   | 2   | 2   | 3   | 2   | -   | 2   | 2      | 2        | 3      | 3       | 3        | 3     |
| CO2 | 3   | 2   | 3   | 2   | 2   | 2   | -   | 1   | 2      | 2        | 3      | 3       | 3        | 3     |
| CO3 | 3   | 3   | 2   | 2   | 3   | 2   | -   | 2   | 2      | 2        | 3      | 3       | 3        | 3     |
| CO4 | 3   | 2   | 2   | 2   | 3   | 2   | -   | 2   | 2      | 2        | 3      | 3       | 3        | 3     |

| Unit | Relevance to the local, national, regional and global | Relevance To the        | Relevance to the      | SD | NE | POE/4 <sup>t</sup> |
|------|---|-------------------------|-----------------------|----|----|--------------------|
|      | developmental needs                                   | Employability/          | Professional Ethics,  | G  | P  | <sup>h</sup> IR    |
|      |   | Entrepreneurship/ Skill | Gender, Human Values, |    |    |                    |
|      |   | Development             | Environment &         |    |    |                    |
|      |   |                         | Sustainability        |    |    |                    |
|      |   |                         |                       |    |    |                    |
|      |   |                         |                       |    |    |                    |

| BP11<br>2RBT | Local | Regi<br>onal | National | Global   | Em<br>plo<br>yabi<br>lity | Entrepr<br>eneursh<br>ip | Skill<br>Developm<br>ent   | Pr<br>ofe<br>ssi<br>on<br>al<br>Et<br>hic<br>s | Gender  | H u m an V al ue s | Enviro<br>nment<br>&<br>Sustai<br>nabilit<br>y |            |                   |  |
|--------------|-------|--------------|----------|--|---------------------------|--------------------------|--|--|---|--------------------|--|------------|-------------------|--|
| Unit I       |       |              |          | The study of microscopy, including sample preparation, section cutting, mounting, staining, and permanent slide preparation, contributes to our understanding of various scientific disciplines. It enables researchers to investigate microscopic details, identify structures, analyze cellular and tissue components, and make important observations that impact global scientific |                           |                          | These experimen ts and techniques contribute to our knowledge of biology, have practical applications in healthcare and forensic investigations, and play a role |  | Remedial Biology provide s a foundat ional underst anding of the human body, includi ng its structur es and functio n for |                    |  | (SD G 4.4) | (9.1<br>-<br>9.3) | Global Educati on Knowle dge, Skill Develo pment, Employ ability |

| Unit        | - | knowledge and advancements  These studies provide essential knowledge for advancing scientific research, addressing global challenges, improving human health, promoting sustainable practices, and ensuring the preservation of our natural world. | in global research and understand ing of living organisms. | both<br>gender | (SD<br>G<br>4.4) | (9.1<br>-<br>9.3) | Global Educati on Knowle dge, Skill Develo pment, Employ ability |
|-------------|---|---|--|----------------|------------------|-------------------|--|
| Unit<br>III |   | By advancing our knowledge of plant tissues through microscopic study and identification, we gain insights into plant biology, ecology,   |  |                | (SD<br>G<br>4.4) | (9.1<br>-<br>9.3) | Global Educati on Knowle dge, Skill Develo pment, Employ ability |
| Unit<br>IV  |   | The determination of blood group has significant implications in various medical settings, forensic   |  |                | (SD<br>G<br>4.4) | (9.1<br>-<br>9.3) | Global<br>Educati<br>on<br>Knowle<br>dge,                        |

|      |  | investigations, and anthropological studies. It plays a crucial role in ensuring safe transfusions, successful organ transplantations, managing prenatal care, aiding forensic investigations, and advancing our |  |  |  |      |      | Skill Develo pment, Employ ability |
|------|--|--|--|--|--|------|------|------------------------------------|
|      |  | knowledge of human populations globally.   |  |  |  |      |      |                                    |
| Unit |  | The determination of   |  |  |  | (SD  | (9.1 | Global                             |
| v    |  | tidal volume is valuable   |  |  |  | G    | -    | Educati                            |
|      |  | in assessing respiratory   |  |  |  | 4.4) | 9.3) | on                                 |
|      |  | health, guiding  |  |  |  |      |      | Knowle                             |
|      |  | mechanical ventilation,  |  |  |  |      |      | dge,                               |
|      |  | understanding exercise   |  |  |  |      |      | Skill                              |
|      |  | physiology, monitoring   |  |  |  |      |      | Develo                             |
|      |  | occupational and   |  |  |  |      |      | pment,                             |
|      |  | environmental  |  |  |  |      |      | Employ                             |
|      |  | exposures, and   |  |  |  |      |      | ability                            |
|      |  | enhancing sports   |  |  |  |      |      |                                    |
|      |  | performance. These   |  |  |  |      |      |                                    |
|      |  | applications have global   |  |  |  |      |      |                                    |
|      |  | relevance in healthcare,   |  |  |  |      |      |                                    |
|      |  | occupational safety,   |  |  |  |      |      |                                    |
|      |  | environmental  |  |  |  |      |      |                                    |
|      |  | protection, and sports   |  |  |  |      |      |                                    |

|  |  | medicine. |  |  |  |  |  |
|--|--|-----------|--|--|--|--|--|
|  |  |           |  |  |  |  |  |
|  |  |           |  |  |  |  |  |

# **Semester-II**

| BP201T                     | Human Anatomy And Physiology-II (Theory) | L   | Т | P | C |
|----------------------------|--|-----|---|---|---|
| Version 2.0                |  | 3   | 1 | 0 | 4 |
| <b>Total Contact Hours</b> | 45 Hours                                 |     |   |   |   |
| Pre-requisites/Exposure    | Human Anatomy & Physiology-I             |     |   |   |   |
| Co-requisites              | Pathophysiology and Biology              |     |   |   |   |
|                            | Course Objectiv                          | ves |   |   |   |

## Upon completion of this course the student should be able to

- 1. Explain the gross morphology, structure and functions of various organs of the human body.
- 2. Describe the various homeostatic mechanisms and their imbalances.
- 3. Identify the various tissues and organs of different systems of human body.
- 4. Perform hematological tests like blood cell counts, hemoglobin estimation, bleeding/clotting time etc and record blood pressure, heart rate, pulse and respiratory volume.
- 5. Appreciate coordinated working pattern of different organs of each system.
- 6. Appreciate the interlinked mechanisms in the maintenance of normal functioning (homeostasis) of human body.

## **Course Outcomes (CO)**

- CO1. Understand fundamental knowledge related to the structure of brain and its functions in the human body.
- CO2. Explain basic knowledge related to digestive system.
- CO3. Explain basic knowledge required to understand the respiratory system.
- CO4. Explain basic knowledge required to understand the reproductive system.
- CO5. Explain the basic knowledge required to understand the hormonal system.

|     |     |     |     |     |        |         |      | P   | rogran | nme and Cou  | rse Mappir | ng              |       |       |
|-----|-----|-----|-----|-----|--------|---------|------|-----|--------|--------------|------------|-----------------|-------|-------|
| CO  | PO1 | PO2 | PO3 | PO4 | PO5    | PO6     | PO7  | PO8 | PO9    | PO 10        | PO11       | PO12            | PSO 1 | PSO 2 |
| CO1 | 3   | 1   |     |     | 2      | 2       |      | 2   |        | 3            | 2          | 3               | 2     |       |
| CO2 | 3   | 1   |     |     | 2      | 2       |      | 2   |        | 2            | 2          | 3               | 2     |       |
| CO3 | 3   | 1   |     |     | 1      | 2       |      | 2   |        | 2            | 2          | 3               | 2     |       |
| CO4 | 3   | 1   |     |     | 2      | 2       |      | 2   |        | 2            | 2          | 3               | 2     |       |
| CO5 | 3   | 1   |     |     | 2      | 2       |      | 2   |        | 2            | 2          | 3               | 2     |       |
|     |     |     |     | •   | 1=ligl | htly ma | pped |     | 2= mc  | derately map | ped        | 3=strongly mapp | ed    |       |

| Unit   | Relevance to the local,<br>national, regional and global |          |          |        | Relevance To the Employability/ | Entrepreneurship/ Skill<br>Development |   | Relevance to the Professional Ethics, Gender, Human | Values, Environment &<br>Sustainability |              |                              | SDG  | NEP           | POE/4 <sup>th</sup> IR  |
|--------|--|----------|----------|--------|---------------------------------|--|---|---|---|--------------|------------------------------|--|---------------|---|
|        | Local  | Regional | National | Global | Employability                   | Entrepreneurship                       | Skill Development   | Professional Ethics                                 | Gender                                  | Human Values | Environment & Sustainability |  |               |   |
| Unit I | -  | -        | -        | -      | -                               | -                                      | Enrichment of thinking ability and creativity as well a tool for building confidence in the | -   | -                                       | -            | -                            | SDG 3:<br>Ensure<br>healthy<br>lives<br>and<br>promote<br>well-<br>being | NEP (9.1-9.3) | Student<br>centric<br>Technical<br>Skills<br>that<br>match<br>Industry<br>Needs |

|           |  |   |   |   | students which is done by providing opportunities to students to give presentations and debates in the classroom   |  |   |   | for all at all ages.  SDG 4.4: Skills for Decent Work   |               |   |
|-----------|--|---|---|---|--|--|---|---|---|---------------|---|
| Unit II - |  | - | - | - | Enrichment of thinking ability and creativity as well a tool for building confidence in the students which is done by providing opportunities to students to give presentations and debates in the classroom |  | - | - | SDG 3: Ensure healthy lives and promote well- being for all at all ages.  SDG 4.4: Skills for Decent Work | NEP (9.1-9.3) | Student<br>centric<br>Technical<br>Skills<br>that<br>match<br>Industry<br>Needs |

| Unit       |   |   | - | - | - | - | Enrichment of thinking ability and creativity as well a tool for building confidence in the students which is done by providing opportunities to students to give presentations and debates in the |   |   | - | - | SDG 3: Ensure healthy lives and promote well- being for all at all ages.  SDG 4.4: Skills for Decent Work | NEP (9.1-9.3) | Student<br>centric<br>Technical<br>Skills<br>that<br>match<br>Industry<br>Needs |
|------------|---|---|---|---|---|---|--|---|---|---|---|---|---------------|---|
| Unit<br>IV | - | - | - | - | - | - | classroom  Enrichment of thinking ability and creativity as well a tool for building confidence in the students which is done by   | - | - | - | - | SDG 3: Ensure healthy lives and promote well- being for all at all ages.                                  | NEP (9.1-9.3) | Student<br>centric<br>Technical<br>Skills<br>that<br>match<br>Industry<br>Needs |

|        |  |   |   |   |   | providing opportunities to students to give presentations and debates in the classroom   |   |   | SDG<br>4.4:<br>Skills<br>for<br>Decent<br>Work  |  |   |
|--------|--|---|---|---|---|--|---|---|---|--|---|
| Unit V |  | - | - | - | - | Enrichment of thinking ability and creativity as well a tool for building confidence in the students which is done by providing opportunities to students to give presentations and debates in the classroom | Gender Based knowledge will benefit the students to respect and understand the other gender in a better way | - | SDG 3: Ensure healthy lives and promote well- being for all at all ages.  SDG 4.4: Skills for Decent Work | NEP 21.1- 21.10: Adult Education and Lifelong Learning | Student<br>centric<br>Technical<br>Skills<br>that<br>match<br>Industry<br>Needs |

| BP202T                     | Pharmaceutical Organic Chemistry –I (Theory) | L | Т | P | C |
|----------------------------|--|---|---|---|---|
| Version 2.0                |  | 3 | 1 | 0 | 4 |
| <b>Total Contact Hours</b> | 45 Hours                                     |   |   |   |   |
| Pre-requisites/Exposure    | Organic chemistry                            |   |   |   |   |
| Co-requisites              | Chemistry                                    |   |   |   |   |
|                            | Course Objective                             |   | · |   |   |

## Upon completion of this course the student should be able to

- 1. Write the structure, name and the type of isomerism of the organic compound.
- 2. Write the reaction, name the reaction and orientation of reactions.
- 3. Account for reactivity/stability of compounds.
- 4. Identify/confirm the identification of organic compound.

## **Course Outcomes (CO)**

- CO1. Explain fundamental knowledge on isomerism.
- CO2. Explain fundamental knowledge of alkanes and alkenes and their stability.
- CO3. Explain the Structure, reactions and function of alkyl halides.
- CO4. Explain the nucleophilic addition reactions.
- CO5. Explain the structure, reaction and effect of various groups acid derivatives

|    |     |     |     |     |     |     |            | Pro | ogram | me and Cour | se Mapping |      |       |       |
|----|-----|-----|-----|-----|-----|-----|------------|-----|-------|-------------|------------|------|-------|-------|
| CO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | <b>PO7</b> | PO8 | PO9   | PO 10       | PO11       | PO12 | PSO 1 | PSO 2 |

| CO1 | 3 | 1 |  | 2       | 2      |     | 2 |        | 3              | 2    | 3              | 2   | 2 |
|-----|---|---|--|---------|--------|-----|---|--------|----------------|------|----------------|-----|---|
| CO2 | 3 | 1 |  | 2       | 2      |     | 2 |        | 2              | 2    | 3              | 2   | 2 |
| CO3 | 3 | 1 |  | 1       | 2      |     | 2 |        | 2              | 2    | 3              | 2   | 2 |
| CO4 | 3 | 1 |  | 2       | 2      |     | 2 |        | 2              | 2    | 3              | 2   | 2 |
| CO5 | 3 | 1 |  | 2       | 2      |     | 2 |        | 2              | 2    | 3              | 2   | 2 |
|     |   |   |  | 1=light | ly map | ped |   | 2= mod | lerately mappe | ed : | B=strongly map | ped |   |

| Unit      | Relevance to the local, national, regional and global | developmental<br>needs |          |                            | Relevance To the Employability/ | Entrepreneurship/<br>Skill<br>Development |  | Relevance to the Professional | Human Values, | Environment & | Sustainability               | SDG                          | NEP                               | POE/4 <sup>th</sup> IR       |
|-----------|---|------------------------|----------|----------------------------|---------------------------------|---|--|-------------------------------|---------------|---------------|------------------------------|------------------------------|-----------------------------------|------------------------------|
|           | Local   | Regional               | National | Global                     | Employability                   | Entrepreneurship                          | Skill Development  | Professional Ethics           | Gender        | Human Values  | Environment & Sustainability |                              |                                   |                              |
| Unit<br>I | -   | -                      | -        | To<br>know<br>standar<br>d | -                               | -   | Knowledge<br>of<br>nomenclatur<br>e will help<br>in naming | -                             | -             | -             | -                            | Skill<br>s for<br>Dece<br>nt | Profes<br>sional<br>Educat<br>ion | Skill<br>Devel<br>opmen<br>t |

|      |   |   |   | IUPAC nomen   |   | unknown<br>compounds      |   |   |   |   | Wor<br>k | (17.1-<br>17.5) |       |
|------|---|---|---|---------------|---|---------------------------|---|---|---|---|----------|-----------------|-------|
|      |   |   |   | clature       |   | -                         |   |   |   |   | (SD      |                 |       |
|      |   |   |   | of            |   |                           |   |   |   |   | Ġ        |                 |       |
|      |   |   |   | compo         |   |                           |   |   |   |   | 4.4)     |                 |       |
|      |   |   |   | unds          |   |                           |   |   |   |   |          |                 |       |
| Unit |   | - | - | Fulfils       |   | Knowledge                 | - | - | - | - | Skill    | Profes          | Skill |
| II   |   |   |   | underst       |   | of basic                  |   |   |   |   | s for    | sional          | Devel |
|      |   |   |   | anding        |   | Elimination, substitution |   |   |   |   | Dece     | Educat ion      | opmen |
|      |   |   |   | of            |   | reactions                 |   |   |   |   | nt       | (17.1-          | t     |
|      |   |   |   | basic         |   | will help in              |   |   |   |   | Wor      | 17.5)           |       |
|      |   |   |   | Elimin        |   | synthesis of              |   |   |   |   | k        | ŕ               |       |
|      |   |   |   | ation,        |   | new                       |   |   |   |   | (SD      |                 |       |
|      |   |   |   | substit       |   | unknown<br>compounds      |   |   |   |   | G        |                 |       |
|      |   |   |   | ution         |   | compounds                 |   |   |   |   | 4.4)     |                 |       |
|      |   |   |   | reactio       |   |                           |   |   |   |   |          |                 |       |
|      |   |   |   | n for further |   |                           |   |   |   |   |          |                 |       |
|      |   |   |   | synthes       |   |                           |   |   |   |   |          |                 |       |
|      |   |   |   | is            |   |                           |   |   |   |   |          |                 |       |
| Unit | _ | - | _ |               | _ | Study of                  | _ | _ | _ | _ | Skill    | Promo           | Skill |
| III  |   |   |   | y             |   | alkyl halide              |   |   |   |   | s for    | ting            | Devel |
|      |   |   |   | aware         |   | and alcohol               |   |   |   |   | Dece     | High-           | opmen |
|      |   |   |   | about         |   | compound                  |   |   |   |   | nt       | quality         | t     |
|      |   |   |   | synthes       |   | will help in              |   |   |   |   | Wor      | researc<br>h    |       |
|      |   |   |   | is of         |   | synthesis of              |   |   |   |   | k        | (18.1-          |       |
|      |   |   |   | alkyl         |   | drugs                     |   |   |   |   | (SD      | 18.9)           |       |
|      |   |   |   | halide        |   | containing                |   |   |   |   | G        |                 |       |
|      |   |   |   | and           |   | alkyl halide              |   |   |   |   | 4.4)     |                 |       |
|      |   |   |   | alcohol       |   | and alcohol               |   |   |   |   |          |                 |       |

|           |   |   |   |  |   | and their derivatives.  |   |   |   |   |  |   |                              |
|-----------|---|---|---|--|---|---|---|---|---|---|--|---|------------------------------|
| Unit      | - | - | - | Globall y aware about synthes is of carbon yl compo und and their determ ination | - | Study of carbonyl compound will help in synthesis of drugs containing carbonyl group and their derivatives.     |   | _ | - | - | Skill<br>s for<br>Dece<br>nt<br>Wor<br>k<br>(SD<br>G<br>4.4) | Promo ting High-quality researc h (18.1-18.9) | Skill<br>Devel<br>opmen<br>t |
| Unit<br>v | - | - | - | Globall y aware about synthes is of carbox ylic compo und and                    | - | Study of carboxylic compound will help in synthesis of drugs containing carboxylic group and their derivatives. | - |   |   | - | Prof<br>essio<br>nal<br>Educ<br>ation<br>(17.1<br>-<br>17.5) | Promo ting High-quality researc h (18.1-18.9) | Skill<br>Devel<br>opmen<br>t |

|  |  | their   |  |  |  |  |  |
|--|--|---------|--|--|--|--|--|
|  |  | determ  |  |  |  |  |  |
|  |  | ination |  |  |  |  |  |

| BP203T                     | Biochemistry (Theory) | L | Т | P | C |
|----------------------------|-----------------------|---|---|---|---|
| Version 2.0                |                       | 3 | 1 | 0 | 4 |
| <b>Total Contact Hours</b> | 45 Hours              |   |   |   |   |
| Pre-requisites/Exposure    | Chemistry             |   |   |   |   |
| Co-requisites              | Chemistry and biology |   |   |   |   |
|                            |                       |   |   |   |   |

## Upon completion of this course the student should be able to:

- 1. Understand the catalytic role of enzymes, importance of enzyme inhibitors in design of new drugs, therapeutic and diagnostic applications of enzymes.
- 2. Understand the metabolism of nutrient molecules in physiological and pathological conditions.
- 3. Understand the genetic organization of mammalian genome and functions of DNA in the synthesis of RNAs and proteins.

#### **Course Outcomes (CO)**

- CO1. Explain fundamental information related to the structure, function and significance of bio molecules.
- CO2. Explain various metabolic pathways based on glucose.
- CO3. Explain lipids oxidation, catabolism, anabolism and related diseases.
- CO4. Explain biosynthesis and catabolism of purine and pyrimidine nucleotide.
- CO5. Explain enzyme kinetics and its various applications.

|     | Programme and Course Mapping |     |     |     |     |     |     |     |     |       |      |      |          |       |
|-----|------------------------------|-----|-----|-----|-----|-----|-----|-----|-----|-------|------|------|----------|-------|
| СО  | PO1                          | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO 10 | PO11 | PO12 | PSO<br>1 | PSO 2 |
| CO1 | 3                            | 1   |     |     | 2   | 2   |     | 2   |     | 3     | 2    | 3    | 2        | 2     |

| CO2              | 3 | 1 |  |  | 2 | 2 |  | 2 |       | 2              | 2       | 3             | 2 | 2 |
|------------------|---|---|--|--|---|---|--|---|-------|----------------|---------|---------------|---|---|
| CO3              | 3 | 1 |  |  | 1 | 2 |  | 2 |       | 2              | 2       | 3             | 2 | 2 |
| CO4              | 3 | 1 |  |  | 2 | 2 |  | 2 |       | 2              | 2       | 3             | 2 | 2 |
| CO5              | 3 | 1 |  |  | 2 | 2 |  | 2 |       | 2              | 2       | 3             | 2 | 2 |
| 1=lightly mapped |   |   |  |  |   |   |  |   | 2= mo | derately mappe | ed 3=st | rongly mapped |   |   |

| Unit   | Relevance to the local, national, regional and global developmental needs |          |          |  | Relevance To the<br>Employability/<br>Futreprepairshin/ | Skill Development |   | Relevance to the<br>Professional Ethics, | Gender, Human<br>Values,<br>Fregiconment & | Sustainability |                              | SDG   | NEP  | POE/4 <sup>th</sup> IR   |
|--------|---|----------|----------|--|---|-------------------|---|--|--|----------------|------------------------------|---|--|--|
|        | Local   | Regional | National | Global   | Employability   | Entrepreneurship  | Skill Development   | Professional Ethics                      | Gender                                     | Human Values   | Environment & Sustainability |   |  |  |
| Unit I | -   | -        | -        | Underst<br>and the<br>importa<br>nce of<br>nutrient<br>molecul<br>es in<br>physiol | -   | -                 | helps<br>students<br>to get<br>familiar<br>with<br>real-<br>world<br>problems | -  | -  | -              | -                            | Give basic knowledge about biomolecu les (SDG 4.2 & SDG 4.4); Subject | Profess<br>ional<br>Educat<br>ion<br>(17.1-<br>17.5) | Hands-<br>on<br>Experie<br>nce<br>Employ<br>ability<br>Skill<br>Develo |

|         |   |   |   | ogical   |   |   | so that   |   |   |   |   | help to    |         | pment   |
|---------|---|---|---|----------|---|---|-----------|---|---|---|---|------------|---------|---------|
|         |   |   |   | and      |   |   | they can  |   |   |   |   | acquire    |         |         |
|         |   |   |   | patholo  |   |   | brainstor |   |   |   |   | basic idea |         |         |
|         |   |   |   | gical    |   |   | m new     |   |   |   |   | about      |         |         |
|         |   |   |   | conditi  |   |   | ideas to  |   |   |   |   | Relationsh |         |         |
|         |   |   |   | ons.     |   |   | address   |   |   |   |   | ip between |         |         |
|         |   |   |   |          |   |   | them      |   |   |   |   | free       |         |         |
|         |   |   |   |          |   |   |           |   |   |   |   | energy,    |         |         |
|         |   |   |   |          |   |   |           |   |   |   |   | enthalpy   |         |         |
|         |   |   |   |          |   |   |           |   |   |   |   | and        |         |         |
|         |   |   |   |          |   |   |           |   |   |   |   | entropy;   |         |         |
|         |   |   |   |          |   |   |           |   |   |   |   | Redox      |         |         |
|         |   |   |   |          |   |   |           |   |   |   |   | potentialE |         |         |
|         |   |   |   |          |   |   |           |   |   |   |   | nergy rich |         |         |
|         |   |   |   |          |   |   |           |   |   |   |   | compound   |         |         |
|         |   |   |   |          |   |   |           |   |   |   |   | s (SDG 7)  |         |         |
| Unit II | - | - | - | Carboh   | - | - | This      | - | - | - | - | Ensure     | Profess | Techni  |
|         |   |   |   | ydrate   |   |   | basic     |   |   |   |   | healthy    | ional   | cal     |
|         |   |   |   | metabol  |   |   | knowled   |   |   |   |   | lives and  | Educat  | Skills  |
|         |   |   |   | ic       |   |   | ge helps, |   |   |   |   | promote    | ion     | that    |
|         |   |   |   | pathwa   |   |   | students  |   |   |   |   | well-being | (17.1-  | match   |
|         |   |   |   | ys       |   |   | would     |   |   |   |   | for all at | 17.5)   | Industr |
|         |   |   |   | knowle   |   |   | find      |   |   |   |   | all ages   |         | У       |
|         |   |   |   | dge hel  |   |   | themselv  |   |   |   |   | (SDG 3)    |         | Needs;  |
|         |   |   |   | to       |   |   | es more   |   |   |   |   | "          |         | Skill   |
|         |   |   |   | develop  |   |   | confident |   |   |   |   | Skills for |         | Develo  |
|         |   |   |   | antidiab |   |   | and       |   |   |   |   | Decent     |         | pment   |
|         |   |   |   | etics    |   |   | ready for |   |   |   |   | Work       |         |         |
|         |   |   |   | drug     |   |   | their     |   |   |   |   | (SDG 4.4)  |         |         |
|         |   |   |   | discove  |   |   | careers.  |   |   |   |   |            |         |         |
|         |   |   |   | ry and   |   |   |           |   |   |   |   |            |         |         |
|         |   |   |   | develop  |   |   |           |   |   |   |   |            |         |         |
|         |   |   |   | ment     |   |   |           |   |   |   |   |            |         |         |

| Unit III | Help to know  | _ | _ | _        | T_ | Τ_ | biochemi  | l _ | l _ | _ | I _ | Skills for  | Profess | Techni  |
|----------|---------------|---|---|----------|----|----|-----------|-----|-----|---|-----|-------------|---------|---------|
|          | about balance | _ |   | _        |    |    | sts may   | -   | _   | _ |     | Decent      | ional   | cal     |
|          | diet and      |   |   |          |    |    | work to   |     |     |   |     | Work        | Educat  | Skills  |
|          | importance    |   |   |          |    |    | develop   |     |     |   |     | (SDG 4.4)   | ion     | that    |
|          | Importance    |   |   |          |    |    | new       |     |     |   |     | (practical  | (17.1-  | match   |
|          |               |   |   |          |    |    | medical   |     |     |   |     | training in | 17.5)   | Industr |
|          |               |   |   |          |    |    | products  |     |     |   |     | lab)        | 17.5)   | y       |
|          |               |   |   |          |    |    | that help |     |     |   |     | "Ensure     |         | Needs;  |
|          |               |   |   |          |    |    | prevent   |     |     |   |     | healthy     |         | Skill   |
|          |               |   |   |          |    |    | diseases  |     |     |   |     | lives and   |         | Develo  |
|          |               |   |   |          |    |    | such as   |     |     |   |     | promote     |         | pment   |
|          |               |   |   |          |    |    | atheroscl |     |     |   |     | well-being  |         | pinent  |
|          |               |   |   |          |    |    | erosis,   |     |     |   |     | for all at  |         |         |
|          |               |   |   |          |    |    | heart     |     |     |   |     | all ages    |         |         |
|          |               |   |   |          |    |    | diseases  |     |     |   |     | (SDG 3)     |         |         |
|          |               |   |   |          |    |    | anscases  |     |     |   |     | "           |         |         |
| Unit IV  | _             | _ | _ | Underst  | _  | _  | Purine    | _   | _   | _ | _   | Skills for  | Profess | Techni  |
|          |               |   |   | anding   |    |    | metaboli  |     |     |   |     | Decent      | ional   | cal     |
|          |               |   |   | the      |    |    | С         |     |     |   |     | Work        | Educat  | Skills  |
|          |               |   |   | structur |    |    | pathways  |     |     |   |     | (SDG 4.4)   | ion     | that    |
|          |               |   |   | e and    |    |    | knowled   |     |     |   |     | (practical  | (17.1-  | match   |
|          |               |   |   | functio  |    |    | ge help   |     |     |   |     | training in | 17.5)   | Industr |
|          |               |   |   | n of     |    |    | to        |     |     |   |     | lab)        | ,       | y       |
|          |               |   |   | DNA      |    |    | develop   |     |     |   |     | "Ensure     |         | Needs;  |
|          |               |   |   | has      |    |    | gout      |     |     |   |     | healthy     |         | Skill   |
|          |               |   |   | revoluti |    |    | drug      |     |     |   |     | lives and   |         | Develo  |
|          |               |   |   | onised   |    |    | discover  |     |     |   |     | promote     |         | pment   |
|          |               |   |   | the      |    |    | y and     |     |     |   |     | well-being  |         | r       |
|          |               |   |   | study    |    |    | develop   |     |     |   |     | for all at  |         |         |
|          |               |   |   | of       |    |    | ment      |     |     |   |     | all ages    |         |         |
|          |               |   |   | disease  |    |    |           |     |     |   |     | (SDG 3)     |         |         |
|          |               |   |   | pathwa   |    |    |           |     |     |   |     | _ ii        |         |         |
|          |               |   |   | ys,      |    |    |           |     |     |   |     |             |         |         |
|          |               |   |   | evaluati |    |    |           |     |     |   |     |             |         |         |
|          |               |   |   | on of a  |    |    |           |     |     |   |     |             |         |         |

|        |   |   |   | person' s genetic predisp osition to particul ar disease                       |   |   |  |   |   |   |   |  |  |  |
|--------|---|---|---|--|---|---|--|---|---|---|---|--|--|--|
|        |   |   |   | s, diagnos is of genetic abnorm alities, and develop ment of new medicat ions. |   |   |  |   |   |   |   |  |  |  |
| Unit v | - | - | - | Help in drug discove ry & develop ment by inhibiti ng enzyme s                 | - | - | Enzymes<br>knowled<br>ge helps<br>us in<br>drug<br>designin<br>g | - | - | - | - | Skills for<br>Decent<br>Work<br>(SDG 4.4)<br>(practical<br>training in<br>lab) | Profess<br>ional<br>Educat<br>ion<br>(17.1-<br>17.5) | Techni cal Skills that match Industr y Needs; Skill Develo pment |

| BP204T                     | Pathophysiology (Theory)       | L | T | P | C |
|----------------------------|--------------------------------|---|---|---|---|
| Version 2.0                |                                | 3 | 1 | 0 | 4 |
| <b>Total Contact Hours</b> | 45 Hours                       |   |   |   |   |
| Pre-requisites/Exposure    | Cellular and molecular Biology |   |   |   |   |
| Co-requisites              | Chemistry and biology          |   |   |   |   |
|                            |                                |   |   |   |   |

## Upon completion of this course the student should be able to

- 1. Describe the aetiology and pathogenesis of the selected diseases.
- 2. Understanding of various types of injuries encountered during life.
- 3. Know the causatives organism of various diseases.
- 4. Study about STDs

## **Course Outcomes (CO)**

- CO1. Learn about the basic principles of Cell injury and Adaptation.
- CO2. Understand the Pathophysiology of heart disease and their complication.
- CO3. Understand the Pathophysiology of disease related to respiratory and endocrine system.
- CO4. Understand the Pathophysiology of Disease related to gastrointestinal, Alzheimer's and cancer disease.
- CO5. Understand the Pathophysiology of Sexually transmitted diseases.

|     | Programme and Course Mapping |     |     |     |     |     |     |     |     |       |      |      |       |       |  |
|-----|------------------------------|-----|-----|-----|-----|-----|-----|-----|-----|-------|------|------|-------|-------|--|
| CO  | PO1                          | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO 10 | PO11 | PO12 | PSO 1 | PSO 2 |  |
| CO1 | 3                            | 1   |     |     | 2   | 2   |     | 2   |     | 3     | 2    | 3    | 2     |       |  |
| CO2 | 3                            | 1   |     |     | 2   | 2   |     | 2   |     | 2     | 2    | 3    | 2     |       |  |
| CO3 | 3                            | 1   |     |     | 1   | 2   |     | 2   |     | 2     | 2    | 3    | 2     |       |  |
| CO4 | 3                            | 1   |     |     | 2   | 2   |     | 2   |     | 2     | 2    | 3    | 2     |       |  |

| CO5 | 3 | 1 |  | 2       | 2      |     | 2 |        | 2             |    | 2  | 3        |       | 2  |  |
|-----|---|---|--|---------|--------|-----|---|--------|---------------|----|----|----------|-------|----|--|
|     |   |   |  | 1=light | ly map | ped | , | 2= mod | lerately mapp | ed | 3= | strongly | nappe | ed |  |

| Unit       | Relevance to the local, national, regional and global developmental | needs    |          |   | Relevance To the<br>Employability/ | Entrepreneurship/<br>Skill Development |                            | Relevance to the    | Professional Ethics,<br>Gender, Human | Values,      | Environment &<br>Sustainability | SDG                          | NEP        | POE/4 <sup>th</sup> IR |
|------------|---|----------|----------|---|------------------------------------|--|----------------------------|---------------------|---------------------------------------|--------------|---------------------------------|------------------------------|------------|------------------------|
| BP2<br>04T |   |          |          |   |                                    |  |                            |                     |                                       |              |                                 |                              |            |                        |
|            | Local   | Regional | National | Global  | Employability                      | Entrepreneurship                       | Skill Development          | Professional Ethics | Gender                                | Human Values | Environment & Sustainability    |                              |            |                        |
| Unit<br>I  | -   | -        | -        | To understand the studies related to basic principles | -                                  | -                                      | In gaining basic knowledge | -                   | -                                     | -            | -                               | Ensure healthy lives         | Pro<br>mot | Global educati         |
|            |   |          |          | of cell injury and                                    |                                    |  | related to cell            |                     |                                       |              |                                 | and promote                  | ing        | on                     |
|            |   |          |          | adaptation of cell that<br>helps in creating baseline |                                    |  | injury and its adaptation  |                     |                                       |              |                                 | well-being<br>for all at all | Hig<br>h-  | knowle<br>dge          |
|            |   |          |          | knowledge   |                                    |  |                            |                     |                                       |              |                                 | ages SDG 3                   | qual       |                        |

| Unit | - | - | - | To emphasize on the pathophysiology of diseases of cardiovascular, respiratory and renal system   | - | - | Understanding basics of pathophysiologica I mechanism of diseases of cardiovascular, respiratory and renal system  In gaining basic | - | - | - | Ensure healthy lives and promote well-being for all at all ages SDG 3      | ity rese arch (18. 1-18.9) Prof essi onal edu cati on (17. 1-17.5) Prof essi onal edu cati on (17. 1-17.5) Prof essi onal edu cati on (17. 1-17.5) Prof | Global educati on knowle dge   |
|------|---|---|---|---|---|---|---|---|---|---|--|---|--------------------------------|
| III  |   | - | - | the pathophysiology of diseases of haematological, endocrine, nervous and gastrointestinal system | - | - | knowledge on pathophysiologica l mechanism of diseases of haematological, endocrine, nervous and                                    | - | - | - | healthy lives<br>and promote<br>well-being<br>for all at all<br>ages SDG 3 | essi<br>onal<br>edu<br>cati<br>on<br>(17.   | educati<br>on<br>knowle<br>dge |

|            |   |   |   |   |   |   | gastrointestinal<br>system  |   |   |   |   |  | 17.5                               |  |
|------------|---|---|---|---|---|---|---|---|---|---|---|--|------------------------------------|--|
| Unit<br>IV | - | - | - | To emphasize the pathophysiology of diseases of inflammatory bowel, bones and joints, and principles of cancer. | - | - | Understanding basics of pathophysiologica I mechanism of diseases of inflammatory bowel diseases, bones and joints, and principles of cancer. | - | - | - | - | Ensure<br>healthy lives<br>and promote<br>well-being<br>for all at all<br>ages SDG 3 | Professional education (17.1-17.5) | Global<br>educati<br>on<br>knowle<br>dge |
| Unit<br>v  | - | - | - | To emphasize the pathophysiology of infectious diseases as well as sexually transmitted diseases.               | - | - | In gaining basic knowledge of pathophysiologica l mechanism of infectious diseases as well as sexually transmitted diseases.                  | - | - | - | - | Ensure<br>healthy lives<br>and promote<br>well-being<br>for all at all<br>ages SDG 3 | Professional education (17.1-17.5) | Global<br>educati<br>on<br>knowle<br>dge |

| BP205T                     | Computer Applications in Pharmacy (Theory) | L | T | P | C |
|----------------------------|--|---|---|---|---|
| Version 2.0                |  | 3 | 0 | 0 | 3 |
| <b>Total Contact Hours</b> | 25 Hours                                   |   |   |   |   |

| Pre-requisites/Exposure Comp | puter sciences  |
|------------------------------|-----------------|
| Co-requisites Comp           | aputer sciences |

### **Course Objectives**

#### Upon completion of this course the student should be able to:

- 1. Know the various types of application of computers in pharmacy.
- 2. Know various types of databases.
- 3. Know various applications of databases in pharmacy.

#### **Course Outcomes (CO)**

- CO1. Learn about the basics of computer applications in pharmacy.
- CO2. Understand various types of databases.
- CO3. Understand the applications of different types of databases in pharmacy.
- CO4. Explain the role of computers for data analysis in Pre clinical development.

|     | Programme and Course Mapping |     |     |     |         |        |     |     |        |              |       |               |       |       |  |
|-----|------------------------------|-----|-----|-----|---------|--------|-----|-----|--------|--------------|-------|---------------|-------|-------|--|
| CO  | PO1                          | PO2 | PO3 | PO4 | PO5     | PO6    | PO7 | PO8 | PO9    | PO 10        | PO11  | PO12          | PSO 1 | PSO 2 |  |
| CO1 | 1                            | 2   | 2   |     | 2       | 2      |     |     |        | 3            | 2     | 3             | 2     |       |  |
| CO2 | 1                            | 1   | 2   |     | 2       | 2      |     |     |        | 2            | 2     | 3             | 2     |       |  |
| CO3 | 1                            | 1   | 2   |     | 1       | 2      |     |     |        | 2            | 2     | 3             | 2     |       |  |
| CO4 | 1                            | 2   | 2   |     | 2       | 2      |     |     |        | 2            | 2     | 3             | 2     |       |  |
|     |                              |     |     | 1   | =lightl | y mapp | ed  | 2   | = mode | rately mappe | ed 3= | strongly mapp | ed    |       |  |

| BP206T                                    | Environmental Sciences (Theory) | L | Т | P | C |  |  |  |  |  |  |
|---|---------------------------------|---|---|---|---|--|--|--|--|--|--|
| Version 2.0                               |                                 | 3 | 0 | 0 | 3 |  |  |  |  |  |  |
| <b>Total Contact Hours</b>                | 30 Hours                        |   |   |   |   |  |  |  |  |  |  |
| Pre-requisites/Exposure                   | Environment studies             |   |   |   |   |  |  |  |  |  |  |
| Co-requisites Social and cultural factors |                                 |   |   |   |   |  |  |  |  |  |  |
|   | Course Objectives               |   |   |   |   |  |  |  |  |  |  |

#### Course

### Upon completion of this course the student should be able to:

- 1. Create the awareness about environmental problems among learners.
- 2. Impart basic knowledge about the environment and its allied problems.
- 3. Develop an attitude of concern for the environment.
- 4. Motivate learner to participate in environment protection and environment improvement.
- 5. Acquire skills to help the concerned individuals in identifying and solving environmental

#### **Course Outcomes (CO)**

- CO1. To study of the environmental system and the status of its inherent or induced changes on organisms.
- CO 2. Strive to attain harmony with Nature
- CO3. Motivate learner to participate in environment protection and environment improvement.
- CO 4. To Impart basic knowledge about the environment and its allied problems

|     |   |     |     |     |     |     |     | Pı  | ogram | me and Cours | se Mapping |      |       |       |
|-----|---|-----|-----|-----|-----|-----|-----|-----|-------|--------------|------------|------|-------|-------|
| CO  | PO1   | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9   | PO 10        | PO11       | PO12 | PSO 1 | PSO 2 |
| CO1 | 2   |     |     |     |     |     | 1   |     |       |              |            |      |       |       |
| CO2 |   |     |     |     |     |     |     |     |       | 3            |            |      |       | 1     |
| CO3 |   |     |     | 3   |     |     |     |     |       |              |            |      |       |       |
| CO4 |   |     |     |     |     |     | 1   |     |       |              |            | 3    | 1     |       |
|     | 1=lightly mapped 2= moderately mapped 3=strongly mapped |     |     |     |     |     |     |     |       |              |            |      |       |       |

| Unit | Relevance t<br>and global o |          |          |   | Releva<br>Emplo<br>Entrep<br>Develo | yabili<br>preneu   | ty/<br>rship/ Skill  | Ethics              | s, Gen | der, Hu      | rofessional<br>ıman Values,<br>ıstainability | SDG  | NEP  | POE/4 <sup>th</sup><br>IR                     |
|------|-----------------------------|----------|----------|---|-------------------------------------|--------------------|--|---------------------|--------|--------------|--|--|--|---|
| Unit | Local                       | Regional | National | Awareness about different natural resources, i.e. renewable/n on-renewable energy resources & etc | ' Employability                     | ' Entrepreneurship | Familiar and identification and knowledge of different environmental resources and their components. | Professional Ethics | Gender | Human Values | Reduction of threat on natural resources.    | Ensure healthy lives and promote wellbeing for all at all ages (SDG 3)  Ensure access to | Globa<br>l<br>Educa<br>tion<br>Know<br>ledge | Consultin<br>g Field<br>Projects,<br>Projects |

|  |  |  |  | off and ala         |  |
|--|--|--|--|---------------------|--|
|  |  |  |  | affordab            |  |
|  |  |  |  | le,                 |  |
|  |  |  |  | reliable,           |  |
|  |  |  |  | sustaina            |  |
|  |  |  |  | ble and             |  |
|  |  |  |  | modern              |  |
|  |  |  |  | energy              |  |
|  |  |  |  | for all             |  |
|  |  |  |  | (SDG 7)             |  |
|  |  |  |  | Promote             |  |
|  |  |  |  | Promote             |  |
|  |  |  |  | sustaine            |  |
|  |  |  |  | d,                  |  |
|  |  |  |  | inclusiv            |  |
|  |  |  |  | e and               |  |
|  |  |  |  | sustaina            |  |
|  |  |  |  | ble                 |  |
|  |  |  |  | economi             |  |
|  |  |  |  | c                   |  |
|  |  |  |  | growth              |  |
|  |  |  |  | growth,<br>full and |  |
|  |  |  |  | nun anu             |  |
|  |  |  |  | producti            |  |
|  |  |  |  | ve                  |  |
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|  |  |  |  | ment                |  |
|  |  |  |  | and                 |  |
|  |  |  |  | decent              |  |
|  |  |  |  | work for            |  |
|  |  |  |  | all                 |  |
|  |  |  |  | (SDG                |  |
|  |  |  |  | 8),                 |  |
|  |  |  |  | Take                |  |
|  |  |  |  |                     |  |
|  |  |  |  | urgent              |  |
|  |  |  |  | action to           |  |
|  |  |  |  | combat              |  |
|  |  |  |  | climate             |  |

|  | T T | <u> </u> | change          |
|--|-----|----------|-----------------|
|  |     |          | change          |
|  |     |          | and its         |
|  |     |          | impacts<br>(SDG |
|  |     |          | (SDG            |
|  |     |          | 13),            |
|  |     |          | Protect,        |
|  |     |          | restore         |
|  |     |          | and             |
|  |     |          | promote         |
|  |     |          | sustaina        |
|  |     |          | ble use         |
|  |     |          | of              |
|  |     |          | terrestria      |
|  |     |          |                 |
|  |     |          | ecosyste        |
|  |     |          | ms,             |
|  |     |          | sustaina        |
|  |     |          | bly             |
|  |     |          | manage          |
|  |     |          | forests,        |
|  |     |          | combat          |
|  |     |          | desertifi       |
|  |     |          | cation,         |
|  |     |          | and halt        |
|  |     |          | and             |
|  |     |          | reverse         |
|  |     |          | land            |
|  |     |          | degradat        |
|  |     |          | ion and         |
|  |     |          | halt            |
|  |     |          | biodiver        |
|  |     |          | sity loss       |
|  |     |          | (SDG            |
|  |     |          | 15)             |

|      | ı |   | 1 |              | ı      |  | 1 |  | I          |        |           |
|------|---|---|---|--------------|--------|--|---|--|------------|--------|-----------|
| Unit |   | - | - | knowledge    | Best   |  |   |  | Protect,   | Prom   |           |
| II   |   |   |   | of different | Com    |  |   |  | restore    | oting  |           |
|      |   |   |   | ecological   | merci  |  |   |  | and        | Highj  | Case      |
|      |   |   |   | systems,     | al     |  |   |  | promote    | -      | Competiti |
|      |   |   |   | their        | utiliz |  |   |  | sustaina   | qualit | ons       |
|      |   |   |   | structure    | ation  |  |   |  | ble use    | y      |           |
|      |   |   |   | and          | of     |  |   |  | of         | resear |           |
|      |   |   |   | functions    | natur  |  |   |  | terrestria | ch     |           |
|      |   |   |   |              | al     |  |   |  | 1          | (18.1- |           |
|      |   |   |   |              | resou  |  |   |  | ecosyste   | 18.9)  |           |
|      |   |   |   |              | rces.  |  |   |  | ms,        |        |           |
|      |   |   |   |              |        |  |   |  | sustaina   |        |           |
|      |   |   |   |              |        |  |   |  | bly        |        |           |
|      |   |   |   |              |        |  |   |  | manage     |        |           |
|      |   |   |   |              |        |  |   |  | forests,   |        |           |
|      |   |   |   |              |        |  |   |  | combat     |        |           |
|      |   |   |   |              |        |  |   |  | desertifi  |        |           |
|      |   |   |   |              |        |  |   |  | cation,    |        |           |
|      |   |   |   |              |        |  |   |  | and halt   |        |           |
|      |   |   |   |              |        |  |   |  | and        |        |           |
|      |   |   |   |              |        |  |   |  | reverse    |        |           |
|      |   |   |   |              |        |  |   |  | land       |        |           |
|      |   |   |   |              |        |  |   |  | degradat   |        |           |
|      |   |   |   |              |        |  |   |  | ion and    |        |           |
|      |   |   |   |              |        |  |   |  | halt       |        |           |
|      |   |   |   |              |        |  |   |  | biodiver   |        |           |
|      |   |   |   |              |        |  |   |  | sity loss  |        |           |
|      |   |   |   |              |        |  |   |  | (SDG       |        |           |
|      |   |   |   |              |        |  |   |  | 15)        |        |           |
|      |   |   |   |              |        |  |   |  | 13)        |        |           |
|      | 1 |   |   |              | 1      |  | 1 |  | 1          |        |           |

| Unit | _ | _ | Know about   |  |  |   |   | Promote       |   | Teamwork  |
|------|---|---|--------------|--|--|---|---|---------------|---|-----------|
| III  |   |   | factors      |  |  |   |   | peaceful      |   | , skill   |
| 111  |   |   | affecting    |  |  |   |   | and           |   | developm  |
|      |   |   | components   |  |  |   |   | inclusiv      |   | ent,      |
|      |   |   | of           |  |  |   |   | e             |   | Case      |
|      |   |   | environment  |  |  |   |   | societies     |   | Competiti |
|      |   |   | & their      |  |  |   |   | for           |   | ons       |
|      |   |   | adverse      |  |  |   |   | sustaina      |   | Olis      |
|      |   |   | effect on    |  |  |   |   | ble           |   |           |
|      |   |   | individual   |  |  |   |   | develop       |   |           |
|      |   |   | health.      |  |  |   |   | ment,         |   |           |
|      |   |   | Introduction |  |  |   |   | provide       |   |           |
|      |   |   | of Public    |  |  |   |   | access to     |   |           |
|      |   |   | awareness    |  |  |   |   | justice       |   |           |
|      |   |   | programmes   |  |  |   |   | for all       |   |           |
|      |   |   | . Introduce  |  |  |   |   | and           |   |           |
|      |   |   | and          |  |  |   |   | build         |   |           |
|      |   |   | implementat  |  |  |   |   | effective     |   |           |
|      |   |   | ion of Laws  |  |  |   |   | CHECHVE       |   |           |
|      |   |   | & Acts       |  |  |   |   | ,<br>accounta |   |           |
|      |   |   | there on.    |  |  |   |   | ble and       |   |           |
|      |   |   | there on.    |  |  |   |   | inclusiv      |   |           |
|      |   |   |              |  |  |   |   | e             |   |           |
|      |   |   |              |  |  |   |   | institutio    |   |           |
|      |   |   |              |  |  |   |   | ns at all     |   |           |
|      |   |   |              |  |  |   |   | levels        |   |           |
|      |   |   |              |  |  |   |   | (SDG          |   |           |
|      |   |   |              |  |  |   |   | 16)           |   |           |
|      |   |   |              |  |  |   |   | Revitali      |   |           |
|      |   |   |              |  |  |   |   | ze the        |   |           |
|      |   |   |              |  |  |   |   | global        |   |           |
|      |   |   |              |  |  |   |   | partners      |   |           |
|      |   |   |              |  |  |   |   | hip for       |   |           |
|      |   |   |              |  |  |   |   | sustaina      |   |           |
|      |   |   |              |  |  |   |   | ble           |   |           |
|      |   | 1 |              |  |  | 1 | 1 | DIC           | 1 |           |

|  |  |  |  |  |  | develop  |  |
|--|--|--|--|--|--|----------|--|
|  |  |  |  |  |  | ment     |  |
|  |  |  |  |  |  | (Role of |  |
|  |  |  |  |  |  | all      |  |
|  |  |  |  |  |  | Schools, |  |
|  |  |  |  |  |  | KRMU)    |  |
|  |  |  |  |  |  | (SDG     |  |
|  |  |  |  |  |  | 17)      |  |

| BP207P                     | Human Anatomy And Physiology-I (Practical) | L | T | P | С |
|----------------------------|--|---|---|---|---|
| Version 2.0                |  | 0 | 0 | 4 | 2 |
| <b>Total Contact Hours</b> | 60 Hours                                   |   |   |   |   |
| Pre-requisites/Exposure    | Pharmacology                               |   |   |   |   |
| Co-requisites              | Pathophysiology                            |   |   |   |   |

#### **Course Objectives**

#### **Upon completion of this course the student should be able to:**

- 1. Practical physiology is complimentary to the theoretical discussions in Physiology.
- 2. Practical allow the verification of physiological processes discusses in theory classes through experiments on living tissue, intact animals or normal human beings.
- 3. This is helpful for developing an insight on the human anatomy and physiology subject.

#### **Course Outcomes (CO)**

- CO1. This subject is designed to impart practical knowledge on the in-theory classes through experiments on living tissue, intact animals or normal human beings.
- CO2. The subject provides the basic knowledge required to understand the digestive system

CO3. The subject provides the basic knowledge required to understand the nervous system.

CO4. The subject provides the basic knowledge required to understand the respiratory system and endocrine system

CO5. The subject provides the basic knowledge required to understand reproductive system.

|     | Programme and Course Mapping  |     |     |     |          |       |     |     |       |              |          |            |          |       |  |
|-----|---|-----|-----|-----|----------|-------|-----|-----|-------|--------------|----------|------------|----------|-------|--|
| СО  | PO1   | PO2 | PO3 | PO4 | PO5      | PO6   | PO7 | PO8 | PO9   | PO 10        | PO11     | PO12       | PSO<br>1 | PSO 2 |  |
| CO1 | 3   | 1   |     |     | 2        | 2     |     | 2   |       | 3            | 2        | 3          | 2        | 2     |  |
| CO2 | 3   | 1   |     |     | 2        | 2     |     | 2   |       | 2            | 2        | 3          | 2        | 2     |  |
| CO3 | 3   | 1   |     |     | 1        | 2     |     | 2   |       | 2            | 2        | 3          | 2        | 2     |  |
| CO4 | 3   | 1   |     |     | 2        | 2     |     | 2   |       | 2            | 2        | 3          | 2        | 2     |  |
| CO5 | CO5         3         1         2         2         2         2         2         3         2         2 |     |     |     |          |       |     |     |       |              |          |            |          |       |  |
|     |   |     |     | 1=  | =lightly | mappe | ed  | 2=  | moder | ately mapped | 3=strong | gly mapped |          |       |  |

| Unit   |
|--|
| Relevance to the local,<br>national, regional and<br>global developmental<br>needs                   |
| Relevance To the<br>Employability/<br>Entrepreneurship/ Skill<br>Development                         |
| Relevance to the<br>Professional Ethics,<br>Gender, Human Values,<br>Environment &<br>Sustainability |
| SDG  |
| NEP  |
| POE/4 <sup>th</sup> IR   |
|  |

| BP207P                     |       |          |  |        |               |                  |   |                     |        |              |                              |   |               |   |
|----------------------------|-------|----------|--|--------|---------------|------------------|---|---------------------|--------|--------------|------------------------------|---|---------------|---|
|                            | Local | Regional | National   | Global | Employability | Entrepreneurship | Skill Development   | Professional Ethics | Gender | Human Values | Environment & Sustainability |   |               |   |
| Unit I<br>Practical<br>1-3 | -     | -        | The concepts once imbibed will help the students to use the practical information in providing better health services to the nation as a whole | -      | -             | -                | Enrichment of thinking ability and creativity. The practical knowledge of the topic will help them to understand the physiology of skin and diseases related to the system in a better way and they will be able to | -                   | -      | -            | -                            | SDG 3: Ensure healthy lives and promote well- being for all at all ages.  SDG 4.4: Skills for Decent Work | NEP (9.1-9.3) | Student<br>centric<br>Technical<br>Skills<br>that<br>match<br>Industry<br>Needs |

|           |   |   |             |   |   |   | corelate the  |   |   |   |   |         |       |           |
|-----------|---|---|-------------|---|---|---|---------------|---|---|---|---|---------|-------|-----------|
|           |   |   |             |   |   |   | knowledge     |   |   |   |   |         |       |           |
|           |   |   |             |   |   |   | and           |   |   |   |   |         |       |           |
|           |   |   |             |   |   |   | information   |   |   |   |   |         |       |           |
|           |   |   |             |   |   |   | gathered in   |   |   |   |   |         |       |           |
|           |   |   |             |   |   |   | their day-to- |   |   |   |   |         |       |           |
|           |   |   |             |   |   |   | day life and  |   |   |   |   |         |       |           |
|           |   |   |             |   |   |   | future job    |   |   |   |   |         |       |           |
|           |   |   |             |   |   |   | prospectives  |   |   |   |   |         |       |           |
|           |   |   |             |   |   |   | also          |   |   |   |   |         |       |           |
| Unit II   | - | - | The         | - | - | - | Enrichment    | - | - | _ | _ | SDG 3:  | NEP   | Student   |
| Practical |   |   | concepts    |   |   |   | of thinking   |   |   |   |   | Ensure  | (9.1- | centric   |
| 4-6       |   |   | once        |   |   |   | ability and   |   |   |   |   | healthy | 9.3)  | Technical |
|           |   |   | imbibed     |   |   |   | creativity.   |   |   |   |   | lives   |       | Skills    |
|           |   |   | will help   |   |   |   | The           |   |   |   |   | and     |       | that      |
|           |   |   | the         |   |   |   | practical     |   |   |   |   | promote |       | match     |
|           |   |   | students to |   |   |   | knowledge     |   |   |   |   | well-   |       | Industry  |
|           |   |   | use the     |   |   |   | of the topic  |   |   |   |   | being   |       | Needs     |
|           |   |   | practical   |   |   |   | will help     |   |   |   |   | for all |       |           |
|           |   |   | information |   |   |   | them to       |   |   |   |   | at all  |       |           |
|           |   |   | in          |   |   |   | understand    |   |   |   |   | ages.   |       |           |
|           |   |   | providing   |   |   |   | the           |   |   |   |   |         |       |           |
|           |   |   | better      |   |   |   | physiology    |   |   |   |   | SDG     |       |           |
|           |   |   | health      |   |   |   | of skin and   |   |   |   |   | 4.4:    |       |           |
|           |   |   | services to |   |   |   | diseases      |   |   |   |   | Skills  |       |           |
|           |   |   | the nation  |   |   |   | related to    |   |   |   |   | for     |       |           |
|           |   |   | as a whole  |   |   |   | the system    |   |   |   |   | Decent  |       |           |
|           |   |   |             |   |   |   | in a better   |   |   |   |   | Work    |       |           |
|           |   |   |             |   |   |   | way and       |   |   |   |   |         |       |           |
|           |   |   |             |   |   |   | they will be  |   |   |   |   |         |       |           |
|           |   |   |             |   |   |   | able to       |   |   |   |   |         |       |           |
|           |   |   |             |   |   |   | correlate the |   |   |   |   |         |       |           |
|           |   |   |             |   |   |   | knowledge     |   |   |   |   |         |       |           |
|           |   |   |             |   |   |   | and           |   |   |   |   |         |       |           |
|           |   |   |             |   |   |   | information   |   |   |   |   |         |       |           |

| Unit III<br>Practical<br>7-9 | - | - | The concepts once imbibed will help the students to use the | - | - | - | gathered in their day-to-day life and future job prospective also Enrichment of thinking ability and creativity. The practical knowledge of the topic | - | - | - | - | SDG 3:<br>Ensure<br>healthy<br>lives<br>and<br>promote<br>well-<br>being | NEP<br>(9.1-<br>9.3) | Student<br>centric<br>Technical<br>Skills<br>that<br>match<br>Industry<br>Needs |
|------------------------------|---|---|---|---|---|---|---|---|---|---|---|--|----------------------|---|
|                              |   |   |   |   |   |   |   |   |   |   |   |  |                      |   |
|                              |   |   |   |   |   |   |   |   |   |   |   |  |                      |   |
|                              | - | - | The   | - | - | - |   | - | - | - | - |  |                      |   |
|                              |   |   | concepts  |   |   |   |   |   |   |   |   |  |                      |   |
| 7-9                          |   |   | once  |   |   |   | ability and   |   |   |   |   | healthy  | 9.3)                 | Technical   |
|                              |   |   | imbibed   |   |   |   | creativity.   |   |   |   |   | lives  |                      | Skills  |
|                              |   |   | will help   |   |   |   | The   |   |   |   |   | and  |                      | that  |
|                              |   |   | the   |   |   |   | practical   |   |   |   |   | promote  |                      | match   |
|                              |   |   | students to   |   |   |   | knowledge   |   |   |   |   | well-  |                      | Industry  |
|                              |   |   | use the   |   |   |   | of the topic  |   |   |   |   | being  |                      | Needs   |
|                              |   |   | practical   |   |   |   | will help   |   |   |   |   | for all  |                      |   |
|                              |   |   | information   |   |   |   | them to   |   |   |   |   | at all   |                      |   |
|                              |   |   | in  |   |   |   | understand  |   |   |   |   | ages.  |                      |   |
|                              |   |   | providing   |   |   |   | the   |   |   |   |   | _  |                      |   |
|                              |   |   | better  |   |   |   | physiology  |   |   |   |   | SDG  |                      |   |
|                              |   |   | health  |   |   |   | of skin and   |   |   |   |   | 4.4:   |                      |   |
|                              |   |   | services to   |   |   |   | diseases  |   |   |   |   | Skills   |                      |   |
|                              |   |   | the nation  |   |   |   | related to  |   |   |   |   | for  |                      |   |
|                              |   |   | as a whole  |   |   |   | the system  |   |   |   |   | Decent   |                      |   |
|                              |   |   |   |   |   |   | in a better   |   |   |   |   | Work   |                      |   |
|                              |   |   |   |   |   |   | way and   |   |   |   |   |  |                      |   |
|                              |   |   |   |   |   |   | they will be  |   |   |   |   |  |                      |   |
|                              |   |   |   |   |   |   | able to   |   |   |   |   |  |                      |   |
|                              |   |   |   |   |   |   | correlate the   |   |   |   |   |  |                      |   |
|                              |   |   |   |   |   |   | knowledge   |   |   |   |   |  |                      |   |
|                              |   |   |   |   |   |   | and   |   |   |   |   |  |                      |   |
|                              |   |   |   |   |   |   | information   |   |   |   |   |  |                      |   |
|                              |   |   |   |   |   |   | gathered in   |   |   |   |   |  |                      |   |
|                              |   |   |   |   |   |   | their day-to-   |   |   |   |   |  |                      |   |
|                              |   |   |   |   |   |   | day life and  |   |   |   |   |  |                      |   |
|                              |   |   |   |   |   |   | future job  |   |   |   |   |  |                      |   |

|                               |  |  |   |   |   | prospective<br>also   |  |   |   |               |  |
|-------------------------------|--|--|---|---|---|---|--|---|---|---------------|--|
| Unit IV<br>Practical<br>10-12 |  | The concepts once imbibed will help the students to use the practical information in providing better health services to the nation as a whole | - | - | - | Enrichment of thinking ability and creativity. The practical knowledge of the topic will help them to understand the physiology of skin and diseases related to the system in a better way and they will be able to correlate the knowledge and information gathered in their day-to-day life and future job prospective also | The practical knowledge of the contraceptive methods and related topics will enrich the knowledge of the students in the field | - | SDG 3: Ensure healthy lives and promote well- being for all at all ages.  SDG 4.4: Skills for Decent Work | NEP (9.1-9.3) | Student centric Technical Skills that match Industry Needs |

|           | 1 | 1 | 1           | ı | 1 | 1 | 1             | 1 |                | 1 | 1 | I       | I     | 1         |
|-----------|---|---|-------------|---|---|---|---------------|---|----------------|---|---|---------|-------|-----------|
| Unit V    | - |   | The         | - | - | - | Enrichment    | - | The practical  | - | - | SDG 3:  | NEP   | Student   |
| Practical |   |   | concepts    |   |   |   | of thinking   |   | knowledge      |   |   | Ensure  | (9.1- | centric   |
| 13-16     |   |   | once        |   |   |   | ability and   |   | of the         |   |   | healthy | 9.3)  | Technical |
|           |   |   | imbibed     |   |   |   | creativity.   |   | contraceptive  |   |   | lives   |       | Skills    |
|           |   |   | will help   |   |   |   | The           |   | methods and    |   |   | and     |       | that      |
|           |   |   | the         |   |   |   | practical     |   | related topics |   |   | promote |       | match     |
|           |   |   | students to |   |   |   | knowledge     |   | will enrich    |   |   | well-   |       | Industry  |
|           |   |   | use the     |   |   |   | of the topic  |   | the            |   |   | being   |       | Needs     |
|           |   |   | practical   |   |   |   | will help     |   | knowledge      |   |   | for all |       |           |
|           |   |   | information |   |   |   | them to       |   | of the         |   |   | at all  |       |           |
|           |   |   | in          |   |   |   | understand    |   | students in    |   |   | ages.   |       |           |
|           |   |   | providing   |   |   |   | the           |   | the field      |   |   |         |       |           |
|           |   |   | better      |   |   |   | physiology    |   |                |   |   | SDG     |       |           |
|           |   |   | health      |   |   |   | of skin and   |   |                |   |   | 4.4:    |       |           |
|           |   |   | services to |   |   |   | diseases      |   |                |   |   | Skills  |       |           |
|           |   |   | the nation  |   |   |   | related to    |   |                |   |   | for     |       |           |
|           |   |   | as a whole  |   |   |   | the system    |   |                |   |   | Decent  |       |           |
|           |   |   |             |   |   |   | in a better   |   |                |   |   | Work    |       |           |
|           |   |   |             |   |   |   | way and       |   |                |   |   |         |       |           |
|           |   |   |             |   |   |   | they will be  |   |                |   |   |         |       |           |
|           |   |   |             |   |   |   | able to       |   |                |   |   |         |       |           |
|           |   |   |             |   |   |   | correlate the |   |                |   |   |         |       |           |
|           |   |   |             |   |   |   | knowledge     |   |                |   |   |         |       |           |
|           |   |   |             |   |   |   | and           |   |                |   |   |         |       |           |
|           |   |   |             |   |   |   | information   |   |                |   |   |         |       |           |
|           |   |   |             |   |   |   | gathered in   |   |                |   |   |         |       |           |
|           |   |   |             |   |   |   | their day-to- |   |                |   |   |         |       |           |
|           |   |   |             |   |   |   | day life and  |   |                |   |   |         |       |           |
|           |   |   |             |   |   |   | future job    |   |                |   |   |         |       |           |
|           |   |   |             |   |   |   | prospective   |   |                |   |   |         |       |           |
|           |   |   |             |   |   |   | also          |   |                |   |   |         |       |           |

| BP208P                     | Pharmaceutical Organic Chemistry –I (Practical) | L | T | P | C |  |  |  |  |  |  |
|----------------------------|---|---|---|---|---|--|--|--|--|--|--|
| Version 2.0                |   | 0 | 0 | 4 | 2 |  |  |  |  |  |  |
| <b>Total Contact Hours</b> | 60 Hours  |   |   |   |   |  |  |  |  |  |  |
| Pre-requisites/Exposure    | Organic chemistry (Practical                    |   |   |   |   |  |  |  |  |  |  |
| Co-requisites              | Chemistry                                       |   |   |   |   |  |  |  |  |  |  |
|                            | Course Objectives                               |   |   |   |   |  |  |  |  |  |  |

#### **Course Objectives**

### Upon completion of this course the student should be able to:

- 1. Write the reaction, name the reaction and orientation of reactions
- 2. Account for reactivity/stability of compounds,
- 3. Identify/confirm the identification of organic compound

#### **Course Outcomes (CO)**

- CO1. Explain fundamental knowledge on isomerism.
- CO2. Explain fundamental knowledge of alkanes and alkenes and their stability.
- CO3. Explain the nucleophilic addition reactions.

|     | Programme and Course Mapping   |   |   |     |        |        |   |    |        |             |       |              |   |   |
|-----|--|---|---|-----|--------|--------|---|----|--------|-------------|-------|--------------|---|---|
| CO  | CO   PO1   PO2   PO3   PO4   PO5   PO6   PO7   PO8   PO9   PO 10   PO11   PO12   PSO 1   PSO 2 |   |   |     |        |        |   |    |        |             |       |              |   |   |
| CO1 | CO1 3 1 2 2 2 3 2 3 2 2  |   |   |     |        |        |   |    |        |             |       |              |   |   |
| CO2 | 3  | 1 |   |     | 2      | 2      |   | 2  |        | 2           | 2     | 3            | 2 | 2 |
| CO3 | 3  | 1 |   |     | 1      | 2      |   | 2  |        | 2           | 2     | 3            | 2 | 2 |
|     |  |   | • | 1=1 | ightly | mapped | i | 2= | modera | tely mapped | 3=str | ongly mapped |   | • |

| Unit       | Relevance to the local, national, regional and global | Relevance to the local, national, regional and global developmental needs |          |   |               | Skin Development |  | Relevance to the    | Professional Ethics,<br>Gender, Human | Values,      | Environment &                | SDG                                       | NEP                                      | POE/4 <sup>th</sup> IR   |
|------------|---|---|----------|---|---------------|------------------|--|---------------------|---------------------------------------|--------------|------------------------------|---|--|--------------------------|
| BP208<br>P | Local   | Regional  | National | Global  | Employability | Entrepreneurship | Skill Development  | Professional Ethics | Gender                                | Human Values | Environment & Sustainability |   |  |                          |
| Unit I     | -   | -   | -        | Fulfils<br>the need<br>for Drug<br>Develop<br>ment<br>globally            | -             | -                | Knowledge of<br>Physicochemic<br>al properties of<br>Drugs helps in<br>Preformulation<br>studies | -                   | -                                     | -            | -                            | Skills for<br>Decent<br>Work<br>(SDG 4.4) | Professional<br>Education<br>(17.1-17.5) | Skill<br>Develo<br>pment |
| Unit II    |   | -   | -        | Fulfils<br>the need<br>for<br>determin<br>ation of<br>different<br>groups | -             | -                | Knowledge of determination of unknown compounds will help in identification of new synthesized   | -                   | -                                     | -            | -                            | Skills for<br>Decent<br>Work<br>(SDG 4.4) | Professional<br>Education<br>(17.1-17.5) | Skill<br>Develo<br>pment |

|             |   |   |   |  |   |   | compounds  |   |   |   |   |   |  |  |
|-------------|---|---|---|--|---|---|--|---|---|---|---|---|--|--|
| Unit<br>III | - | - | - | Fulfils<br>the need<br>for Drug<br>Develop<br>ment<br>globally | - | - | Knowledge of<br>synthesis of<br>different<br>derivatives<br>helps in<br>synthesis of<br>new moieties | - | - | - | - | Skills for<br>Decent<br>Work<br>(SDG 4.4) | Promoting<br>High-quality<br>research (18.1-<br>18.9), | Skill<br>Develo<br>pment,<br>Employ<br>ability |

| BP209P                     | Biochemistry (Practical) | L   | Т | P | C |
|----------------------------|--------------------------|-----|---|---|---|
| Version 2.0                |                          | 3   | 1 | 0 | 4 |
| <b>Total Contact Hours</b> | 60 Hours                 |     |   |   |   |
| Pre-requisites/Exposure    | Chemistry                |     |   |   |   |
| Co-requisites              | Chemistry and biology    |     |   |   |   |
|                            | Course Objectiv          | res |   |   |   |

### **Upon completion of this course the student should be able to:**

- 1. Understand the catalytic role of enzymes, importance of enzyme inhibitors in design of new drugs, therapeutic and diagnostic applications of enzymes.
- 2. Understand the metabolism of nutrient molecules in physiological and pathological conditions.
- 3. Understand the genetic organization of mammalian genome and functions of DNA in the synthesis of RNAs and proteins.

### **Course Outcomes (CO)**

CO1. Learn about the basic principles of Biochemistry

CO2. Understand the Pathophysiology of Urine.

CO3. Understand the basics about Protein Carbohydrate, Fats

|   |     |     |     |     |     |     |     | P   | rogran | me and Cou | rse Mapping | 3    |       |       |
|---|-----|-----|-----|-----|-----|-----|-----|-----|--------|------------|-------------|------|-------|-------|
| CO  | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9    | PO 10      | PO11        | PO12 | PSO 1 | PSO 2 |
| CO1   | 3   | 1   | -   | -   | 2   | 2   | -   | 2   |        | 3          | 2           | 3    | 2     |       |
| CO2   | 3   | 1   | -   | -   | 2   | 2   |     | 2   |        | 2          | 2           | 3    | 2     |       |
| CO3   | 3   | 1   | -   | -   | 1   | 2   |     | 2   |        | 2          | 2           | 3    | 2     |       |
| 1=lightly mapped 2= moderately mapped 3=strongly mapped |     |     |     |     |     |     |     |     |        | pped       |             |      |       |       |

| Unit | Relevance to the | regional and global | developmental<br>needs |        | Relevance To the<br>Employability/<br>Entrepreneurship/<br>Skill Development |                  |                   | Relevance to the<br>Professional Ethics, | Gender, Human<br>Values, | Environment &<br>Sustainability |                                 | SDG | NEP | POE/4 <sup>th</sup> IR |
|------|------------------|---------------------|------------------------|--------|--|------------------|-------------------|--|--------------------------|---------------------------------|---------------------------------|-----|-----|------------------------|
|      | Local            | Regional            | National               | Global | Employability  | Entrepreneurship | Skill Development | Professional Ethics                      | Gender                   | Human Values                    | Environment &<br>Suctainability |     |     |                        |

| Unit | Experiments involving             |  | A           | - | - | - | - | Sustai | Quality     | Global  |
|------|-----------------------------------|--|-------------|---|---|---|---|--------|-------------|---------|
| I    | laboratory techniques like        |  | knowledge   |   |   |   |   | nable  | Universitie | Educati |
|      | recrystallization, steam          |  | able        |   |   |   |   | Devel  | s and       | on      |
|      | distillation is important part of |  | individual  |   |   |   |   | opme   | Colleges: A | Knowle  |
|      | pharmaceutical sciences           |  | in organic  |   |   |   |   | nt and | New and     | dge     |
|      | experiment. These experiments     |  | chemistry   |   |   |   |   | Globa  | Forward-    | Practic |
|      | are usually conducted all over    |  | aids in the |   |   |   |   | 1      | looking     | al      |
|      | the world.                        |  | synthesis   |   |   |   |   | Citize | Vision for  | Course  |
|      |                                   |  | of drugs    |   |   |   |   | nship  | India's     | s from  |
|      |                                   |  | and their   |   |   |   |   | (SDG   | Higher      | Industr |
|      |                                   |  | intermedia  |   |   |   |   | 4.7)   | Education   | y/Alum  |
|      |                                   |  | tes.        |   |   |   |   |        | System      | ni      |
|      |                                   |  |             |   |   |   |   | Schol  | (9.1-9.3)   | Techni  |
|      |                                   |  |             |   |   |   |   | arship | Professiona | cal     |
|      |                                   |  |             |   |   |   |   | s for  | 1 Education | Skills  |
|      |                                   |  |             |   |   |   |   | Highe  | (17.1-17.5) | that    |
|      |                                   |  |             |   |   |   |   | r      | Promoting   | match   |
|      |                                   |  |             |   |   |   |   | Educa  | High-       | Industr |
|      |                                   |  |             |   |   |   |   | tion   | quality     | y       |
|      |                                   |  |             |   |   |   |   | (SDG   | research    | Needs   |
|      |                                   |  |             |   |   |   |   | 4.b)   | (18.1-18.9) | Focus   |
|      |                                   |  |             |   |   |   |   | Revita | Technology  | on      |
|      |                                   |  |             |   |   |   |   | lize   | Use &       | Employ  |
|      |                                   |  |             |   |   |   |   | the    | Integration | ability |
|      |                                   |  |             |   |   |   |   | global | (23.1-      | Skills  |
|      |                                   |  |             |   |   |   |   | partne | 23.13)      | (Local/ |
|      |                                   |  |             |   |   |   |   | rship  |             | Region  |
|      |                                   |  |             |   |   |   |   | for    |             | al and  |
|      |                                   |  |             |   |   |   |   | sustai |             | Global) |
|      |                                   |  |             |   |   |   |   | nable  |             | Interns |
|      |                                   |  |             |   |   |   |   | devel  |             | hip     |
|      |                                   |  |             |   |   |   |   | opme   |             | Progra  |
|      |                                   |  |             |   |   |   |   | nt     |             | ms      |
|      |                                   |  |             |   |   |   |   | (SDG   |             | Consult |
|      |                                   |  |             |   |   |   |   | 17)    |             | ing     |

|      |   |  |  |   |   |   | Field Project s Entrepr eneursh ip Progra m through Innovat ion System   |
|------|---|--|--|---|---|---|--|
| Unit | The determination of acid/saponification/iodine value of fats and oils has a significant global impact by ensuring quality, stability, and functionality in various industries, promoting sustainability, and facilitating international trade. | A knowledge able individual in organic chemistry aids in the synthesis of drugs and their intermedia tes |  | - | Sustai nable Devel opme nt and Globa l Citize nship (SDG 4.7) Schol arship s for Highe r Educa tion (SDG 4.b) Revita lize the | Quality Universitie s and Colleges: A New and Forward- looking Vision for India's Higher Education System (9.1- 9.3) Professiona 1 Education (17.1-17.5) Promoting Highj- quality research (18.1-18.9) Technology Use & | Global Educati on Knowle dge Practic al Course s from Industr y/Alum ni Techni cal Skills that match Industr y Needs Focus on Employ |

|             |      |                                |  |                    |   |   |   |   | global         | Integration          | ability      |
|-------------|------|--------------------------------|--|--------------------|---|---|---|---|----------------|----------------------|--------------|
|             |      |                                |  |                    |   |   |   |   | partne         | (23.1-               | Skills       |
|             |      |                                |  |                    |   |   |   |   | rship          | 23.13)               | (Local/      |
|             |      |                                |  |                    |   |   |   |   | for            |                      | Region       |
|             |      |                                |  |                    |   |   |   |   | sustai         |                      | al and       |
|             |      |                                |  |                    |   |   |   |   | nable          |                      | Global)      |
|             |      |                                |  |                    |   |   |   |   | devel          |                      | Interns      |
|             |      |                                |  |                    |   |   |   |   | opme           |                      | hip          |
|             |      |                                |  |                    |   |   |   |   | nt             |                      | Progra       |
|             |      |                                |  |                    |   |   |   |   | (SDG           |                      | ms           |
|             |      |                                |  |                    |   |   |   |   | 17)            |                      | Consult      |
|             |      |                                |  |                    |   |   |   |   |                |                      | ing          |
|             |      |                                |  |                    |   |   |   |   |                |                      | Field        |
|             |      |                                |  |                    |   |   |   |   |                |                      | Project      |
|             |      |                                |  |                    |   |   |   |   |                |                      | S            |
|             |      |                                |  |                    |   |   |   |   |                |                      | Entrepr      |
|             |      |                                |  |                    |   |   |   |   |                |                      | eneursh      |
|             |      |                                |  |                    |   |   |   |   |                |                      | ip           |
|             |      |                                |  |                    |   |   |   |   |                |                      | Progra       |
|             |      |                                |  |                    |   |   |   |   |                |                      | m            |
|             |      |                                |  |                    |   |   |   |   |                |                      | through      |
|             |      |                                |  |                    |   |   |   |   |                |                      | Innovat      |
|             |      |                                |  |                    |   |   |   |   |                |                      | ion          |
| T T 14      | Cl   |                                |  | <b>A</b>           |   |   |   |   | C4-:           | O1:4                 | System       |
| Unit<br>III |      | emical, drug, and              |  | A                  | - | - | - | - | Sustai         | Quality              | Global       |
| 1111        |      | ermediate preparation is a key |  | knowledge<br>able  |   |   |   |   | nable          | Universitie          | Educati      |
|             |      | t of the pharmaceutical sector |  | able<br>individual |   |   |   |   | Devel          | s and<br>Colleges: A | on<br>Knowle |
|             | giot | bally.                         |  | in organic         |   |   |   |   | opme<br>nt and | New and              | dge          |
|             |      |                                |  | chemistry          |   |   |   |   | Globa          | Forward-             | Practic      |
|             |      |                                |  | aids in the        |   |   |   |   | 1              | looking              | al           |
|             |      |                                |  | synthesis          |   |   |   |   | Citize         | Vision for           | Course       |
|             |      |                                |  | of drugs           |   |   |   |   | nship          | India's              | s from       |
|             |      |                                |  | and their          |   |   |   |   | (SDG           | Higher               | Industr      |
|             |      |                                |  | intermedia         |   |   |   |   | 4.7)           | Education            | y/Alum       |
|             |      |                                |  | memedia            |   |   |   |   | 4.1)           | Education            | y/Aiuiii     |

|  |  |  | tes |  |  | Schol  | System      | ni      |
|--|--|--|-----|--|--|--------|-------------|---------|
|  |  |  |     |  |  | arship | (9.1-9.3)   | Techni  |
|  |  |  |     |  |  | s for  | Professiona | cal     |
|  |  |  |     |  |  |        | 1 Education | Skills  |
|  |  |  |     |  |  | r      | (17.1-17.5) | that    |
|  |  |  |     |  |  |        | Promoting   | match   |
|  |  |  |     |  |  | tion   | Highj-      | Industr |
|  |  |  |     |  |  | (SDG   | quality     | y       |
|  |  |  |     |  |  | 4.b)   | research    | Needs   |
|  |  |  |     |  |  | Revita | (18.1-18.9) | Focus   |
|  |  |  |     |  |  | lize   | Technology  | on      |
|  |  |  |     |  |  | the    | Use &       | Employ  |
|  |  |  |     |  |  | global | Integration | ability |
|  |  |  |     |  |  | partne | (23.1-      | Skills  |
|  |  |  |     |  |  | rship  | 23.13)      | (Local/ |
|  |  |  |     |  |  | for    |             | Region  |
|  |  |  |     |  |  | sustai |             | al and  |
|  |  |  |     |  |  | nable  |             | Global) |
|  |  |  |     |  |  | devel  |             | Interns |
|  |  |  |     |  |  | opme   |             | hip     |
|  |  |  |     |  |  | nt     |             | Progra  |
|  |  |  |     |  |  | (SDG   |             | ms      |
|  |  |  |     |  |  | 17)    |             | Consult |
|  |  |  |     |  |  |        |             | ing     |
|  |  |  |     |  |  |        |             | Field   |
|  |  |  |     |  |  |        |             | Project |
|  |  |  |     |  |  |        |             | S       |
|  |  |  |     |  |  |        |             | Entrepr |
|  |  |  |     |  |  |        |             | eneursh |
|  |  |  |     |  |  |        |             | ip      |
|  |  |  |     |  |  |        |             | Progra  |
|  |  |  |     |  |  |        |             | m       |
|  |  |  |     |  |  |        |             | through |
|  |  |  |     |  |  |        |             | Innovat |
|  |  |  |     |  |  |        |             | ion     |

|  |  |  |  |  |  | System |
|--|--|--|--|--|--|--------|
|  |  |  |  |  |  |        |
|  |  |  |  |  |  |        |
|  |  |  |  |  |  |        |

# **Semester-III**

| BP 301T                      | Pharmaceutical Organic Chemistry –II (Theory)              | L           | T       | P | C |  |  |  |  |  |
|------------------------------|--|-------------|---------|---|---|--|--|--|--|--|
| Version 2.0                  |  | 3           | 1       | 0 | 4 |  |  |  |  |  |
| <b>Total Contact Hours</b>   | 45 Hours   |             |         |   |   |  |  |  |  |  |
| Pre-requisites/Exposure      |  |             |         |   |   |  |  |  |  |  |
| Co-requisites                |  | -           |         |   |   |  |  |  |  |  |
|                              | Course Objectives  |             |         |   |   |  |  |  |  |  |
| Upon completion of this o    | course the student should be able to:                      |             |         |   |   |  |  |  |  |  |
| 1. Write the structure,      | name and the type of isomerism of the organic compound     |             |         |   |   |  |  |  |  |  |
| 2. Write the reaction,       | name the reaction and orientation of reactions             |             |         |   |   |  |  |  |  |  |
| 3. Account for reactiv       | ity/stability of compounds,                                |             |         |   |   |  |  |  |  |  |
| 4. Prepare organic cor       | npounds  |             |         |   |   |  |  |  |  |  |
|                              | Course Outcomes (C   | <b>O</b> )  |         |   |   |  |  |  |  |  |
| On completion of this cou    | rrse, the student will be able to:                         |             |         |   |   |  |  |  |  |  |
| CO1. This subject deals wi   | th general methods of preparation and reactions of some or | rganic comp | oounds. |   |   |  |  |  |  |  |
| CO2. Reactivity and mechanic | anism deal with organic compounds are studied here.        |             |         |   |   |  |  |  |  |  |
| CO3. The syllabus emphas     | izes on orientation of reactions and application.          |             |         |   | - |  |  |  |  |  |

| CO4. | Chemis | stry of | fats and | l oils are | also de  | scribed l  | nere.     |            |          |          |         |         |           |       |
|------|--------|---------|----------|------------|----------|------------|-----------|------------|----------|----------|---------|---------|-----------|-------|
| CO5. | Applic | ation a | nd purit | y of fats  | and oils | s also dis | scussed i | in this su | ıbjects. |          |         |         |           |       |
|      |        |         |          |            |          |            |           |            |          |          |         |         |           |       |
|      |        |         |          |            |          |            |           | Progra     | mme an   | d Course | Mapping | g       |           |       |
| CO   | PO1    | PO2     | PO3      | PO4        | PO5      | PO6        | PO7       | PO8        | PO9      | PO 10    | PO11    | PO12    | PSO 1     | PSO 2 |
| CO1  | -      | 1       | 1        | -          | -        | -          | -         | -          | -        | -        | 1       | 1       | 1         | -     |
| CO2  | -      | 1       | 1        | -          | -        | -          | -         | -          | -        | -        | 1       | 1       | 1         | -     |
| CO3  | -      | 1       | 1        | -          | -        | -          | -         | -          | -        | -        | 1       | 1       | 1         | -     |
| CO4  | -      | 1       | 1        | -          | -        | -          | -         | -          | -        | -        | 1       | 1       | 1         | -     |
| CO5  | -      | 1       | 1        | -          | -        | -          | -         | -          | -        | -        | 1       | 1       | 1         | -     |
|      |        | 1       | I        |            | 1=lightl | y mappe    | d         | 2= m       | oderatel | y mapped | 1       | 3=stron | gly mappe | ed .  |

| Relevance to the local, national, regional and global developmental needs  Relevance To the Employability/ Entrepreneurshi p/ Skill Development | Relevance to the Professional Ethics, Gender, Human Values, Environment & Sustainability SDG | POE/4 <sup>th</sup> IR |
|---|--|------------------------|
|---|--|------------------------|

| BP3  |       |          |          |                              |               |                  |                   |                     |        |              | 8           |        |             |              |
|------|-------|----------|----------|------------------------------|---------------|------------------|-------------------|---------------------|--------|--------------|-------------|--------|-------------|--------------|
| 01T  |       |          |          |                              |               |                  |                   |                     |        |              | 7           |        |             |              |
|      | Local | Regional | National | Global                       | Employability | Entrepreneurship | Skill Development | Professional Ethics | Gender | Human Values | Environment |        |             |              |
| Unit |       |          |          | The knowledge of general     |               |                  | A                 | -                   | -      | -            | -           | Sustai | Quality     | Global       |
| I    |       |          |          | methods of preparation and   |               |                  | knowledge         |                     |        |              |             | nable  | Universitie | Educati      |
|      |       |          |          | reactions of Benzene and its |               |                  | able              |                     |        |              |             | Devel  | s and       | on           |
|      |       |          |          | derivatives has global       |               |                  | individual        |                     |        |              |             | opme   | Colleges: A | Knowle       |
|      |       |          |          | importance                   |               |                  | in organic        |                     |        |              |             | nt and | New and     | dge          |
|      |       |          |          |                              |               |                  | chemistry         |                     |        |              |             | Globa  | Forward-    | Practic      |
|      |       |          |          |                              |               |                  | aids in the       |                     |        |              |             | 1      | looking     | al           |
|      |       |          |          |                              |               |                  | synthesis         |                     |        |              |             | Citize | Vision for  | Course       |
|      |       |          |          |                              |               |                  | of drugs          |                     |        |              |             | nship  | India's     | s from       |
|      |       |          |          |                              |               |                  | and their         |                     |        |              |             | (SDG   | Higher      | Industr      |
|      |       |          |          |                              |               |                  | intermedia        |                     |        |              |             | 4.7)   | Education   | y/Alum       |
|      |       |          |          |                              |               |                  | tes.              |                     |        |              |             | Schol  | System      | ni<br>To a c |
|      |       |          |          |                              |               |                  |                   |                     |        |              |             | arship | (9.1- 9.3)  | Techni       |
|      |       |          |          |                              |               |                  |                   |                     |        |              |             | s for  | Professiona | cal          |
|      |       |          |          |                              |               |                  |                   |                     |        |              |             | Highe  | 1 Education | Skills       |
|      |       |          |          |                              |               |                  |                   |                     |        |              |             | r      | (17.1-17.5) | that         |
|      |       |          |          |                              |               |                  |                   |                     |        |              |             | Educa  | Promoting   | match        |
|      |       |          |          |                              |               |                  |                   |                     |        |              |             | tion   | Highj-      | Industr      |
|      |       |          |          |                              |               |                  |                   |                     |        |              |             | (SDG   | quality     | у            |
|      |       |          |          |                              |               |                  |                   |                     |        |              |             | 4.b)   | research    | Needs        |
|      |       |          |          |                              |               |                  |                   |                     |        |              |             | Revita | (18.1-18.9) | Focus        |

| the global Integration partne (23.1-rship for sustainable developme | & Employ ability Skills (Local/Region al and Global) Interns |
|---|--|
| partne rship for sustai nable devel                                 | Skills (Local/ Region al and Global)                         |
| rship for sustai nable devel  | (Local/<br>Region<br>al and<br>Global)                       |
| for sustai nable devel  | Region<br>al and<br>Global)                                  |
| sustai nable devel  | al and Global)   |
| nable devel   | Global)  |
| devel   | , , , , , , , , , , , , , , , , , , ,                        |
|   | Interns  |
| opme  |  |
|   | hip  |
|   | Progra   |
|   | ms   |
|   | Consult  |
|   | ing  |
|   | Field  |
|   | Project  |
|   | S  |
|   | Entrepr  |
|   | eneursh  |
|   | ip   |
|   | Progra   |
|   | m  |
|   | through  |
|   | Innovat  |
|   | ion  |
|   | System   |
| Unit   The exploration of qualitative   A Sustai Quality            | Global   |
| II analysis, general methods of knowledge nable University          | e Educati  |
|   | nd on  |
| phenols, acids and amines is an inorganic opme Colleges             | A Knowle   |

| essential part of the           | chemistry      | nt and | New and     | dge     |
|---------------------------------|----------------|--------|-------------|---------|
| pharmaceutical sciences and has | aids in the    | Globa  | Forward-    | Practic |
| global importance.              | synthesis      | 1      | looking     | al      |
| Broom importante.               | of drugs       | Citize | Vision for  | Course  |
|                                 | and their      | nship  | India's     | s from  |
|                                 | intermedia tes | (SDG   | Higher      | Industr |
|                                 | tes            | 4.7)   | Education   | y/Alum  |
|                                 |                | Schol  | System      | ni      |
|                                 |                | arship | (9.1- 9.3)  | Techni  |
|                                 |                | s for  | Professiona | cal     |
|                                 |                | Highe  | 1 Education | Skills  |
|                                 |                | r      | (17.1-17.5) | that    |
|                                 |                | Educa  | Promoting   | match   |
|                                 |                | tion   | Highj-      | Industr |
|                                 |                | (SDG   | quality     | у       |
|                                 |                | 4.b)   | research    | Needs   |
|                                 |                | Revita | (18.1-18.9) | Focus   |
|                                 |                | lize   | Technology  | on      |
|                                 |                | the    | Use &       | Employ  |
|                                 |                | global | Integration | ability |
|                                 |                | partne | (23.1-      | Skills  |
|                                 |                | rship  | 23.13)      | (Local/ |
|                                 |                | for    |             | Region  |
|                                 |                | sustai |             | al and  |
|                                 |                | nable  |             | Global) |
|                                 |                | devel  |             | Interns |
|                                 |                | opme   |             | hip     |
|                                 |                | nt     |             | Progra  |
|                                 |                | (SDG   |             | ms      |
|                                 |                | 17)    |             | Consult |

| Unit |  |  |  | The global importance of studying fats and oils lies in their role in human nutrition, food industry development, agriculture, industrial applications, and environmental sustainability. |  |  | A knowledge able individual in organic chemistry aids in the synthesis of drugs and their intermedia tes | - | - | - | - | Sustai<br>nable<br>Devel<br>opme<br>nt and<br>Globa<br>l<br>Citize<br>nship<br>(SDG<br>4.7)<br>Schol<br>arship<br>s for<br>Highe<br>r<br>Educa | Quality Universitie s and Colleges: A New and Forward- looking Vision for India's Higher Education System (9.1- 9.3) Professiona 1 Education (17.1-17.5) Promoting | ing Field Project s Entrepr eneursh ip Progra m through Innovat ion System Global Educati on Knowle dge Practic al Course s from Industr y/Alum ni Techni cal Skills that match |
|------|--|--|--|---|--|--|--|---|---|---|---|--|--|---|
|------|--|--|--|---|--|--|--|---|---|---|---|--|--|---|

|  |  |  |  |  |  | tion   | Highj-      | Industr |
|--|--|--|--|--|--|--------|-------------|---------|
|  |  |  |  |  |  | (SDG   | quality     | у       |
|  |  |  |  |  |  | 4.b)   | research    | Needs   |
|  |  |  |  |  |  | Revita | (18.1-18.9) | Focus   |
|  |  |  |  |  |  | lize   | Technology  | on      |
|  |  |  |  |  |  | the    | Use &       | Employ  |
|  |  |  |  |  |  | global | Integration | ability |
|  |  |  |  |  |  | partne | (23.1-      | Skills  |
|  |  |  |  |  |  | rship  | 23.13)      | (Local/ |
|  |  |  |  |  |  | for    |             | Region  |
|  |  |  |  |  |  | sustai |             | al and  |
|  |  |  |  |  |  | nable  |             | Global) |
|  |  |  |  |  |  | devel  |             | Interns |
|  |  |  |  |  |  | opme   |             | hip     |
|  |  |  |  |  |  | nt     |             | Progra  |
|  |  |  |  |  |  | (SDG   |             | ms      |
|  |  |  |  |  |  | 17)    |             | Consult |
|  |  |  |  |  |  |        |             | ing     |
|  |  |  |  |  |  |        |             | Field   |
|  |  |  |  |  |  |        |             | Project |
|  |  |  |  |  |  |        |             | Entrepr |
|  |  |  |  |  |  |        |             | eneursh |
|  |  |  |  |  |  |        |             | ip      |
|  |  |  |  |  |  |        |             | Progra  |
|  |  |  |  |  |  |        |             | m       |
|  |  |  |  |  |  |        |             | through |
|  |  |  |  |  |  |        |             | Innovat |
|  |  |  |  |  |  |        |             | ion     |
|  |  |  |  |  |  |        |             | System  |

| Unit | The knowledge of general   |  | A           | - | - | - | - | Sustai      | Quality     | Global  |
|------|----------------------------|--|-------------|---|---|---|---|-------------|-------------|---------|
| IV   | methods of preparation and |  | knowledge   |   |   |   |   | nable       | Universitie | Educati |
|      | reactions of Polynuclear   |  | able        |   |   |   |   | Devel       | s and       | on      |
|      | hydrocarbons has global    |  | individual  |   |   |   |   | opme        | Colleges: A | Knowle  |
|      |                            |  | in organic  |   |   |   |   | nt and      | New and     | dge     |
|      | importance.                |  | chemistry   |   |   |   |   | Globa       | Forward-    | Practic |
|      |                            |  | aids in the |   |   |   |   | 1           | looking     | al      |
|      |                            |  | synthesis   |   |   |   |   | Citize      | Vision for  | Course  |
|      |                            |  | of drugs    |   |   |   |   | nship       | India's     | s from  |
|      |                            |  | and their   |   |   |   |   | (SDG        | Higher      | Industr |
|      |                            |  | intermedia  |   |   |   |   | 4.7)        | Education   | y/Alum  |
|      |                            |  | tes         |   |   |   |   | Schol       | System      | ni      |
|      |                            |  |             |   |   |   |   | arship      | (9.1- 9.3)  | Techni  |
|      |                            |  |             |   |   |   |   | s for       | Professiona | cal     |
|      |                            |  |             |   |   |   |   | Highe       | 1 Education | Skills  |
|      |                            |  |             |   |   |   |   | r           | (17.1-17.5) | that    |
|      |                            |  |             |   |   |   |   | Educa       | Promoting   | match   |
|      |                            |  |             |   |   |   |   | tion        | Highj-      | Industr |
|      |                            |  |             |   |   |   |   | (SDG        | quality     | y       |
|      |                            |  |             |   |   |   |   | 4.b)        | research    | Needs   |
|      |                            |  |             |   |   |   |   | Revita      | (18.1-18.9) | Focus   |
|      |                            |  |             |   |   |   |   | lize        | Technology  | on      |
|      |                            |  |             |   |   |   |   | the         | Use &       | Employ  |
|      |                            |  |             |   |   |   |   | global      | Integration | ability |
|      |                            |  |             |   |   |   |   | partne      | (23.1-      | Skills  |
|      |                            |  |             |   |   |   |   | rship       | 23.13)      | (Local/ |
|      |                            |  |             |   |   |   |   | for         |             | Region  |
|      |                            |  |             |   |   |   |   | sustai      |             | al and  |
|      |                            |  |             |   |   |   |   | nable       |             | Global) |
|      |                            |  |             |   |   |   |   | devel       |             | Interns |
|      |                            |  |             |   |   |   |   | opme        |             | hip     |
|      |                            |  |             |   |   |   |   | nt          |             | Progra  |
|      |                            |  |             |   |   |   |   | (SDG        |             | ms      |
|      |                            |  |             |   |   |   |   | <u>1</u> 7) |             | Consult |
|      |                            |  |             |   |   |   |   | ,           |             | ing     |

|           |  |  |  |  |   |  |   |   | Field Project s Entrepr eneursh ip Progra m through Innovat ion System   |
|-----------|--|--|--|--|---|--|---|---|--|
| Unit<br>V |  | The knowledge of general chemistry, methods of preparation and reactions of Cyclo alkanes has global importance. |  | A knowledge able individual in organic chemistry aids in the synthesis of drugs and their intermedia tes | - |  | Sustai nable Devel opme nt and Globa l Citize nship (SDG 4.7) Schol arship s for Highe r Educa tion (SDG 4.b) Revita lize the | Quality Universitie s and Colleges: A New and Forward- looking Vision for India's Higher Education System (9.1- 9.3) Professiona 1 Education (17.1-17.5) Promoting Highj- quality research (18.1-18.9) Technology Use & | Global Educati on Knowle dge Practic al Course s from Industr y/Alum ni Techni cal Skills that match Industr y Needs Focus on Employ |

| <br>1 |  | 1 | , |  |        |             | ,            |
|-------|--|---|---|--|--------|-------------|--------------|
|       |  |   |   |  | global | Integration | ability      |
|       |  |   |   |  | partne | (23.1-      | Skills       |
|       |  |   |   |  | rship  | 23.13)      | (Local/      |
|       |  |   |   |  | for    |             | Region       |
|       |  |   |   |  | sustai |             | al and       |
|       |  |   |   |  | nable  |             | Global)      |
|       |  |   |   |  | devel  |             | Interns      |
|       |  |   |   |  | opme   |             | hip          |
|       |  |   |   |  | nt     |             | Progra       |
|       |  |   |   |  | (SDG   |             | ms           |
|       |  |   |   |  | 17)    |             | Consult      |
|       |  |   |   |  | 17)    |             | ing          |
|       |  |   |   |  |        |             | Field        |
|       |  |   |   |  |        |             | Project      |
|       |  |   |   |  |        |             | S            |
|       |  |   |   |  |        |             | Entrepr      |
|       |  |   |   |  |        |             | eneursh      |
|       |  |   |   |  |        |             |              |
|       |  |   |   |  |        |             | ip<br>Progra |
|       |  |   |   |  |        |             | Progra       |
|       |  |   |   |  |        |             | m<br>through |
|       |  |   |   |  |        |             | through      |
|       |  |   |   |  |        |             | Innovat      |
|       |  |   |   |  |        |             | ion          |
|       |  |   |   |  |        |             | System       |

| BP 302T                    | Physical Pharmaceutics-I (Theory) | L | Т | P | C |
|----------------------------|-----------------------------------|---|---|---|---|
| Version 2.0                |                                   | 3 | 1 | 0 | 4 |
| <b>Total Contact Hours</b> | 45 Hours                          |   |   |   |   |
| Pre-requisites/Exposure    |                                   |   |   |   |   |

| Co-rec       | quisites                 |           |           |           |                     |          |                   |           |          |           | -            |            |           |                                       |
|--------------|--------------------------|-----------|-----------|-----------|---------------------|----------|-------------------|-----------|----------|-----------|--------------|------------|-----------|---------------------------------------|
|              |                          |           |           |           |                     |          |                   | Cou       | ırse Ob  | jective   | s            |            |           |                                       |
| Upon         | comple                   | tion of   | this cou  | ırse the  | studer              | nt shoul | d be al           | ole to:   |          |           |              |            |           |                                       |
| 1.           | Unders                   | stand va  | rious pl  | hysicoc   | hemical             | proper   | ties of c         | drug mo   | lecules  | in the d  | lesigning    | the dosaş  | ge forms  |                                       |
| 2.           | Know                     | the prin  | ciples o  | of chem   | ical kin            | etics &  | to use t          | hem for   | stabilit | y testin  | g and det    | erminatio  | on of exp | iry date of formulations              |
| 3.           | Demoi                    | ıstrate u | ise of pl | hysicoc   | hemical             | proper   | ties in t         | he form   | ulation  | develop   | ment and     | d evaluati | ion of do | sage forms.                           |
|              |                          |           |           |           |                     |          |                   | Cours     | e Outc   | omes (C   | C <b>O</b> ) |            |           |                                       |
| On co        | mpletio                  | n of thi  | is cours  | se, the s | tudent              | will be  | able to           | :         |          |           |              |            |           |                                       |
| CO 1.        | The co                   | urse dea  | ls with   | the vari  | ous phy             | ysicoche | emical p          | properti  | es       |           |              |            |           |                                       |
| CO 3. develo | The the pment.  It helps | eory and  | l practic | cal com   | ponents<br>ous tecl | of the   | subject<br>and me | helps the | nvolved  | ent to ge | et a better  | _          |           | ous areas of formulation research and |
|              |                          |           |           |           |                     |          | P                 | rogram    | me and   | d Cours   | se Mappi     | ing        |           |                                       |
| СО           | PO1                      | PO2       | PO3       | PO4       | PO5                 | PO6      | PO7               | PO8       | PO9      | PO<br>10  | PO11         | PO12       | PSO<br>1  | PSO 2                                 |
| CO1          | 2                        | -         | 1         | -         | 2                   | 2        | -                 | -         | -        | -         | -            | 1          | 2         | 2                                     |
| CO2          | 2                        | -         | 1         | -         | 2                   | 2        | -                 | -         | -        | -         | -            | 1          | 2         | 2                                     |
| ~ ~ ~        |                          | _         | 1         | _         | 2                   | 2.       | _                 | _         | _        | _         | _            |            |           |                                       |

| CO  | PO1 | PO2 | PO3 | PO4  | PO5     | PO6   | PO7 | PO8   | PO9      | PO<br>10 | PO11 | PO12   | PSO<br>1 | PSO 2 |
|-----|-----|-----|-----|------|---------|-------|-----|-------|----------|----------|------|--------|----------|-------|
| CO1 | 2   | •   | 1   | -    | 2       | 2     | -   | •     | •        | -        | -    | 1      | 2        | 2     |
| CO2 | 2   | -   | 1   | -    | 2       | 2     | -   | -     | 1        | -        | -    | 1      | 2        | 2     |
| CO3 | 2   | -   | 1   | -    | 2       | 2     | -   | -     | -        | -        | -    | 1      | 2        | 2     |
| CO4 | 2   | -   | 1   | -    | 2       | 2     | -   | -     | -        | -        | -    | 1      | 2        | 2     |
| CO5 | 2   | -   | 1   | -    | 2       | 2     | -   | -     | -        | -        | -    | 1      | 2        | 2     |
|     |     |     |     | 1=li | ghtly m | apped |     | 2= mo | derately | mappe    | d    | 3=stro | ngly ma  | pped  |

| Unit | Relevance to the local, national, regional and global developmental | needs    |          |  | Relevance To the Employability/ | Entrepreneurship/<br>Skill Development |   | Relevance to the<br>Professional Ethics,<br>Gender, Human | Values,<br>Environment & | Sustainability |                              | SDG  | NEP                                     | POE/4 <sup>th</sup> IR                       |
|------|---|----------|----------|--|---------------------------------|--|---|---|--------------------------|----------------|------------------------------|--|---|--|
| Unit | Local   | Regional | National | Global Health care Needs. It will increas e the solubili ty of poorly soluble drugs. | Employability                   | Entrepreneurship                       | It will bring preformul ation knowhow in the students | Professional Ethics                                       | ' Gender                 | Human Values   | Environment & Sustainability | Ens<br>ure<br>heal<br>thy<br>live<br>s<br>and<br>pro<br>mot<br>e<br>well | Prof essi onal Edu cati on (17. 1-17.5) | Techni cal Skills that match Industr y Needs |

|      |  |   |  |  |  |   | bein g for all at all ages (SD G 3)  |                                    |  |
|------|--|---|--|--|--|---|--|------------------------------------|--|
| Unit |  | Global Health care Needs. It will detail physio chemic al needs in the new lyform ulated drug produc ts |  | It will create the analytical knowhow among the students |  | - | Ens ure heal thy live s and pro mot e well bein g for all at all ages (SD G 3) | Professional Education (17.1-17.5) | Techni cal Skills that match Industr y Needs |

| TT *: |   | 1 | C1 1 1  | T. '11       | I | ı |   | I | Б            | D C  | m 1 ·   |
|-------|---|---|---------|--------------|---|---|---|---|--------------|------|---------|
| Unit  | - | - | Global  | It will      | - | - | - | - | Ens          | Prof | Techni  |
| III   |   |   | Health  | improve      |   |   |   |   | ure          | essi | cal     |
|       |   |   | care    | the skill of |   |   |   |   | heal         | onal | Skills  |
|       |   |   | Needs.  | developin    |   |   |   |   | thy          | Edu  | that    |
|       |   |   | It will | g different  |   |   |   |   | live         | cati | match   |
|       |   |   | create  | biphasic     |   |   |   |   | S            | on   | Industr |
|       |   |   | the     | dosage       |   |   |   |   | and          | (17. | y       |
|       |   |   | dosage  | forms and    |   |   |   |   | pro          | 1-   | Needs   |
|       |   |   | form    | the          |   |   |   |   | mot          | 17.5 |         |
|       |   |   | develo  | remedies     |   |   |   |   | e            | )    |         |
|       |   |   | pment   | to           |   |   |   |   | well         |      |         |
|       |   |   | in      | overtake     |   |   |   |   | -            |      |         |
|       |   |   | differe | the          |   |   |   |   | bein         |      |         |
|       |   |   | d       | problems.    |   |   |   |   | g            |      |         |
|       |   |   | forms   |              |   |   |   |   | g<br>for     |      |         |
|       |   |   | with    |              |   |   |   |   | all          |      |         |
|       |   |   | differe |              |   |   |   |   | at           |      |         |
|       |   |   | d       |              |   |   |   |   | all          |      |         |
|       |   |   | release |              |   |   |   |   | ages         |      |         |
|       |   |   | propert |              |   |   |   |   | (SD          |      |         |
|       |   |   | ies.    |              |   |   |   |   | G 3)         |      |         |
|       |   |   | 105.    |              |   |   |   |   |              |      |         |
| Unit  | - | _ | Global  | It will      | _ | _ | _ | _ | Ens          | Prof | Techni  |
| IV    |   |   | Health  | generate     |   |   |   |   | ure          | essi | cal     |
| 1     |   |   | care    | the          |   |   |   |   | heal         | onal | Skills  |
|       |   |   | Needs.  | technical    |   |   |   |   | thy          | Edu  | that    |
|       |   |   | It will | knowhow      |   |   |   |   | live         | cati | match   |
|       |   |   | increas | among the    |   |   |   |   | S            | on   | Industr |
|       |   |   | e the   | students     |   |   |   |   | and          | (17. | y       |
|       |   |   | pharma  | towards      |   |   |   |   |              | 1-   | Needs   |
|       |   |   | cokinet | the animal   |   |   |   |   | pro<br>mot   | 17.5 | riccus  |
|       |   |   | ics     | and human    |   |   |   |   |              | 17.3 |         |
|       |   |   | basis   | studies.     |   |   |   |   | e<br>well    |      |         |
|       |   |   |         | studies.     |   |   |   |   | well         |      |         |
|       |   |   | among   |              |   |   |   |   | -<br>1 : - : |      |         |
|       |   |   | the     |              |   |   |   |   | bein         |      |         |

|      | clinical trials of differe d drugs among the dtudent s.   |   | g for all at all ages (SD G 3)  |
|------|---|---|---|
| Unit | Global Health care Needs. It will be highly helpful to student s to prepare the differe d medias and buffers used in the industr y. | It will bring the skill among the students to work in the research & developme nt labs. | Ens prof Techni ure essi cal heal onal Skills thy Edu that live cati match s on Industr and (17. y pro 1- Needs mot 17.5 e ) well bein g for all at all ages (SD G 3) |

| BP 303T | Pharmaceutical Microbiology (Theory) | L | T | P | C |
|---------|--------------------------------------|---|---|---|---|
|---------|--------------------------------------|---|---|---|---|

| Versio  | n 2.0     |           |           |           |           |          |           |            |           |           | 3          | 1         |           | 0         | 4                         |
|---|-----------|-----------|-----------|-----------|-----------|----------|-----------|------------|-----------|-----------|------------|-----------|-----------|-----------|---------------------------|
|   |           | t Hours   | <u> </u>  | 45 Ho     | urs       |          |           |            |           |           |            |           |           | , v       | •                         |
|   |           | s/Expos   |           | .6 110    |           |          |           |            |           |           |            |           |           |           |                           |
|   | quisites  |           |           |           |           |          |           |            |           |           | _          |           |           |           |                           |
|   | 102252005 |           |           |           |           |          |           | Con        | ırse Ob   | jectives  |            |           |           |           |                           |
| Upon  | comple    | tion of   | this cou  | ırse the  | studen    | t shoul  | d be ab   |            |           | <u> </u>  |            |           |           |           |                           |
|   |           |           |           |           |           |          |           |            | rvation   | of vario  | us micro   | organism  | S         |           |                           |
| 2.  | To unc    | lerstand  | the im    | portance  | and in    | plemen   | tation o  | of sterili | zation i  | n pharm   | aceutical  | processi  | ng and in | ndustry   |                           |
| 3.  | Learn     | sterility | testing   | of phar   | maceuti   | cal prod | lucts.    |            |           |           |            |           |           |           |                           |
| 4.  | Carrie    | d out mi  | crobiol   | ogical s  | tandard   | ization  | of Phari  | maceuti    | cals.     |           |            |           |           |           |                           |
| 5.  | Unders    | stand th  | e cell cı | ılture te | chnolog   | gy and i | ts applic | cations    | in pharr  | naceutic  | cal indust | ries.     |           |           |                           |
| Course Outcomes (CO)  |           |           |           |           |           |          |           |            |           |           |            |           |           |           |                           |
| On completion of this course, the student will be able to:  |           |           |           |           |           |          |           |            |           |           |            |           |           |           |                           |
| CO1. This subject is designed to study the morphology, classification of microorganisms like bacteria, fungi and virus. |           |           |           |           |           |          |           |            |           |           |            |           |           |           |                           |
| CO2.  |           |           |           | s the u   | ndersta   | nding o  | f bacter  | ia using   | g stainir | ng techn  | iques (si  | mple, Gr  | ram's &   | Acid-fast | staining) and biochemical |
| ~~^   | ,         | MViC)     |           |           | 2 .       |          |           |            |           |           |            |           |           |           |                           |
| CO3.  |           | -         |           |           |           |          |           |            |           | products  |            |           |           |           |                           |
| CO4.  |           |           |           |           |           |          |           |            |           |           |            |           |           | mins and  | amino acids.              |
| CO5.  | It also   | deals w   | 1th the 1 | microbia  | al spoila | ige, typ | es, sour  | ces and    | method    | is in pha | ırmaceuti  | cal indus | stry.     |           |                           |
|   |           |           |           |           |           |          |           |            |           |           | 3.6 .      |           |           |           |                           |
|   |           |           |           |           |           |          | Pi        | rogram     | me and    | PO        | e Mappii   | ng<br>    | PSO       |           |                           |
| CO  | PO1       | PO2       | PO3       | PO4       | PO5       | PO6      | PO7       | PO8        | PO9       | 10        | PO11       | PO12      | 1         |           | PSO 2                     |
| CO1   | -         | -         | -         | -         | -         | 1        | 1         | 1          | -         | -         | -          | 1         | 1         |           | -                         |
| CO2   | -         | -         | -         | -         | -         | 1        | 1         | 1          | -         | -         | -          | 1         | 1         |           | -                         |
| CO3   | -         | -         | -         | -         | -         | 1        | 1         | 1          | -         | -         | -          | 1         | 1         |           | -                         |

CO4

| CO5 | - | - | - | -     | -       | 1     | 1 | 1      | -        | -      | - | 1      | 1        |     | • |
|-----|---|---|---|-------|---------|-------|---|--------|----------|--------|---|--------|----------|-----|---|
|     |   |   |   | 1=lig | ghtly m | apped |   | 2= mod | derately | mapped | 1 | 3=stro | ngly map | ped |   |

| Unit | vance to the national, nal and global opmental    | 'ance To the<br>loyability/<br>epreneurship/<br>Development | elevance to the rofessional Ethics, ender, Human alues, nvironment & ustainability |     |     | 4 <sup>th</sup> IR |
|------|---|---|--|-----|-----|--------------------|
|      | Releva<br>local, n<br>regiona<br>develoj<br>needs | Releva<br>Employ<br>Entrep<br>Skill D                       | Releva<br>Profess<br>Gendei<br>Values<br>Enviro<br>Sustair                         | SDG | NEP | POE/4              |

| BP303T   |       |          |   |   |               | ď                | ent   | nics                |        |              | Environment & Sustainability |  |  |  |
|----------|-------|----------|---|---|---------------|------------------|---|---------------------|--------|--------------|------------------------------|--|--|--|
| <b>T</b> | Local | Regional | National  | Global  | Employability | Entrepreneurship |   | Professional Ethics | Gender | Human Values |                              | W2.6   | D  | CLL                                      |
| Unit I   | -     | -        | Its shown a remarkable opportunity to improve the standard of national pharmacy practice. | Antibiotic control programs growing globally, essential to effective and forward-looking for society. | -             |                  | Many tools to facilitate, microbiology learning objects or lab-related and data-driven exercises. | _                   |        | Z o          |                              | "Ma ke citie s and hum an settl eme nts incl usiv e, safe , resil ient and sust aina ble | Pro mot ing Hig hj-qual ity rese arch (18. 1-18.9) | Global<br>Educati<br>on<br>Knowle<br>dge |

|         |   | Г | T             |                    | 1 | 1 |                 |   |   |   | T |       | 1    |         |
|---------|---|---|---------------|--------------------|---|---|-----------------|---|---|---|---|-------|------|---------|
|         |   |   |               |                    |   |   |                 |   |   |   |   | (SD   |      |         |
|         |   |   |               |                    |   |   |                 |   |   |   |   | G     |      |         |
|         |   |   |               |                    |   |   |                 |   |   |   |   | 11)"  |      |         |
|         |   |   |               |                    |   |   |                 |   |   |   |   |       |      |         |
| T TT    |   |   | T .           | G 1.6              |   |   | A 1             |   |   |   |   |       | Ъ    | G1 1 1  |
| Unit II | - | - | Imparts       | Current and future | - | - | Apply to a wide | - | - | - | - |       | Pro  | Global  |
|         |   |   | knowledge in  |                    |   |   | variety of      |   |   |   |   | "Ma   | mot  | Educati |
|         |   |   | various       | globally requires  |   |   | problems        |   |   |   |   | ke    | ing  | on      |
|         |   |   | aspects of    | staining and       |   |   | affecting the   |   |   |   |   | citie | Hig  | Knowle  |
|         |   |   | marketing     | sterilization.     |   |   | overall human   |   |   |   |   | S     | hj-  | dge     |
|         |   |   | and its       |                    |   |   | condition.      |   |   |   |   | and   | qual | Ü       |
|         |   |   | applications. |                    |   |   |                 |   |   |   |   | hum   | ity  |         |
|         |   |   | uppiroutions. |                    |   |   |                 |   |   |   |   | an    | rese |         |
|         |   |   |               |                    |   |   |                 |   |   |   |   | settl | arch |         |
|         |   |   |               |                    |   |   |                 |   |   |   |   |       |      |         |
|         |   |   |               |                    |   |   |                 |   |   |   |   | eme   | (18. |         |
|         |   |   |               |                    |   |   |                 |   |   |   |   | nts   | 1-   |         |
|         |   |   |               |                    |   |   |                 |   |   |   |   | incl  | 18.9 |         |
|         |   |   |               |                    |   |   |                 |   |   |   |   | usiv  | )    |         |
|         |   |   |               |                    |   |   |                 |   |   |   |   | e,    |      |         |
|         |   |   |               |                    |   |   |                 |   |   |   |   | safe  |      |         |
|         |   |   |               |                    |   |   |                 |   |   |   |   |       |      |         |
|         |   |   |               |                    |   |   |                 |   |   |   |   | resil |      |         |
|         |   |   |               |                    |   |   |                 |   |   |   |   | ient  |      |         |
|         |   |   |               |                    |   |   |                 |   |   |   |   | and   |      |         |
|         |   |   |               |                    |   |   |                 |   |   |   |   |       |      |         |
|         |   |   |               |                    |   |   |                 |   |   |   |   | sust  |      |         |
|         |   |   |               |                    |   |   |                 |   |   |   |   | aina  |      |         |
|         |   |   |               |                    |   |   |                 |   |   |   |   | ble   |      |         |
|         |   |   |               |                    |   |   |                 |   |   |   |   | (SD   |      |         |
|         |   |   |               |                    |   |   |                 |   |   |   |   | G     |      |         |
|         |   |   |               |                    |   |   |                 |   |   |   |   | 11)"  |      |         |
|         |   |   |               |                    |   |   |                 |   |   |   |   |       |      |         |

| Unit III |                                   | Aids in unders tandin g the variety of microo rganis ms and fungus | Gives a fundamental understandin g of the variety of creatures and forms of algae. | Develop the concepts of origin, continuity, complexity of molecular life activities, and cytological aspects of growth and development. |   |   | Recognise the significance of micro methods in plant anatomy.              |   | _ |   |   | "Ma ke citie s and hum an settl eme nts incl usiv e, safe , resil ient and sust aina ble (SD G 11)" | Pro mot ing Hig hj-qual ity rese arch (18. 1-18.9) | Global<br>Educati<br>on<br>Knowle<br>dge |
|----------|-----------------------------------|--|--|---|---|---|--|---|---|---|---|---|--|--|
| Unit IV  | s in<br>lear<br>ning<br>abo<br>ut | Encou<br>rages<br>physic<br>al and<br>cogniti<br>ve<br>health      | Offers<br>national<br>protection<br>from food<br>poisoning.                        | Provides protection against food poisoning globally.  | - | - | Apply to a wide variety of problems affecting the overall human condition. | - | - | - | - | "Ma<br>ke<br>citie<br>s<br>and<br>hum<br>an<br>settl<br>eme   | Pro mot ing Hig hj-qual ity rese arch              | Global<br>Educati<br>on<br>Knowle<br>dge |

|        | al, mec hani cal, and phy sical proc esse s that mai ntai n hum an heal th and well bein g. |   |  |   |   |   |                               |   |   |   |   | nts incl usiv e, safe , resil ient and sust aina ble (SD G 11)"                          | (18.<br>1-<br>18.9<br>)                           |  |
|--------|---|---|--|---|---|---|-------------------------------|---|---|---|---|--|---|--|
| Unit v |   | - | Improves<br>Human<br>Health and<br>wellbeing . | Environmental concerns, ecological preservation, sustainable living, and the defence of human rights. | - | _ | Develops<br>research aptitude | - | - | - | - | "Ma<br>ke<br>citie<br>s<br>and<br>hum<br>an<br>settl<br>eme<br>nts<br>incl<br>usiv<br>e, | Pro mot ing Hig h-qual ity rese arch (18. 1-18.9) | Global<br>Educati<br>on<br>Knowle<br>dge |

|  |  |  |  |  | safe  |  |
|--|--|--|--|--|-------|--|
|  |  |  |  |  | ,     |  |
|  |  |  |  |  | resil |  |
|  |  |  |  |  | ient  |  |
|  |  |  |  |  | and   |  |
|  |  |  |  |  | sust  |  |
|  |  |  |  |  | aina  |  |
|  |  |  |  |  | ble   |  |
|  |  |  |  |  | (SD   |  |
|  |  |  |  |  | G     |  |
|  |  |  |  |  | 11)"  |  |
|  |  |  |  |  |       |  |

| BP 304T                         | Pharmaceutical Engineering (Theory)                           | L         | T   | P | С |  |  |  |  |  |  |  |  |
|---------------------------------|---|-----------|-----|---|---|--|--|--|--|--|--|--|--|
| Version 2.0                     |   | 3         | 1   | 0 | 4 |  |  |  |  |  |  |  |  |
| <b>Total Contact Hours</b>      | 45 Hours  |           |     |   |   |  |  |  |  |  |  |  |  |
| Pre-requisites/Exposure         |   |           |     |   |   |  |  |  |  |  |  |  |  |
| Co-requisites -                 |   |           |     |   |   |  |  |  |  |  |  |  |  |
| Course Objectives               |   |           |     |   |   |  |  |  |  |  |  |  |  |
| Upon completion of this cou     | Upon completion of this course the student should be able to: |           |     |   |   |  |  |  |  |  |  |  |  |
| 1. To know various unit opera   | tions used in pharmaceutical industries.                      |           |     |   |   |  |  |  |  |  |  |  |  |
| 2. To understand the material   | handling techniques.  |           |     |   |   |  |  |  |  |  |  |  |  |
| 3. To perform various process   | es involved in pharmaceutical manufacturing process.          |           |     |   |   |  |  |  |  |  |  |  |  |
| 4. To carry out various test to | prevent environmental pollution.                              |           |     |   |   |  |  |  |  |  |  |  |  |
| 5. To appreciate and comprehe   | end significance of plant lay out design for optimum use      | of resour | ces |   |   |  |  |  |  |  |  |  |  |

6. To appreciate the various preventive methods used for corrosion control in pharmaceutical industries.

# **Course Outcomes (CO)**

# On completion of this course, the student will be able to:

CO 1. This course is designed to impart a fundamental knowledge on the art and science of various unit operations used in pharmaceutical industry.

CO 2. This subject also deals with the various manufacturing process and material handling techniques.

**CO 3.** It helps in understanding significance of plant layout design for optimum use of resources.

CO 4. It also dealt with various preventive methods for corrosion control in pharmaceutical industries.

CO 5. It also helps in understanding the different measures to prevent environmental pollution.

|     |     |     |     |       |         |      | Pro | gramm  | e and C  | Course M | apping |          |        |       |
|-----|-----|-----|-----|-------|---------|------|-----|--------|----------|----------|--------|----------|--------|-------|
| CO  | PO1 | PO2 | PO3 | PO4   | PO5     | PO6  | PO7 | PO8    | PO9      | PO 10    | PO11   | PO12     | PSO 1  | PSO 2 |
| CO1 | 3   | -   | 2   | -     | 3       | 3    | •   | 2      | •        | -        | 3      | 2        | 3      | 2     |
| CO2 | 3   | -   | 2   | -     | 3       | 3    | -   | 2      | -        | -        | 3      | 2        | 3      | 2     |
| CO3 | 3   | -   | 2   | -     | 3       | 3    | -   | 2      | -        | -        | 3      | 2        | 3      | 2     |
| CO4 | 3   | -   | 2   | -     | 3       | 3    | -   | 2      | -        | -        | 3      | 2        | 3      | 2     |
| CO5 | 3   | -   | 2   | -     | 3       | 3    | -   | 2      | -        | -        | 3      | 2        | 3      | 2     |
|     |     |     |     | 1=lig | htly ma | pped | 2   | = mode | rately m | apped    | 3=     | strongly | mapped |       |

| Unit       | Relevance to the | local, national,<br>regional and global | developmental<br>needs |  | Relevance To the<br>Employability/<br>Entrepreneurship/<br>Skill Development   |                  | ı                 | Relevance to the    | Froiessional<br>Ethics, Gender, | Human Values, | Sustainability               | SDG | NEP | POE/4 <sup>th</sup> IR   |
|------------|------------------|---|------------------------|--|--|------------------|-------------------|---------------------|---------------------------------|---------------|------------------------------|-----|-----|--|
| Unit       | Local            | Regional                                | National               | It enables optimization of processes, quality control, and efficient utilization of resources, leading to improved product performance and operational efficiency. | Making individuals well-suited for roles in industries where fluid handling, particle analysis, and process optimization are critical. | Entrepreneurship | Skill Development | Professional Ethics | Gender                          | Human Values  | Environment & Sustainability |     |     | Focus<br>on<br>Employ<br>ability<br>Skills<br>(Local/<br>Region<br>al and<br>Global) |
| Unit<br>II |                  |   |                        | This knowledge is valuable for designing efficient systems, optimizing processes, ensuring product quality, and improving energy efficiency.                       | It enhances employability in industries such as chemical engineering, process engineering, energy management, and manufacturing.       |                  |                   |                     |                                 |               |                              |     |     | Focus on Employ ability Skills (Local/ Region  |

|             |      |  |  |      |      |      |      | al and<br>Global)  |
|-------------|------|--|--|------|------|------|------|--|
| Unit<br>III | <br> | <br>Helps working in industries where drying and mixing play a critical role in product development, quality control, and manufacturing efficiency.  | Enhance employability in process engineering, product development, quality assurance, manufacturing, research and development, technical sales, and consulting roles across various industries.                                  | <br> | <br> | <br> | <br> | Focus on Employ ability Skills (Local/ Region al and Global) |
| Unit<br>IV  | <br> | <br>Provides essential knowledge and skills applicable to industries involving separation processes, purification, particle removal, and fluid clarification   | Valuable in sectors such as pharmaceuticals, biotechnology, chemical engineering, water treatment, and food processing, where efficient separation techniques are critical for product quality, safety, and process optimization | <br> | <br> | <br> | <br> | Focus on Employ ability Skills (Local/ Region al and Global) |
| Unit<br>v   | <br> | <br>Crucial for ensuring the selection of appropriate materials, preventing material degradation and failure, and optimizing material flow and handling processes in pharmaceutical plant operations. This knowledge contributes to the safe, efficient, and compliant functioning of pharmaceutical manufacturing facilities. | Provides diverse range of employment opportunities in the pharmaceutical industry, including roles in engineering, operations, quality assurance, research and development, and environmental health and safety.                 | <br> | <br> | <br> | <br> | Focus on Employ ability Skills (Local/ Region al and Global) |

| BP 305P                    | Pharmaceutical Organic Chemistry II – Practical | L | T | P | C |
|----------------------------|---|---|---|---|---|
| Version 2.0                |   | 0 | 0 | 4 | 2 |
| <b>Total Contact Hours</b> | 60 Hours  |   |   |   |   |
| Pre-requisites/Exposure    |   |   |   |   |   |
| Co-requisites              |   |   |   |   |   |

### **Course Objectives**

### Upon completion of this course the student should be able to:

- 1. Write the structure, name and the type of isomerism of the organic compound
- 2. Write the reaction, name the reaction and orientation of reactions
- 3. Account for reactivity/stability of compounds, 4. prepare organic compounds
- 4. Prepare organic compounds

#### **Course Outcomes (CO)**

#### On completion of this course, the student will be able to:

CO1 Recall the basic knowledge of method of preparation, reactions and properties of Benzene and its derivatives

CO2 Demonstrate a high-level understanding of method of preparation, reactions and properties of phenols, aromatic amines and aromatic acids

CO3 Develop basic knowledge of fats and oils and their analytical constants

CO4 Analyse the synthesis, different reactions, properties, structure and medicinal uses of polynuclear hydrocarbons and substituted alkanes

CO5 Assess the stabilities, theory of strain less rings and reactions of cyclo alkanes

# **Programme and Course Mapping**

| CO  | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO 10 | PO11 | PO12 | PSO 1 | PSO 2 |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-------|------|------|-------|-------|
| CO1 | -   | 1   | 1   | -   | -   | -   | -   | -   | -   | -     | 1    | 1    | 1     | -     |
| CO2 | •   | 1   | 1   | -   | -   | -   | •   | -   | -   | -     | 1    | 1    | 1     | -     |
| CO3 | -   | 1   | 1   | -   | -   | -   | -   | -   | -   | -     | 1    | 1    | 1     | -     |

| CO4 | -                             | 1 | 1 | - | - | - | -  | -        | -        | -    | 1    | 1         | 1      | - |
|-----|-------------------------------|---|---|---|---|---|----|----------|----------|------|------|-----------|--------|---|
| CO5 | -                             | 1 | 1 | - | - | - | -  | -        | -        |      | 1    | 1         | 1      | - |
|     | 3   -   -   -   1=lightly map |   |   |   |   |   | 2= | = modera | ately ma | pped | 3=st | trongly n | napped |   |

| Unit | Relevance to the | regional and global | needs    |   | Relevance To the<br>Employability/<br>Entrepreneurship/<br>Skill Development | T                | T   | Relevance to the<br>Professional Ethics, | Gender, Human<br>Values, | Environment & Sustainability |               | SDG   | NEP  | POE/4 <sup>th</sup> IR   |
|------|------------------|---------------------|----------|---|--|------------------|---|--|--------------------------|------------------------------|---------------|---|--|--|
| Unit | Local            | Regional            | National | Experiments involving laboratory techniques like recrystallization, steam distillation is important part of pharmaceutical sciences experiment. These experiments are usually conducted all over the world. | Employability  | Entrepreneurship | A knowledge able individual in organic chemistry aids in the synthesis of drugs and their | Professional Ethics                      | Gender                   | Human Values                 | Environment & | Sustai<br>nable<br>Devel<br>opme<br>nt and<br>Globa<br>l<br>Citize<br>nship<br>(SDG | Quality Universitie s and Colleges: A New and Forward- looking Vision for India's Higher | Global<br>Educati<br>on<br>Knowle<br>dge<br>Practic<br>al<br>Course<br>s from<br>Industr |

|  |  |  | intermedia |  |  | 4.7)   | Education   | y/Alum  |
|--|--|--|------------|--|--|--------|-------------|---------|
|  |  |  | tes.       |  |  | ŕ      | System      | ni      |
|  |  |  |            |  |  | Schol  | (9.1- 9.3)  | Techni  |
|  |  |  |            |  |  | arship | Professiona | cal     |
|  |  |  |            |  |  | s for  | 1 Education | Skills  |
|  |  |  |            |  |  | Highe  | (17.1-17.5) | that    |
|  |  |  |            |  |  | r      | Promoting   | match   |
|  |  |  |            |  |  | Educa  | Highj-      | Industr |
|  |  |  |            |  |  | tion   | quality     | y       |
|  |  |  |            |  |  | (SDG   | research    | Needs   |
|  |  |  |            |  |  | 4.b)   | (18.1-18.9) | Focus   |
|  |  |  |            |  |  | Revita | Technology  | on      |
|  |  |  |            |  |  | lize   | Use &       | Employ  |
|  |  |  |            |  |  | the    | Integration | ability |
|  |  |  |            |  |  | global | (23.1-      | Skills  |
|  |  |  |            |  |  | partne | 23.13)      | (Local/ |
|  |  |  |            |  |  | rship  |             | Region  |
|  |  |  |            |  |  | for    |             | al and  |
|  |  |  |            |  |  | sustai |             | Global) |
|  |  |  |            |  |  | nable  |             | Interns |
|  |  |  |            |  |  | devel  |             | hip     |
|  |  |  |            |  |  | opme   |             | Progra  |
|  |  |  |            |  |  | nt     |             | ms      |
|  |  |  |            |  |  | (SDG   |             | Consult |
|  |  |  |            |  |  | 17)    |             | ing     |
|  |  |  |            |  |  |        |             | Field   |
|  |  |  |            |  |  |        |             | Project |
|  |  |  |            |  |  |        |             | s       |
|  |  |  |            |  |  |        |             | Entrepr |
|  |  |  |            |  |  |        |             | eneursh |
|  |  |  |            |  |  |        |             | ip      |
|  |  |  |            |  |  |        |             | Progra  |
|  |  |  |            |  |  |        |             | m       |
|  |  |  |            |  |  |        |             | through |
|  |  |  |            |  |  |        |             | Innovat |

|      |   |  |  |  |   |   | ion<br>System   |
|------|---|--|--|--|---|---|---|
| Unit | The determination of acid/ saponification/ iodine value of fats and oils has a significant global impact by ensuring quality, stability, and functionality in various industries, promoting sustainability, and facilitating international trade. | A knowledge able individual in organic chemistry aids in the synthesis of drugs and their intermedia tes |  |  | Sustai nable Devel opme nt and Globa l Citize nship (SDG 4.7) Schol arship s for Highe r Educa tion (SDG 4.b) Revita lize the global partne rship for sustai nable devel opme | Quality Universitie s and Colleges: A New and Forward- looking Vision for India's Higher Education System (9.1- 9.3) Professiona 1 Education (17.1-17.5) Promoting Highj- quality research (18.1-18.9) Technology Use & Integration (23.1- 23.13) | Global Educati on Knowle dge Practic al Course s from Industr y/Alum ni Techni cal Skills that match Industr y Needs Focus on Employ ability Skills (Local/ Region al and Global) Interns hip |

|      |  |                                   |   |             |   |   |   |   | nt     |             | Drogro  |
|------|--|-----------------------------------|---|-------------|---|---|---|---|--------|-------------|---------|
|      |  |                                   |   |             |   |   |   |   | nt     |             | Progra  |
|      |  |                                   |   |             |   |   |   |   | (SDG   |             | ms      |
|      |  |                                   |   |             |   |   |   |   | 17)    |             | Consult |
|      |  |                                   |   |             |   |   |   |   |        |             | ing     |
|      |  |                                   |   |             |   |   |   |   |        |             | Field   |
|      |  |                                   |   |             |   |   |   |   |        |             | Project |
|      |  |                                   |   |             |   |   |   |   |        |             | S       |
|      |  |                                   |   |             |   |   |   |   |        |             | Entrepr |
|      |  |                                   |   |             |   |   |   |   |        |             | eneursh |
|      |  |                                   |   |             |   |   |   |   |        |             | ip      |
|      |  |                                   |   |             |   |   |   |   |        |             | Progra  |
|      |  |                                   |   |             |   |   |   |   |        |             | m       |
|      |  |                                   |   |             |   |   |   |   |        |             | through |
|      |  |                                   |   |             |   |   |   |   |        |             | Innovat |
|      |  |                                   |   |             |   |   |   |   |        |             | ion     |
|      |  |                                   |   |             |   |   |   |   |        |             | System  |
| Unit |  | Chemical, drug, and               |   | A           | - | - | - | - | Sustai | Quality     | Global  |
| III  |  | intermediate preparation is a key |   | knowledge   |   |   |   |   | nable  | Universitie | Educati |
|      |  | part of the pharmaceutical sector |   | able        |   |   |   |   | Devel  | s and       | on      |
|      |  | globally.                         |   | individual  |   |   |   |   | opme   | Colleges: A | Knowle  |
|      |  | <i>,</i>                          |   | in organic  |   |   |   |   | nt and | New and     | dge     |
|      |  |                                   |   | chemistry   |   |   |   |   | Globa  | Forward-    | Practic |
|      |  |                                   |   | aids in the |   |   |   |   | 1      | looking     | al      |
|      |  |                                   |   | synthesis   |   |   |   |   | Citize | Vision for  | Course  |
|      |  |                                   |   | of drugs    |   |   |   |   | nship  | India's     | s from  |
|      |  |                                   |   | and their   |   |   |   |   | (SDG   | Higher      | Industr |
|      |  |                                   |   | intermedia  |   |   |   |   | 4.7)   | Education   | y/Alum  |
|      |  |                                   |   | tes         |   |   |   |   | Schol  | System      | ni      |
|      |  |                                   |   |             |   |   |   |   | arship | (9.1- 9.3)  | Techni  |
|      |  |                                   |   |             |   |   |   |   | s for  | Professiona | cal     |
|      |  |                                   |   |             |   |   |   |   | Highe  | l Education | Skills  |
|      |  |                                   |   |             |   |   |   |   | r      | (17.1-17.5) | that    |
|      |  |                                   |   |             |   |   |   |   | Educa  | Promoting   | match   |
|      |  |                                   |   |             |   |   |   |   | tion   | Highj-      | Industr |
|      |  |                                   |   |             |   |   |   |   | (SDG   | quality     |         |
|      |  |                                   | 1 |             | Ì |   |   | 1 | (SDG   | quanty      | y       |

|  |  |  |  |  |  | 1 b)   | rasaarah    | Needs        |
|--|--|--|--|--|--|--------|-------------|--------------|
|  |  |  |  |  |  | 4.b)   | research    |              |
|  |  |  |  |  |  |        | (18.1-18.9) | Focus        |
|  |  |  |  |  |  | lize   | Technology  | on           |
|  |  |  |  |  |  | the    | Use &       | Employ       |
|  |  |  |  |  |  |        | Integration | ability      |
|  |  |  |  |  |  |        | (23.1-      | Skills       |
|  |  |  |  |  |  | rship  | 23.13)      | (Local/      |
|  |  |  |  |  |  | for    |             | Region       |
|  |  |  |  |  |  | sustai |             | al and       |
|  |  |  |  |  |  | nable  |             | Global)      |
|  |  |  |  |  |  | devel  |             | Interns      |
|  |  |  |  |  |  | opme   |             | hip          |
|  |  |  |  |  |  | nt     |             | Progra       |
|  |  |  |  |  |  | (SDG   |             | ms           |
|  |  |  |  |  |  | 17)    |             | Consult      |
|  |  |  |  |  |  |        |             | ing<br>Field |
|  |  |  |  |  |  |        |             | Field        |
|  |  |  |  |  |  |        |             | Project      |
|  |  |  |  |  |  |        |             | S            |
|  |  |  |  |  |  |        |             | Entrepr      |
|  |  |  |  |  |  |        |             | eneursh      |
|  |  |  |  |  |  |        |             | ip           |
|  |  |  |  |  |  |        |             | Progra       |
|  |  |  |  |  |  |        |             | m            |
|  |  |  |  |  |  |        |             | through      |
|  |  |  |  |  |  |        |             | Innovat      |
|  |  |  |  |  |  |        |             | ion          |
|  |  |  |  |  |  |        |             | System       |

| BP 306P                    | Physical Pharmaceutics-I (Practical) | L | T | P | C |
|----------------------------|--------------------------------------|---|---|---|---|
| Version 2.0                |                                      | 0 | 0 | 4 | 2 |
| <b>Total Contact Hours</b> | 60 Hours                             |   |   |   |   |
| Pre-requisites/Exposure    |                                      |   |   |   |   |

| Co-re  | quisite   | ·S      |          |           |          |          |          |          |           |             |            | -              |             |                                    |
|--|---|---------|----------|-----------|----------|----------|----------|----------|-----------|-------------|------------|----------------|-------------|------------------------------------|
|  | _   |         |          |           |          |          |          |          | Cou       | rse Obje    | ctives     |                |             |                                    |
| Upon   | compl   | etion o | f this c | course t  | he stu   | lent sh  | ould be  | able to  | 0:        |             |            |                |             |                                    |
| 1. Uno   | derstan   | d vario | us phys  | sicoche   | mical p  | ropertie | s of dr  | ug mole  | ecules i  | nvolved i   | n the des  | signing o      | f dosage    | forms                              |
| 2. Kno   | 2. Know the principles of chemical kinetics and to use them for stability testing and determination of expiry date of formulations. |         |          |           |          |          |          |          |           |             |            |                |             |                                    |
| 3. Demonstrate use of physicochemical properties in the formulation development and evaluation of dosage forms                                   |   |         |          |           |          |          |          |          |           |             |            |                |             |                                    |
| Course Outcomes (CO)   |   |         |          |           |          |          |          |          |           |             |            |                |             |                                    |
| On co  | On completion of this course, the student will be able to:  |         |          |           |          |          |          |          |           |             |            |                |             |                                    |
| CO 1. The course deals with the study of various physicochemical properties, and principles involved in manufacturing dosage forms/formulations. |   |         |          |           |          |          |          |          |           |             |            |                |             |                                    |
| CO 2.  | Practi  | cal con | ponent   | ts of the | subjec   | t help t | he stud  | ent to g | et a bet  | tter insigh | nt into va | rious are      | eas of forr | nulation research and development, |
| CO 3.  | It also   | helps   | n unde   | rstandir  | ng prind | ciples o | f chemi  | ical kin | etics an  | nd to use   | them in o  | letermini      | ing stabili | ty of pharmaceutical dosage forms. |
| CO 4.  | Demo  | nstrate | use of   | physico   | chemic   | al prop  | erties i | n the fo | rmulati   | ion devel   | opment a   | and evalu      | ation of c  | losage forms.                      |
| CO 5.  | This s  | ubject  | also hel | lps in le | arning   | physio   | chemica  | al prope | erties of | f individu  | al dosag   | e forms.       |             |                                    |
|  |   |         |          |           |          |          |          | Pr       | ogram     | me and (    | Course N   | <b>Mapping</b> | <u> </u>    |                                    |
| СО   | PO1   | PO2     | PO3      | PO4       | PO5      | PO6      | PO7      | PO8      | PO9       | PO 10       | PO11       | PO12           | PSO 1       | PSO 2                              |
| CO1  | 2   | -       | 1        | -         | 2        | 2        | -        | -        | -         | -           | -          | 1              | 2           | 2                                  |
| CO2  | 2   | -       | 1        | -         | 2        | 2        | -        | -        | -         | -           | -          | 1              | 2           | 2                                  |
| CO3  | 2   | -       | 1        | -         | 2        | 2        | -        | -        | -         | -           | -          | 1              | 2           | 2                                  |

|     |     |     |     |     |     |            |            | FI  | ogram | me anu v | Jourse I | Mapping | ,     |       |
|-----|-----|-----|-----|-----|-----|------------|------------|-----|-------|----------|----------|---------|-------|-------|
| CO  | PO1 | PO2 | PO3 | PO4 | PO5 | <b>PO6</b> | <b>PO7</b> | PO8 | PO9   | PO 10    | PO11     | PO12    | PSO 1 | PSO 2 |
| CO1 | 2   | ı   | 1   | •   | 2   | 2          | -          | -   | •     | •        | -        | 1       | 2     | 2     |
| CO2 | 2   | -   | 1   | -   | 2   | 2          | -          | -   | -     | -        | -        | 1       | 2     | 2     |
| CO3 | 2   | -   | 1   | -   | 2   | 2          | -          | -   | -     | -        | -        | 1       | 2     | 2     |
| CO4 | 2   | -   | 1   | -   | 2   | 2          | -          | -   | -     | -        | -        | 1       | 2     | 2     |
| CO5 | 2   | -   | 1   | -   | 2   | 2          | -          | -   | -     | -        | -        | 1       | 2     | 2     |

| 1=lightly mapped 2= moderately mapped 3=strongly mapped |  |
|---|--|
|---|--|

| Unit | Relevance to the | local, national,<br>regional and global | developmental<br>needs |  | Relevance To the | Entrepreneurship/ | - Skiii Developineiii  | Relevance to the    | -Frofessional<br>Ethics, Gender, | Human Values, | Sustainability               | SDG        | NEP                     | POE/4 <sup>th</sup> IR   |
|------|------------------|---|------------------------|--|------------------|-------------------|--|---------------------|----------------------------------|---------------|------------------------------|------------|-------------------------|--|
| Unit | l Local          | Regional                                | National               | Contribute globally in the field of solubility and pKa determination by conducting research, sharing knowledge, and collaborating with scientists worldwide to advance understanding and develop innovative methodologies. | Employability    | Entrepreneurship  | Contribute to skill development in solubility and pKa determination using Half Neutralization/Henderson-Hasselbalch by conducting workshops and training programs to educate researchers and scientists on the principles, techniques, and applications of these methods, fostering their expertise and advancement in the field. Additionally, develop online resources and interactive | Professional Ethics | o Z Gender                       | Human Values  | Environment & Sustainability | (SD G4. 1) | (18.<br>1-<br>18.9<br>) | Focus<br>on<br>Employ<br>ability<br>Skills<br>(Local/<br>Region<br>al and<br>Global) |

|             |      |  |   | platforms to facilitate self-<br>learning and knowledge sharing,<br>promoting skill development<br>globally.   |            |      |                  |                         |  |
|-------------|------|--|---|--|------------|------|------------------|-------------------------|--|
| Unit        |      | <br>Contribute globally in the field of partition coefficient and % composition determination of NaCl in a phenol-water solution by conducting research, developing accurate CST methods, and sharing findings to enhance scientific understanding and promote global collaboration in this area.  | - | <br>Contribute to skill development in the field of partition coefficient and % composition determination of NaCl in a phenol-water system by offering training programs, workshops, and hands-on practical sessions to empower researchers and scientists with the necessary techniques and expertise. Additionally, develop educational resources and online platforms for knowledge sharing to reach a wider audience and promote skill development in this area. | <br>N<br>o | <br> | (SD<br>G4.<br>1) | (18.<br>1-<br>18.9<br>) | Focus<br>on<br>Employ<br>ability<br>Skills<br>(Local/<br>Region<br>al and<br>Global) |
| Unit<br>III | <br> | <br>By conducting research, creating standardised protocols, and working with scientists around the world, you can make a significant global contribution to the field of surface tension and the calculation of Hydrophilic-Lipophilic Balance (HLB), helping to advance knowledge, enhance measurement methods, and foster international harmony in surface tension and HLB determination. | - | <br>Contribute to skill development in the field of surface tension and determination of Hydrophilic-Lipophilic Balance (HLB) by providing training programs, hands-on workshops, and educational resources that empower researchers and scientists with the necessary knowledge and techniques for accurate measurement and interpretation of surface tension and HLB values. Additionally, foster collaboration and  | <br>N<br>o | <br> | (SD G4. 1)       | (18.<br>1-<br>18.9<br>) | Focus<br>on<br>Employ<br>ability<br>Skills<br>(Local/<br>Region<br>al and<br>Global) |

|            |      |   |   | knowledge-sharing platforms to<br>enhance skill development and<br>exchange of expertise in these<br>areas.   |            |      |                  |                         |  |
|------------|------|---|---|---|------------|------|------------------|-------------------------|--|
| Unit<br>IV | <br> | <br>Contribute globally to the field of stability constant determination and donor-acceptor ratio calculation of PABA-Caffeine and Cupric-Glycine complexes by conducting research, developing standardized solubility and pH titration methods, and sharing findings to enhance global understanding, promote accurate characterization of complex formation, and facilitate collaboration among scientists worldwide. | - | <br>By providing training programmes, workshops, and hands-on sessions that concentrate on the solubility method and pH titration method, you can help researchers and scientists develop their skills and advance in their field while also making a contribution to the field of stability constant determination and donor-acceptor ratio calculation of PABA-Caffeine and Cupric-Glycine complexes. | <br>N<br>o | <br> | (SD G4. 1)       | (18.<br>1-<br>18.9<br>) | Focus<br>on<br>Employ<br>ability<br>Skills<br>(Local/<br>Region<br>al and<br>Global) |
| Unit<br>v  | <br> | <br>Important for guaranteeing the choice of suitable materials, avoiding material degradation and failure, and improving material flow and handling procedures in pharmaceutical plant operations. The safe, effective, and legal operation of pharmaceutical production facilities is facilitated by this information.  | - | <br>  | <br>N<br>o | <br> | (SD<br>G4.<br>1) | (18.<br>1-<br>18.9<br>) | Focus on Employ ability Skills (Local/ Region al and Global)                         |

| BP 307P                    | Pharmaceutical Microbiology (Practical) | L | T | P | C |
|----------------------------|---|---|---|---|---|
| Version 2.0                |   | 0 | 0 | 4 | 2 |
| <b>Total Contact Hours</b> | 60 Hours                                |   |   |   |   |

| Pre-re | equisit  | es/Exn   | osure    |           |         |          |         |           |           |             |            |          |          |       |
|--------|--|----------|----------|-----------|---------|----------|---------|-----------|-----------|-------------|------------|----------|----------|-------|
|        | quisite  |          | osure    |           |         |          |         |           |           |             | -          |          |          |       |
|        | 1  |          |          |           |         |          |         |           | Cours     | se Object   | ives       |          |          |       |
| Upon   | compl  | etion o  | f this c | ourse t   | he stud | lent sh  | ould be | able to   |           |             |            |          |          |       |
|        |  |          |          |           |         |          |         |           |           | f various : | microorg   | ganisms  |          |       |
| 2. To  | underst  | and the  | e impor  | tance a   | nd impl | ementa   | tion of | steriliza | ation in  | pharmace    | eutical pr | ocessing | and indu | stry  |
| 3. Lea | ırn steri  | lity tes | ting of  | pharma    | ceutica | l produ  | cts.    |           |           |             |            |          |          |       |
| 4. Car | 4. Carried out microbiological standardization of Pharmaceuticals.   |          |          |           |         |          |         |           |           |             |            |          |          |       |
| 5. Uno | 5. Understand the cell culture technology and its applications in pharmaceutical industries.                   |          |          |           |         |          |         |           |           |             |            |          |          |       |
|        | Course Outcomes (CO)   |          |          |           |         |          |         |           |           |             |            |          |          |       |
|        | On completion of this course, the student will be able to:   |          |          |           |         |          |         |           |           |             |            |          |          |       |
| CO     | CO1. These subjects deal with the study of all categories of microorganisms like bacteria and fungi and virus. |          |          |           |         |          |         |           |           |             |            |          |          |       |
|        | CO2. It helps in learning of different techniques of sterilization, BOD detection.                             |          |          |           |         |          |         |           |           |             |            |          |          |       |
| CO     |  |          |          |           |         |          | y study |           |           |             |            |          |          |       |
|        |  | •        |          |           |         | •        |         |           | olation o | of culture. | •          |          |          |       |
| C      | O5. It   | also de  | als the  | sterility | testing | g, Bioch | emical  | assay     |           |             |            |          |          |       |
|        |  |          |          |           |         |          |         | Pro       | gramm     | e and Co    | ourse Ma   | npping   |          |       |
| CO     | PO1  | PO2      | PO3      | PO4       | PO5     | PO6      | PO7     | PO8       | PO9       | PO 10       | PO11       | PO12     | PSO 1    | PSO 2 |
| CO1    | _  | _        | _        | _         | _       | 1        | 1       | 1         | _         | _           | _          | 1        | 1        |       |
|        |  |          |          |           |         | 1        |         | _         |           |             |            | 1        | 1        |       |
| CO2    | -  | -        | -        | -         | -       | 1        | 1       | 1         | -         | -           | -          | 1        | 1        | -     |
| CO3    | CO3 1 1 1 1 1 1 1  |          |          |           |         |          |         |           |           |             |            |          |          |       |
| CO4    | -  | -        | -        | -         | -       | 1        | 1       | 1         | -         | -           | -          | 1        | 1        | -     |
| CO5    |  |          |          |           |         |          |         |           |           |             |            |          |          |       |

1=lightly mapped

2= moderately mapped

3=strongly mapped

| Unit   | Relevance to the local, national, regional and global develonmental | reeds  |  | Relevance To the Employability/ | Entrepreneurship/  | Skill Development  | Relevance to the<br>Professional Ethics,<br>Gender, Human | Values,<br>Environment & | Sustainability |                              | SDG  | NEP  | POE/4 <sup>th</sup> IR                   |
|--------|---|--|--|---------------------------------|--------------------|--|---|--------------------------|----------------|------------------------------|--|--|--|
| Unit I | Local Regional  | It has shown a wonderful chance to raise the bar for national pharmacy practise. | Antibiotic control programmes are expanding globally and are crucial for society to be effective and forward-thinking. | ' Employability                 | . Entrepreneurship | Apply to a wide range of issues affecting people's general well-being. | Professional Ethics                                       | Gender                   | Human Values   | Environment & Sustainability | Sust aina ble Dev elop men t and Glo bal Citi zens hip (SD | Pro mot ing Hig hj-qual ity rese arch (18. 1-18.9) | Global<br>Educati<br>on<br>Knowle<br>dge |

|          |  |   |   |   |   |  |   |   |   |   | G<br>4.7)   |  |  |
|----------|--|---|---|---|---|--|---|---|---|---|---|--|--|
| Unit II  | -  | Imparts knowledge in various aspects of marketing and its applications. | Staining and sterilisation are necessary for current and future generations to be skilled globally.                                     |   |   | Apply to a wide range of issues affecting people's general well-being. |   | - | - |   | Sust aina ble Dev elop men t and Glo bal Citi zens hip (SD G 4.7) | Pro mot ing Hig hj- qual ity rese arch (18. 1- 18.9) | Global<br>Educati<br>on<br>Knowle<br>dge |
| Unit III | Aids in under tandin g the variet of micro rganis ms and fungu | g of the variety of creatures and forms of algae.                       | Develop the concepts of origin, continuity, complexity of molecular life activities, and cytological aspects of growth and development. | - | - | Recognise the significance of micro methods in plant anatomy           | - | - | - | - |   |  |  |

| Unit IV    | Hel   | Encou   | Provides    | Provides protection    |   |   |                   |   |   |   |   | Sust | Pro         | Global  |
|------------|-------|---------|-------------|------------------------|---|---|-------------------|---|---|---|---|------|-------------|---------|
|            | ps    | rages   | nationwide  | against food           |   |   |                   |   |   |   |   | aina | mot         | Educati |
|            | stud  | physic  | protection  | poisoning globally.    |   |   |                   |   |   |   |   | ble  | ing         | on      |
|            | ents  | al and  | from        | poisoning globally.    |   |   |                   |   |   |   |   | Dev  | Hig         | Knowle  |
|            | gain  | cogniti |             |                        |   |   |                   |   |   |   |   | elop | hj-         | dge     |
|            | kno   | ve      | illness.    |                        |   |   |                   |   |   |   |   | men  | _           | uge     |
|            | wle   | health  | IIIIIESS.   |                        |   |   |                   |   |   |   |   |      | qual<br>ity |         |
|            |       | neam    |             |                        |   |   |                   |   |   |   |   | t    |             |         |
|            | dge   |         |             |                        |   |   |                   |   |   |   |   | and  | rese        |         |
|            | of    |         |             |                        |   |   |                   |   |   |   |   | Glo  | arch        |         |
|            | the   |         |             |                        |   |   |                   |   |   |   |   | bal  | (18.        |         |
|            | biol  |         |             |                        |   |   |                   |   |   |   |   | Citi | 1-          |         |
|            | ogic  |         |             |                        |   |   |                   |   |   |   |   | zens | 18.9        |         |
|            | al,   |         |             |                        |   |   |                   |   |   |   |   | hip  | )           |         |
|            | mec   |         |             |                        |   |   |                   |   |   |   |   | (SD  |             |         |
|            | hani  |         |             |                        |   |   |                   |   |   |   |   | G    |             |         |
|            | cal,  |         |             |                        |   |   |                   |   |   |   |   | 4.7) |             |         |
|            | and   |         |             |                        |   |   |                   |   |   |   |   |      |             |         |
|            | phy   |         |             |                        |   |   |                   |   |   |   |   |      |             |         |
|            | sical |         |             |                        |   |   |                   |   |   |   |   |      |             |         |
|            | syst  |         |             |                        |   |   |                   |   |   |   |   |      |             |         |
|            | ems   |         |             |                        |   |   |                   |   |   |   |   |      |             |         |
|            | that  |         |             |                        |   |   |                   |   |   |   |   |      |             |         |
|            | kee   |         |             |                        |   |   |                   |   |   |   |   |      |             |         |
|            | p     |         |             |                        |   |   |                   |   |   |   |   |      |             |         |
|            | peo   |         |             |                        |   |   |                   |   |   |   |   |      |             |         |
|            | ple   |         |             |                        |   |   |                   |   |   |   |   |      |             |         |
|            | heal  |         |             |                        |   |   |                   |   |   |   |   |      |             |         |
|            | thy   |         |             |                        |   |   |                   |   |   |   |   |      |             |         |
|            | and   |         |             |                        |   |   |                   |   |   |   |   |      |             |         |
|            |       |         |             |                        |   |   |                   |   |   |   |   |      |             |         |
|            | hap   |         |             |                        |   |   |                   |   |   |   |   |      |             |         |
| T.T., 14 . | py.   |         | T           | II                     | 1 |   | D1                |   |   |   |   | C 1  | D.          | C1-1 1  |
| Unit v     | -     | -       | Improves    | Human rights           | - | - | Develops          | - | - | - | - | Sust | Pro         | Global  |
|            |       |         | Human       | protection, ecological |   |   | research aptitude |   |   |   |   | aina | mot         | Educati |
|            |       |         | Health and  | preservation,          |   |   |                   |   |   |   |   | ble  | ing         | on      |
|            |       |         | well being. | environmental issues,  |   |   |                   |   |   |   |   | Dev  | Hig         | Knowle  |

| and sustainable life. |  |  | elop | hj-  | dge |
|-----------------------|--|--|------|------|-----|
|                       |  |  | men  | qual |     |
|                       |  |  | t    | ity  |     |
|                       |  |  | and  | rese |     |
|                       |  |  | Glo  | arch |     |
|                       |  |  | bal  | (18. |     |
|                       |  |  | Citi | 1-   |     |
|                       |  |  | zens | 18.9 |     |
|                       |  |  | hip  | )    |     |
|                       |  |  | (SD  |      |     |
|                       |  |  | G    |      |     |
|                       |  |  | 4.7) |      |     |
|                       |  |  | Í    |      |     |

| BP 308P                          | Pharmaceutical Engineering (Practical)                        | L    | T | P | C |  |  |  |  |  |
|----------------------------------|---|------|---|---|---|--|--|--|--|--|
| Version 2.0                      |   | 0    | 0 | 4 | 2 |  |  |  |  |  |
| <b>Total Contact Hours</b>       | 60 Hours  |      |   |   |   |  |  |  |  |  |
| Pre-requisites/Exposure          |   |      |   |   |   |  |  |  |  |  |
| Co-requisites                    |   |      |   |   |   |  |  |  |  |  |
|                                  | Course Object   | ives |   |   |   |  |  |  |  |  |
| <b>Upon completion of this c</b> | Upon completion of this course the student should be able to: |      |   |   |   |  |  |  |  |  |

- 1. To know various unit operations used in Pharmaceutical industries.
- 2. To understand the material handling techniques.
- 3. To perform various processes involved in pharmaceutical manufacturing process.
- 4. To carry out various test to prevent environmental pollution.
- 5. To appreciate and comprehend significance of plant lay out design for optimum use of resources
- 6. To appreciate the various preventive methods used for corrosion control in Pharmaceutical industries

# **Course Outcomes (CO)**

# On completion of this course, the student will be able to:

CO1. To imparts fundamental knowledge of various unit operations used in pharmaceutical industry.

| CO  | D2. It  | deals   | with the | e detern | nination  | of radi  | ation co   | onstant | of diffe | rent metal | s and pai  | ints.      |  |  |
|-----|---|---------|----------|----------|-----------|----------|------------|---------|----------|------------|------------|------------|--|--|
| CO  | )3. It  | also h  | elps to  | underst  | and the   | steam c  | distillati | on proc | ess and  | heat trans | sfer cons  | tant.      |  |  |
| CO  | )4. It  | is also | applic   | able for | the cor   | structio | on of dr   | ying cu | rves (Ps | sychometr  | ric charts | ).         |  |  |
| CO  | O5. T   | his sub | ject als | so usefu | ıl for ur | nderstan | ding si    | ze redu | ction m  | ethods, si | ze analys  | sis and st | udy indus                                | trial instruments used in unit operation |
|     | p   | rocesse | es.      |          |           |          |            |         |          |            |            |            |  |  |
|     |   |         |          |          |           |          |            | Prog    | ramme    | and Cou    | rse Map    | ping       | T. T |  |
| CO  | PO1   | PO2     | PO3      | PO4      | PO5       | PO6      | PO7        | PO8     | PO9      | PO 10      | PO11       | PO12       | PSO 1                                    | PSO 2                                    |
| CO1 | 3   | -       | 2        | -        | 3         | 3        | -          | 2       | -        | -          | 3          | 2          | 3  | 2  |
| CO2 |   |         |          |          |           |          |            |         |          |            |            |            |  |  |
| CO3 | 3   | -       | 2        | -        | 3         | 3        | -          | 2       | -        | -          | 3          | 2          | 3  | 2  |
| CO4 | CO4 3 - 2 - 3 3 - 2 - 3 2 3                         |         |          |          |           |          |            |         |          |            |            |            |  |  |
| CO5 | CO5     3     -     2     -     -     3     2     3 |         |          |          |           |          |            |         |          |            |            |            |  |  |
|     |   |         |          |          | l=lightl  | y mappe  | ed         | 2=      | modera   | ately map  | ped        | 3=s1       | trongly ma                               | apped                                    |

| vance to the harional, onal and global lopmental | vance To the<br>bloyability/<br>epreneurship/<br>Development | vance to the essional cs, Gender, nan Values, ironment & ainability |
|--|--|---|
| Releva<br>local, region<br>develo<br>needs       | Relevi<br>Emple<br>Entrej<br>Skill I                         | Releva<br>Profese<br>Ethics<br>Huma<br>Envir<br>Sustai<br>NEP       |

| Unit       | l Local | Regional | National | It provides process optimisation, quality assurance, and resource-efficient resource use, which improves product performance and operating efficiency. | Enabling people to perform well in positions in sectors where fluid handling, particle analysis, and process optimisation are essential. | Entrepreneurship | Skill Development | Professional Ethics | o Z Gender | Human Values | Environment & Sustainability | SD<br>G 6) | (18.<br>1-<br>18.9<br>) | Focus<br>on<br>Employ<br>ability<br>Skills<br>(Local/<br>Region<br>al and<br>Global) |
|------------|---------|----------|----------|--|--|------------------|-------------------|---------------------|------------|--------------|------------------------------|------------|-------------------------|--|
| Unit<br>II |         |          |          | This knowledge is valuable for designing efficient systems, optimizing processes, ensuring product quality, and improving energy efficiency.           | It increases one's employability in sectors including manufacturing, energy management, chemical engineering, and process engineering.   |                  |                   |                     |            | 1            |                              | SD<br>G 6) | (18.<br>1-<br>18.9<br>) | Focus on Employ ability Skills (Local/ Region al and Global)                         |

| TT 1. |      |                                      | Letter 1                          | 1 | 1 | 1 | 1 |      | an   | (10  | -        |
|-------|------|--------------------------------------|-----------------------------------|---|---|---|---|------|------|------|----------|
| Unit  | <br> | <br>Aids those who operate in fields | The improvement of                |   |   |   |   | <br> | SD   | (18. | Focus    |
| III   |      | where drying and mixing are          | employability in process          |   |   |   |   |      | G 6) | 1-   | on       |
|       |      | essential for product development,   | engineering, product              |   |   |   |   |      |      | 18.9 | Employ   |
|       |      | quality assurance, and production    | development, quality control,     |   |   |   |   |      |      | )    | ability  |
|       |      | effectiveness.                       | manufacturing, R&D, technical     |   |   |   |   |      |      |      | Skills   |
|       |      |                                      | sales, and consulting             |   |   |   |   |      |      |      | (Local/  |
|       |      |                                      | professions across many           |   |   |   |   |      |      |      | Region   |
|       |      |                                      | industries.                       |   |   |   |   |      |      |      | al and   |
|       |      |                                      |                                   |   |   |   |   |      |      |      | Global)  |
| Unit  | <br> | <br>Provides essential knowledge and | Valuable in sectors such as       |   |   |   |   | <br> | SD   | (18. | Focus    |
| IV    |      | skills applicable to industries      | pharmaceuticals,                  |   |   |   |   |      | G 6) | 1-   | on       |
|       |      | involving separation processes,      | biotechnology, chemical           |   |   |   |   |      |      | 18.9 | Employ   |
|       |      | purification, particle removal, and  | engineering, water treatment,     |   |   |   |   |      |      | )    | ability  |
|       |      | fluid clarification                  | and food processing, where        |   |   |   |   |      |      |      | Skills   |
|       |      |                                      | efficient separation techniques   |   |   |   |   |      |      |      | (Local/  |
|       |      |                                      | are critical for product quality, |   |   |   |   |      |      |      | Region   |
|       |      |                                      | safety, and process               |   |   |   |   |      |      |      | al and   |
|       |      |                                      | optimization                      |   |   |   |   |      |      |      | Global)  |
| Unit  | <br> | <br>Important for guaranteeing the   | Provides diverse range of         |   |   |   |   | <br> | SD   | (18. | Focus    |
| v     |      | choice of suitable materials,        | employment opportunities in       |   |   |   |   |      | G 6) | 1-   | on       |
|       |      | avoiding material degradation and    | the pharmaceutical industry,      |   |   |   |   |      |      | 18.9 | Employ   |
|       |      | failure, and improving material      | including roles in engineering,   |   |   |   |   |      |      | )    | ability  |
|       |      | flow and handling procedures in      | operations, quality assurance,    |   |   |   |   |      |      | ŕ    | Skills   |
|       |      | pharmaceutical plant operations.     | research and development, and     |   |   |   |   |      |      |      | (Local/  |
|       |      | The safe, effective, and legal       | environmental health and          |   |   |   |   |      |      |      | Region   |
|       |      | operation of pharmaceutical          | safety.                           |   |   |   |   |      |      |      | al and   |
|       |      | production facilities is facilitated |                                   |   |   |   |   |      |      |      | Global)  |
|       |      | by this information.                 |                                   |   |   |   |   |      |      |      | <b> </b> |

# **Semester-IV**

| BP401T                     | Pharmaceutical Organic Chemistry-III (Theory) | L | T | P | C |
|----------------------------|---|---|---|---|---|
| Version 2.0                |   | 3 | 1 | 0 | 4 |
| <b>Total Contact Hours</b> | 45 Hours                                      |   |   |   |   |
| Pre-requisites/Exposure    | Organic Chemistry                             |   |   |   |   |
| Co-requisites              | Pharmaceutical Organic Chemistry-III          |   |   |   |   |

### **Course Objectives**

# **Upon completion of this course the student should be able to:**

- 1. Understand the methods of preparation and properties of organic compounds
- 2. Explain the stereo chemical aspects of organic compounds and stereo chemical reactions
- 3. Know the medicinal uses and other applications of organic compounds

# **Course Outcomes (CO)**

# On completion of this course, the student will be able to:

- CO1. Able to explain chemistry of important heterocyclic compounds.
- CO2. To describe detailed mechanisms for common naming reactions.
- CO3. It imparts knowledge on stereo-chemical aspects of organic compounds and organic reactions.
- CO4. To acquire the knowledge and understanding of medicinal and other uses of organic compounds.

# **Programme and Course Mapping**

|     |     |     |     |     |     |     |            | 0   |     |       | 1 1  | 0    |       |       |
|-----|-----|-----|-----|-----|-----|-----|------------|-----|-----|-------|------|------|-------|-------|
| CO  | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | <b>PO7</b> | PO8 | PO9 | PO 10 | PO11 | PO12 | PSO 1 | PSO 2 |
| CO1 | 3   |     |     |     |     | 3   |            | 1   |     |       |      |      |       |       |
| CO2 |     |     | 3   |     |     |     |            |     |     |       |      | 1    |       |       |
| CO3 |     | 1   |     |     | 3   |     |            |     | 1   |       |      |      |       |       |
| CO4 |     |     |     |     |     |     |            |     |     | 1     |      |      |       | 1     |

| 1=lightly mapped 2= moderately mapped | 3=strongly mapped |  |
|---------------------------------------|-------------------|--|
|---------------------------------------|-------------------|--|

| Unit      | Relevance to the local, national, regional and global developmental needs |          |          |   | Relevance To the<br>Employability/<br>Entrepreneurship/<br>Skill Development |                  |   | Relevance to the<br>Professional Ethics,<br>Gender, Human | Sustainability | SDG          | NEP                          | POE/4 <sup>th</sup> IR                                     |   |  |
|-----------|---|----------|----------|---|--|------------------|---|---|----------------|--------------|------------------------------|--|---|--|
|           | Local   | Regional | National | Global  | Employability  | Entrepreneurship | Skill Development   | Professional Ethics                                       | Gender         | Human Values | Environment & Sustainability |  |   |  |
| Unit<br>I | [   |          | -        | Nomen clature of optical isomer s and separat ion is used | Syn<br>thes<br>is<br>and<br>sep<br>arat<br>ion<br>of<br>opti                 | -                | There are four methods to separation of isomers. Which develop skills | Usage of any medicin e especiall y isomers is based on    | -              | -            | [                            | Skil<br>l for<br>dece<br>nt<br>wor<br>k<br>SD<br>G4.<br>4. | Prof<br>essi<br>onal<br>Edu<br>cati<br>on<br>(17.<br>1-<br>17.5 | It helps in develop ing technic al skills that industr y |

|      |  | globall<br>y   | cal iso mer gen erat e emp loy men t.   |  |  | appropri<br>ate<br>professi<br>onal<br>ethics. |  |   | )                                  | require<br>s and<br>thus<br>helps in<br>creatin<br>g<br>employ<br>ment. |
|------|--|--|---|--|--|--|--|---|------------------------------------|---|
| Unit |  | Geome trical isomeri sm Nomen clature of geomet rical isomer s (Cis Trans, EZ, Syn Anti system s | Pro duct ion of geo met ric iso mer s acro ss the glo be pro vide s a lot of emp loy men t. | Product ion of Geomet ric isomers across the globe provide s a lot of employ ment. | A Geometric isomer developed synthetical ly, helps in honing the technical skill and expertise in production |  |  | Skil<br>ls<br>for<br>Dec<br>ent<br>Wor<br>k<br>(SD<br>G<br>4.4) | Professional Education (17.1-17.5) | Skill<br>Develo<br>pment  |

| Unit       |   |   |   | Synthe sis, reactions and medicinal uses of following compounds/derivatives Pyrrole, Furan, and Thiophene Relative aromaticity and reactivity of Pyrrole, Furan and Thiophene | Syn thes is of dru gs cont aini ng Pyrr ole, fura n and Thi oph en glo be pro vide s a lot of emp loy men t. |   | Synthesis of furan thiophene and Pyrrole, helps in honing the technical skill and expertise in production |   |   | - | Skil ls for Dec ent Wor k (SD G 4.4) | Professional Education (17.1-17.5) | Skill<br>Develo<br>pment |
|------------|---|---|---|---|--|---|---|---|---|---|--------------------------------------|------------------------------------|--------------------------|
| Unit<br>IV | - | - | - | Pyrazo<br>le,<br>Imidaz   | Syn<br>thes<br>is  | - | Synthesis<br>of furan<br>Quinoline  | - | - | - | Skil<br>ls<br>for                    | Prof<br>essi<br>onal               | Skill<br>Develo<br>pment |

|      |   |   |   | ole,     | of         |   | Iso        |       |   | Dec  | Edu  |        |
|------|---|---|---|----------|------------|---|------------|-------|---|------|------|--------|
|      |   |   |   | Oxazol   | dru        |   | quinoline, |       |   | ent  | cati |        |
|      |   |   |   | e and    | gs         |   | acridine   |       |   | Wor  | on   |        |
|      |   |   |   | Thiazo   | cont       |   | helps in   |       |   | k    | (17. |        |
|      |   |   |   | le.      | aini       |   | honing the |       |   | (SD  | 1-   |        |
|      |   |   |   | Pyridin  |            |   | technical  |       |   | G    | 17.5 |        |
|      |   |   |   | e,       | ng<br>Pyri |   | skill and  |       |   | 4.4) | )    |        |
|      |   |   |   | Quinol   | dine       |   | expertise  |       |   | ,    | ,    |        |
|      |   |   |   | ine, Iso |            |   | in         |       |   |      |      |        |
|      |   |   |   | quinoli  | ,<br>Qui   |   | production |       |   |      |      |        |
|      |   |   |   | ne,      | noli       |   | production |       |   |      |      |        |
|      |   |   |   | Acridi   | ne         |   |            |       |   |      |      |        |
|      |   |   |   | ne and   | Iso        |   |            |       |   |      |      |        |
|      |   |   |   | Indole   | qui        |   |            |       |   |      |      |        |
|      |   |   |   | 1110010  | noli       |   |            |       |   |      |      |        |
|      |   |   |   |          | ne         |   |            |       |   |      |      |        |
|      |   |   |   |          | acri       |   |            |       |   |      |      |        |
|      |   |   |   |          | dine       |   |            |       |   |      |      |        |
|      |   |   |   |          | glo        |   |            |       |   |      |      |        |
|      |   |   |   |          | be         |   |            |       |   |      |      |        |
|      |   |   |   |          | pro        |   |            |       |   |      |      |        |
|      |   |   |   |          | vide       |   |            |       |   |      |      |        |
|      |   |   |   |          | s a        |   |            |       |   |      |      |        |
|      |   |   |   |          | lot        |   |            |       |   |      |      |        |
|      |   |   |   |          | of         |   |            |       |   |      |      |        |
|      |   |   |   |          | emp        |   |            |       |   |      |      |        |
|      |   |   |   |          | loy        |   |            |       |   |      |      |        |
|      |   |   |   |          | men        |   |            |       |   |      |      |        |
|      |   |   |   |          | t.         |   |            |       |   |      |      |        |
| Unit | - | - | - | Fulfils  | Opp        | - | Docking    | <br>- | 1 | Skil | Prof | Skill  |
| v    |   |   |   | the      | ena        |   | techniques |       |   | ls   | essi | Develo |
|      |   |   |   | need     | uer-       |   | helps in   |       |   | for  | onal | pment  |
|      |   |   |   | for      | oxi        |   | acing      |       |   | Dec  | Edu  |        |
|      |   |   |   | Reacti   | dati       |   | technical  |       |   | ent  | cati |        |
|      |   |   |   | ons of   | on         |   | skill,     |       |   | Wor  | on   |        |

|  |  | synthet         | and         |   | Oppenauer          |  |  | k         | (17. |  |
|--|--|-----------------|-------------|---|--------------------|--|--|-----------|------|--|
|  |  | ic              | Dak         |   | -oxidation         |  |  | (SD       | 1-   |  |
|  |  | import          | in          |   | and Dakin          |  |  | G<br>4.4) | 17.5 |  |
|  |  | ance            | reac        |   | reaction.          |  |  | 4.4)      | )    |  |
|  |  | globall         | tion        |   | Beckmann           |  |  |           |      |  |
|  |  | y               | Bec         |   | S                  |  |  |           |      |  |
|  |  | coding          | Вес         |   | rearrange          |  |  |           |      |  |
|  |  | dockin          | kma         |   | ment and           |  |  |           |      |  |
|  |  | g<br>ta alami a | nns         |   | Schmidt            |  |  |           |      |  |
|  |  | techniq         | rear        |   | rearrange          |  |  |           |      |  |
|  |  | ues.            | ran         |   | ment.              |  |  |           |      |  |
|  |  |                 | gem         |   | Claisen-           |  |  |           |      |  |
|  |  |                 | ent         |   | Schmidt condensati |  |  |           |      |  |
|  |  |                 | and         |   |                    |  |  |           |      |  |
|  |  |                 | Sch         | ' | on                 |  |  |           |      |  |
|  |  |                 | mid         |   |                    |  |  |           |      |  |
|  |  |                 | t           |   |                    |  |  |           |      |  |
|  |  |                 | rear        |   |                    |  |  |           |      |  |
|  |  |                 | ran         |   |                    |  |  |           |      |  |
|  |  |                 | gem<br>ent. |   |                    |  |  |           |      |  |
|  |  |                 | Clai        |   |                    |  |  |           |      |  |
|  |  |                 |             |   |                    |  |  |           |      |  |
|  |  |                 | sen-<br>Sch |   |                    |  |  |           |      |  |
|  |  |                 | mid         |   |                    |  |  |           |      |  |
|  |  |                 | t           |   |                    |  |  |           |      |  |
|  |  |                 |             |   |                    |  |  |           |      |  |
|  |  |                 | con<br>den  |   |                    |  |  |           |      |  |
|  |  |                 | sati        |   |                    |  |  |           |      |  |
|  |  |                 |             |   |                    |  |  |           |      |  |
|  |  |                 | on<br>of    |   |                    |  |  |           |      |  |
|  |  |                 |             |   |                    |  |  |           |      |  |
|  |  |                 | emp         |   |                    |  |  |           |      |  |
|  |  |                 | loy         |   |                    |  |  |           |      |  |
|  |  |                 | men         |   |                    |  |  |           |      |  |
|  |  |                 | t.          |   |                    |  |  |           |      |  |

| BP402T                     | Medicinal Chemistry-I (Theory) | L | T | P | С |
|----------------------------|--------------------------------|---|---|---|---|
| Version 2.0                |                                | 3 | 1 | 0 | 4 |
| <b>Total Contact Hours</b> | 45 Hours                       |   |   |   |   |
| Pre-requisites/Exposure    | Chemistry of drugs             |   |   |   |   |
| Co-requisites              |                                |   |   |   |   |

## **Upon completion of this course the student should be able to:**

- 1. Understand the chemistry of drugs with respect to their pharmacological activity
- 2. Understand the drug metabolic pathways, adverse effect and therapeutic value of drugs
- 3. Know the Structural Activity Relationship (SAR) of different class of drugs
- 4. Write the chemical synthesis of some drugs

## **Course Outcomes (CO)**

## On completion of this course, the student will be able to:

- CO1. To understand the chemistry of drugs with respect to their pharmacological activity.
- CO2. To understand the drug metabolic pathways, adverse effect and therapeutic value of drugs
- CO3. To know the structural activity relationship of different class of drugs.
- CO4. Well acquainted with the synthesis of some important class of drugs.

## **Programme and Course Mapping**

| СО  | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO<br>10 | PO11 | PO12 | PSO<br>1 | PSO 2 |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|----------|------|------|----------|-------|
| CO1 | 1   |     |     |     |     |     |     |     |     |          |      |      |          |       |
| CO2 |     |     |     | 1   | 1   |     |     | 2   |     | 3        |      |      | 3        |       |

| CO3 | 1 |   |        |         |      | 3     | 3        |        |   |       | 3            |
|-----|---|---|--------|---------|------|-------|----------|--------|---|-------|--------------|
| CO4 | 1 | 1 | 2      |         | 2    | 2     |          |        |   |       |              |
|     |   |   | 1=ligh | tly map | pped | 2= mo | derately | mapped | l | 3=str | ongly mapped |

| Unit   | Relevance to the local, national, regional and global | needs    |            |  | Relevance To the Employability/ Entrepreneurship/ | Skiii Development  |   | Relevance to the    | Professional Ethics,<br>Gender, Human | Values,      | Environment &                | SDG | NEP                                      | POE/4 <sup>th</sup> IR   |
|--------|---|----------|------------|--|---|--------------------|---|---------------------|---------------------------------------|--------------|------------------------------|-----|--|--------------------------|
| Unit I | Local   | Regional | - National | Fulfils<br>the need<br>for Drug<br>Develop<br>ment<br>globally | <b>'</b> Employability                            | ' Entrepreneurship | Knowledge of Physicochemic al properties of Drugs helps in Preformulation studies | Professional Ethics | Gender                                | Human Values | Environment & Sustainability |     | Professional<br>Education<br>(17.1-17.5) | Skill<br>Develo<br>pment |

| Unit II    |   | - |   | Fulfils the need for Develop ment of Drug acting on ANS (Sympat hetic)                        |   | - | Study of SAR<br>and synthesis<br>of drugs acting<br>on<br>Sympathetic<br>nervous system<br>helps in New<br>drug synthesis<br>and Drug<br>development | - | - | - | - | Skills for<br>Decent<br>Work<br>(SDG 4.4)   | Professional<br>Education<br>(17.1-17.5)           | Skill<br>Develo<br>pment |
|------------|---|---|---|---|---|---|--|---|---|---|---|---|--|--------------------------|
| Unit       |   | - | - | globally Fulfils the need for Develop ment of Drug acting on ANS (parasy mpatheti c) globally | - | - | study of SAR and synthesis of drugs acting on Parasympatheti c nervous system helps in new drug synthesis and Drug development process               | - | - | - | - | Skills for<br>Decent<br>Work<br>(SDG 4.4)   | Professional<br>Education<br>(17.1-17.5)           | Skill<br>Develo<br>pment |
| Unit<br>IV |   | - | - | Fulfils the need for Develop ment of Drugs acting on CNS globally                             | - | - | Understand the chemistry of drugs with respect to their pharmacologic al activity  | - | - | - | - | Youth and<br>Adult<br>Literacy<br>(SDG 4.6) | Adult Education and Lifelong Learning (21.1-21.10) | Skill<br>Develo<br>pment |
| Unit V     | - | - | - | Globally<br>Aware<br>youth  | - | - | It imparts<br>fundamental<br>knowledge on  | - | - | - | - | Youth and<br>Adult<br>Literacy              | Adult Education and Lifelong                       | Skill<br>Develo<br>pment |

|  |  | about     |  | the structure, |  |  | (SDG 4.6) | Learning (21.1- |  |
|--|--|-----------|--|----------------|--|--|-----------|-----------------|--|
|  |  | uses and  |  | chemistry,     |  |  |           | 21.10)          |  |
|  |  | side      |  | SAR,           |  |  |           |                 |  |
|  |  | effect of |  | Synthesis and  |  |  |           |                 |  |
|  |  | Narcotic  |  | therapeutic    |  |  |           |                 |  |
|  |  | S         |  | value of drugs |  |  |           |                 |  |
|  |  |           |  | acting on CNS  |  |  |           |                 |  |
|  |  |           |  | which helps in |  |  |           |                 |  |
|  |  |           |  | generating new |  |  |           |                 |  |
|  |  |           |  | drug           |  |  |           |                 |  |
|  |  |           |  | molecules.     |  |  |           |                 |  |

| BP403T                     | Physical Pharmaceutics-II (Theory) | L | T | P | C |
|----------------------------|------------------------------------|---|---|---|---|
| Version 2.0                |                                    | 3 | 1 | 0 | 4 |
| <b>Total Contact Hours</b> | 45 Hours                           |   |   |   |   |
| Pre-requisites/Exposure    | Pharmaceutics                      |   |   |   |   |
| Co-requisites              | Physical Pharmaceutics             |   |   |   |   |

# Upon completion of this course the student should be able to:

- 1. Understand various physicochemical properties of drug molecules in the designing the dosage forms
- 2. Know the principles of chemical kinetics & to use them for stability testing and determination of expiry date of formulations
- 3. Demonstrate use of physicochemical properties in the formulation development and evaluation of dosage forms.

## **Course Outcomes (CO)**

## On completion of this course, the student will be able to:

CO1. State the physicochemical properties of drug molecules

CO2. Analyze the chemical stability tests of various drug products and determination of expiry date of formulations.

CO3. Have basic knowledge of physicochemical properties in the formulation development and evaluation of dosage forms.

|     |     |     |     |     |        |            |            | Pr  | ogram | me and     | Course 1 | Mapping | 3        |            |
|-----|-----|-----|-----|-----|--------|------------|------------|-----|-------|------------|----------|---------|----------|------------|
| CO  | PO1 | PO2 | PO3 | PO4 | PO5    | <b>PO6</b> | <b>PO7</b> | PO8 | PO9   | PO 10      | PO11     | PO12    | PSO 1    | PSO 2      |
| CO1 | 1   |     |     |     | 2      |            |            |     |       |            |          |         |          |            |
| CO2 |     | 1   |     |     |        |            |            |     |       | 3          |          | 3       |          |            |
| CO3 |     |     | 1   |     |        | 2          |            | 3   |       |            |          |         | 1        |            |
|     |     |     |     |     | 1=ligh | ntly ma    | pped       |     | 2= mo | derately r | napped   |         | 3=strong | gly mapped |

|                              | Unit  |
|------------------------------|---|
| ocal                         | Relevance to the local, national, regional and global developmental |
| Regional                     | needs   |
| National                     |   |
| Global                       |   |
|                              |   |
| Employability                | Relevance To the Employability/                                     |
| Entrepreneurship             | Entrepreneurship/<br>Skill Development                              |
| Skill Development            |   |
|                              |   |
| Professional Ethics          | Relevance to the  |
| Gender                       | Gender, Human   |
| Human Values                 | Values,<br>Environment &  |
| Environment & Sustainability | Sustainability  |
|                              | SDG   |
|                              | NEP   |
|                              | POE/4 <sup>th</sup> IR  |
|                              |   |

| Unit<br>I   | Knowledge about physicochemical properties colloidal dispersions enables pharmaceutical professionals to develop effective drug  | Knowledge about the physicochemical properties of colloidal dispersions skill development in areas of optimal drug delivery systems and contribute to the advancement of  | SDG<br>3<br>SDG<br>9 | Professi<br>onal<br>Educati<br>on<br>(17.1-<br>17.5) | Technica<br>I Skills<br>that<br>match<br>Industry<br>Needs/<br>Skill                    |
|-------------|--|---|----------------------|--|---|
|             | delivery systems, improve drug stability and bioavailability.  | pharmaceutical technologies and patient care.   |                      |  | Develop<br>ment   |
| Unit        | Knowledge about rheology enables understanding of flow behaviour, stability, and bioavailability of pharmaceutical formulations globally.  | Knowledge about rheology enhances skills in formulation development, process optimization, and quality control, enabling professionals to design effective drug delivery systems and ensure product stability and performance                                 | SDG<br>3<br>SDG<br>9 | Professi<br>onal<br>Educati<br>on<br>(17.1-<br>17.5) | Technica<br>I Skills<br>that<br>match<br>Industry<br>Needs/<br>Skill<br>Develop<br>ment |
| Unit<br>III | Learning the physicochemical properties of coarse dispersion is crucial for understanding and optimizing the formulation and delivery of suspensions, emulsions, and other coarse dispersions, ensuring effective drug delivery and stability of | Understanding the physicochemical properties of coarse dispersion develops skills in formulating stable suspensions and emulsions, optimizing drug delivery systems, and ensuring proper dosage administration, thereby enhancing expertise in pharmaceutical | SDG<br>3<br>SDG<br>9 | Professi<br>onal<br>Educati<br>on<br>(17.1-<br>17.5) | Technica<br>1 Skills<br>that<br>match<br>Industry<br>Needs/<br>Skill<br>Develop<br>ment |

|            | pharmaceutical products   | formulation development<br>and product quality<br>control  |  |                       |  |   |
|------------|---|--|--|-----------------------|--|---|
| Unit<br>IV | Learning the concept of micrometrics in is crucial for understanding and controlling particle size, shape, and surface properties, enabling formulation optimization and efficient drug delivery systems, ensuring product efficacy and patient safety.   | Understanding the concept of micrometrics in pharmaceutical sciences develops skills in particle characterization, formulation optimization, and drug delivery system design, enhancing expertise in quality control and process development for effective pharmaceutical products.                    |  | SDG<br>3<br>SDG<br>12 | Professi<br>onal<br>Educati<br>on<br>(17.1-<br>17.5) | Technica<br>I Skills<br>that<br>match<br>Industry<br>Needs/<br>Skill<br>Develop<br>ment |
| Unit       | Having knowledge about drug stability is crucial for formulating safe and effective pharmaceutical products, ensuring their quality and shelf life, and minimizing the risk of drug degradation and loss of potency. It enables regulatory compliance and supports patient safety by providing reliable and stable medications. | Having knowledge about drug stability develops skills in formulating stable and reliable pharmaceutical products, conducting quality control tests to assess stability, and implementing strategies to mitigate degradation risks, enhancing expertise in ensuring product quality and patient safety. |  | SDG<br>3<br>SDG<br>9  | Professi<br>onal<br>Educati<br>on<br>(17.1-<br>17.5) | Technica<br>I Skills<br>that<br>match<br>Industry<br>Needs/<br>Skill<br>Develop<br>ment |

| BP404T                     | Pharmacology-I (Theory)      | L | Т | P | C |
|----------------------------|------------------------------|---|---|---|---|
| Version 2.0                |                              | 3 | 1 | 0 | 4 |
| <b>Total Contact Hours</b> | 45 Hours                     |   |   |   |   |
| Pre-requisites/Exposure    | Human anatomy and Physiology |   |   |   |   |
| Co-requisites              | Pathophysiology              |   |   |   |   |
|                            |                              |   |   |   |   |

# Upon completion of this course the student should be able to

- 1. Understand the pharmacological actions of different categories of drugs
- 2. Explain the mechanism of drug action at organ system/sub cellular/macromolecular levels.
- 3. Apply the basic pharmacological knowledge in the prevention and treatment of various diseases.
- 4. Observe the effect of drugs on animals by simulated experiments.
- 5. Appreciate correlation of pharmacology with other bio medical sciences.

#### **Course Outcomes (CO)**

## On completion of this course, the student will be able to:

- CO1. Students would have understood the pharmacological actions of different categories of drugs
- CO2. They would have studied in detailed about mechanism of drug action at organ system/sub cellular/ macromolecular levels.
- CO3. They would have understood the application of basic pharmacological knowledge in the prevention and treatment of various diseases.
- CO4. They would get an idea about correlation of pharmacology with other bio medical sciences.

#### **Programme and Course Mapping** PO **PSO** PO9 **PO12** CO **PO1** PO<sub>2</sub> PO<sub>3</sub> PO4 PO<sub>5</sub> **PO6 PO7 PO8** PO11 PSO<sub>2</sub> 10 1 CO<sub>1</sub> CO<sub>2</sub> 3 **CO3 CO4** 3

1=lightly mapped 2= moderately mapped 3=strongly mapped

| Unit       | Relevance to the local, national, regional and global developmental needs  Local Regi National Global |          |          |  |                           | vance To t<br>loyability/<br>epreneurs<br>lopment | 1  | Relevance<br>Professiona<br>Gender, Hi<br>Environme<br>Sustainabil | SD<br>G | NE<br>P          | POE/4 <sup>t</sup> h IR |   |
|------------|---|----------|----------|--|---------------------------|---|--|--|---------|------------------|-------------------------|---|
|            | Local   | Regional | National | Global   | Em<br>plo<br>yabi<br>lity | Entrepr<br>eneursh<br>ip                          | Skill<br>Developm<br>ent   |  |         |                  |                         |   |
| Unit I     |   |          |          | Student will be able to understand General Pharmacology special context Pharmacokinetics which will help to understand disease mechanism and drug action |                           |   | Pharmacol ogy as a discipline has significant ly contribute d to skill developme nt in |  |         | (SD<br>G<br>4.4) | (9.1<br>-<br>9.3)       | Global<br>Educati<br>on<br>Knowle<br>dge,<br>Skill<br>Develo<br>pment,<br>Employ<br>ability |
| Unit<br>II |   | -        |          | Student will be able to know general pharmacology is crucial for ensuring the safe,  |                           |   | various<br>aspects of<br>drug<br>therapy. It   |  |         | (SD<br>G<br>4.4) | (9.1<br>-<br>9.3)       | Global<br>Educati<br>on<br>Knowle   |

| Unit       | <br>effective, and rational use of drugs globally. It informs drug regulation, promotes rational drug use, contributes to pharmacovigilance efforts, supports global health initiatives, informs pharmacoeconomic evaluations, and fosters international collaborations and research in pharmacology.  The global impact of drugs targeting the peripheral nervous system is vast, with | has provided the knowledge , education, and training necessary for healthcare profession als to understand drug actions, make informed therapeuti | (SD<br>G<br>4.4) | (9.1<br>-<br>9.3) | dge,<br>Skill<br>Develo<br>pment,<br>Employ<br>ability<br>Global<br>Educati<br>on<br>Knowle |
|------------|---|---|------------------|-------------------|---|
|            | applications in treating autonomic disorders, anaesthesia, neuromuscular disorders and research, allowing healthcare professionals to optimize patient outcomes by leveraging their pharmacological properties.   | c decisions, ensure drug safety, and contribute to patient care. Skill developme nt in  |                  |                   | dge,<br>Skill<br>Develo<br>pment,<br>Employ<br>ability                                      |
| Unit<br>IV | <br>The pharmacology of drugs acting on the central nervous system has profound various global applications such as neurological and  | pharmacol ogy continues through lifelong learning   | (SD<br>G<br>4.4) | (9.1<br>-<br>9.3) | Global<br>Educati<br>on<br>Knowle<br>dge,<br>Skill  |

|      | psychiatric disorders,    | and         |      |      | Develo  |
|------|---------------------------|-------------|------|------|---------|
|      | pain management sleep     | interdiscip |      |      | pment,  |
|      | disorders, substance      | linary      |      |      | Employ  |
|      | abuse, neuroprotection    | collaborati |      |      | ability |
| Unit | The global impact of      | on,         | (SD  | (9.1 | Global  |
| V    | drugs acting on the       | enabling    | G    | _    | Educati |
|      | central nervous system is | profession  | 4.4) | 9.3) | on      |
|      | vast, addressing          | als to      |      |      | Knowle  |
|      | neurological and          | adapt to    |      |      | dge,    |
|      | psychiatric disorders     | new         |      |      | Skill   |
|      |                           | developme   |      |      | Develo  |
|      |                           | nts and     |      |      | pment,  |
|      |                           | improve     |      |      | Employ  |
|      |                           | patient     |      |      | ability |
|      |                           | outcomes.   |      |      |         |

| BP405T                     | Pharmacognosy and Phytochemistry-I (Theory) | L | T | P | C |  |  |  |  |
|----------------------------|---|---|---|---|---|--|--|--|--|
| Version 2.0                |   | 3 | 1 | 0 | 4 |  |  |  |  |
| <b>Total Contact Hours</b> | 45 Hours                                    |   |   |   |   |  |  |  |  |
| Pre-requisites/Exposure    | Pharmacognosy                               |   |   |   |   |  |  |  |  |
| Co-requisites              | Pharmacognosy                               |   |   |   |   |  |  |  |  |
| Course Objectives          |   |   |   |   |   |  |  |  |  |

# **Upon completion of this course the student should be able to:**

- 1. To know the techniques in the cultivation and production of crude drugs
- 2. To know the crude drugs, their uses and chemical nature
- 3. Know the evaluation techniques for the herbal drugs
- 4. To carry out the microscopic and morphological evaluation of crude drugs

# **Course Outcomes (CO)**

# On completion of this course, the student will be able to:

CO1. Student will be aware of the techniques in the cultivation and production of crude drugs

CO2. Have Knowledge of the crude drugs, their uses and chemical nature

CO3. Know the evaluation techniques for the herbal drugs

CO4. Able to carry out the microscopic and morphological evaluation of crude drugs

|                  | Programme and Course Mapping |     |     |     |     |      |                      |     |     |                   |      |      |       |       |
|------------------|------------------------------|-----|-----|-----|-----|------|----------------------|-----|-----|-------------------|------|------|-------|-------|
| CO               | PO1                          | PO2 | PO3 | PO4 | PO5 | PO6  | PO7                  | PO8 | PO9 | PO 10             | PO11 | PO12 | PSO 1 | PSO 2 |
| CO1              |                              |     |     |     |     |      |                      |     |     |                   |      |      |       |       |
| CO2              | 1                            |     | 2   |     | 3   |      |                      | 3   |     | 3                 |      |      |       | 1     |
| CO3              |                              |     |     | 2   |     |      |                      |     |     |                   |      |      |       |       |
| CO4              |                              | 1   | 2   |     |     | 3    | 3                    |     |     |                   |      |      |       |       |
| 1=lightly mapped |                              |     |     |     |     | 2= m | 2= moderately mapped |     |     | 3=strongly mapped |      |      |       |       |

|                              | Unit  |
|------------------------------|---|
| Jocal                        | Relevance to the local, national, regional and global developmental |
| Regional                     | secos   |
| National                     |   |
| Global                       |   |
| Employability                | Relevance To the Employability/                                     |
| Entrepreneurship             | Entrepreneurship/<br>Skill Development                              |
| Skill Development            |   |
| Professional Ethics          | Relevance to the<br>Professional Ethics,<br>Gender, Human           |
| Gender                       | values,<br>Environment &  |
| Human Values                 | Sustainability  |
| Environment & Sustainability |   |
| <b>9</b> 4                   | SDG   |
|                              | NEP   |
|                              | POE/4 <sup>th</sup> IR  |
|                              |   |

| Unit | _ | _ | _ | Introdu       |   | Skills            | В       | Skil     | Prof       | Global     |
|------|---|---|---|---------------|---|-------------------|---------|----------|------------|------------|
| I    |   |   |   | ction to      |   | related to        | et      | ls       | essi       | Educati    |
|      |   |   |   | Pharm         |   | Pharmaco          | te      | for      | onal       | on         |
|      |   |   |   | acogno        |   | gnosy &           | r       | Dec      | Edu        | Knowle     |
|      |   |   |   | sy &          |   | Phytoche          | Q       | ent      | cati       | dge        |
|      |   |   |   | Phytoc        |   | mistry            | ua      | Wor      | on         | Techni     |
|      |   |   |   | hemistr       |   | fields            | lit     | k        | (17.       | cal        |
|      |   |   |   | у             |   | would be          | y       | (SD      | 1-         | Skills     |
|      |   |   |   |               |   | developed         | of      | G        | 17.5       | that       |
|      |   |   |   |               |   |                   | he      | 4.4)     | )          | match      |
|      |   |   |   |               |   |                   | rb      |          |            | Industr    |
|      |   |   |   |               |   |                   | al      |          |            | у          |
|      |   |   |   |               |   |                   | D       |          |            | Needs,     |
|      |   |   |   |               |   |                   | ru      |          |            | Skill      |
|      |   |   |   |               |   |                   | gs      |          |            | Develo     |
|      |   |   |   |               |   |                   |         |          |            | pment      |
| Unit | _ | - | - | Knowl         |   | Skills            | В       | Skil     | Prof       | Global     |
| II   |   |   |   | edge of       |   | related to        | et      | ls       | essi       | Educati    |
|      |   |   |   | cultivat      |   | production        | te      | for      | onal       | on         |
|      |   |   |   | ion,          |   | and               | r .     | Dec      | Edu        | Knowle     |
|      |   |   |   | collecti      |   | storage of        | yi      | ent      | cati       | dge        |
|      |   |   |   | on,           |   | herbal            | el<br>d | Wor      | on         | Techni cal |
|      |   |   |   | process       |   | drugs<br>would be | a       | k<br>(SD | (17.<br>1- | Skills     |
|      |   |   |   | ing &         |   | enhanced          |         | (SD<br>G | 17.5       | that       |
|      |   |   |   | storage<br>of |   | emianceu          |         | 4.4)     | 17.5       | match      |
|      |   |   |   | crude         |   |                   |         | 4.4)     | ,          | Industr    |
|      |   |   |   | drugs         |   |                   |         |          |            | y          |
|      |   |   |   | arugs         |   |                   |         |          |            | Needs,     |
|      |   |   |   |               |   |                   |         |          |            | Skill      |
|      |   |   |   |               |   |                   |         |          |            | Develo     |
|      |   |   |   |               |   |                   |         |          |            | pment      |
|      | 1 |   |   |               | 1 |                   |         |          | l          | Pilicit    |

| Unit | _ | _ | _ | knowle         | Skills      | Е   | Skil      | Prof         | Global          |
|------|---|---|---|----------------|-------------|-----|-----------|--------------|-----------------|
| III  |   |   |   | dge of         | related to  | n   | ls        | essi         | Educati         |
|      |   |   |   | plant          | production  | vi  | for       | onal         | on              |
|      |   |   |   | tissue         | of plants   | ro  | Dec       | Edu          | Knowle          |
|      |   |   |   | culture        | through     | n   | ent       | cati         | dge             |
|      |   |   |   |                | tissue      | m   | Wor       | on           | Techni          |
|      |   |   |   |                | culture     | en  | k         | (17.         | cal             |
|      |   |   |   |                | technique   | t   | (SD       | 1-           | Skills          |
|      |   |   |   |                | would be    | co  | Ğ         | 17.5         | that            |
|      |   |   |   |                | enhanced.   | ns  | 4.4)      | )            | match           |
|      |   |   |   |                |             | er  |           |              | Industr         |
|      |   |   |   |                |             | va  |           |              | y               |
|      |   |   |   |                |             | ti  |           |              | Needs,          |
|      |   |   |   |                |             | О   |           |              | Skill           |
|      |   |   |   |                |             | n   |           |              | Develo          |
|      |   |   |   |                |             |     |           |              | pment           |
| Unit | - | - | - | Role of        | Skills      | Tr  | Skil      | Prof         | Global          |
| IV   |   |   |   | Pharm          | related to  | ad  | ls        | essi         | Educati         |
|      |   |   |   | acogno         | principle   | iti | for       | onal         | on              |
|      |   |   |   | sy in          | and         | О   | Dec       | Edu          | Knowle          |
|      |   |   |   | allopat        | practice of | na  | ent       | cati         | dge             |
|      |   |   |   | hy and         | traditional | 1   | Wor       | on           | Techni          |
|      |   |   |   | traditio       | medicines   | k   | k         | (17.         | cal             |
|      |   |   |   | nal            | would be    | n   | (SD       | 1-           | Skills          |
|      |   |   |   | system         | developed   | 0   | G         | 17.5         | that            |
|      |   |   |   | s of           |             | W   | 4.4)      | )            | match           |
|      |   |   |   | medici         |             | le  |           |              | Industr         |
|      |   |   |   | ne             |             | d   |           |              | y<br>Naada      |
|      |   |   |   |                |             | ge  |           |              | Needs,<br>Skill |
|      |   |   |   |                |             |     |           |              | Develo          |
|      |   |   |   |                |             |     |           |              |                 |
| Unit |   |   |   | knowle         | Skills      | N   | Skil      | Prof         | pment<br>Global |
|      |   |   |   |                |             |     |           |              | Educati         |
| V    |   |   |   | dge of various | related to  | e   | ls<br>for | essi<br>onal | on              |
|      |   |   |   | various        | production  | W   | 101       | onal         | OII             |

|  |  | categor |  | and usage  |  | er | Dec  | Edu  | Knowle  |
|--|--|---------|--|------------|--|----|------|------|---------|
|  |  | ies of  |  | of         |  | dr | ent  | cati | dge     |
|  |  | second  |  | secondary  |  | u  | Wor  | on   | Techni  |
|  |  | ary     |  | metabolite |  | gs | k    | (17. | cal     |
|  |  | metabo  |  | s would be |  | fr | (SD  | 1-   | Skills  |
|  |  | lites   |  | enhanced   |  | О  | G    | 17.5 | that    |
|  |  |         |  |            |  | m  | 4.4) | )    | match   |
|  |  |         |  |            |  | na |      |      | Industr |
|  |  |         |  |            |  | tu |      |      | y       |
|  |  |         |  |            |  | ra |      |      | Needs,  |
|  |  |         |  |            |  | 1  |      |      | Skill   |
|  |  |         |  |            |  | re |      |      | Develo  |
|  |  |         |  |            |  | so |      |      | pment   |
|  |  |         |  |            |  | ur |      |      |         |
|  |  |         |  |            |  | ce |      |      |         |
|  |  |         |  |            |  | s  |      |      |         |

| BP406P                            | Medicinal Chemistry-I (Practical) | L | T | P | C |  |  |  |  |
|-----------------------------------|-----------------------------------|---|---|---|---|--|--|--|--|
| Version 2.0                       |                                   | 0 | 0 | 4 | 2 |  |  |  |  |
| <b>Total Contact Hours</b>        | 60 Hours                          |   |   |   |   |  |  |  |  |
| Pre-requisites/Exposure           | Medicinal Chemistry               |   |   |   |   |  |  |  |  |
| Co-requisites Medicinal Chemistry |                                   |   |   |   |   |  |  |  |  |
|                                   | C Oh!                             | 4 |   | _ |   |  |  |  |  |

# **Upon completion of this course the student should be able to:**

- 1. Understand the chemistry of drugs with respect to their pharmacological activity
- 2. Understand the synthetic procedure and therapeutic value of drugs
- 3. Know the mechanism of reaction and Structural Activity Relationship (SAR) of different class of drugs
- 4. Understand methods and basics required for the assay of some drugs.

# **Course Outcomes (CO)**

# On completion of this course, the student will be able to:

- CO1. It imparts the knowledge of synthesizing, characterization and purification of medicinal compounds and intermediates.
- CO2. To analyse the selected drugs, present in dosage forms and to determine the percentage purity.
- CO3. Able to study physiochemical properties of drug.

|     |   |     |     |     |     |            |            | Pro | gramn | ne and C | ourse M | apping |       |       |
|-----|---|-----|-----|-----|-----|------------|------------|-----|-------|----------|---------|--------|-------|-------|
| CO  | PO1   | PO2 | PO3 | PO4 | PO5 | <b>PO6</b> | <b>PO7</b> | PO8 | PO9   | PO 10    | PO11    | PO12   | PSO 1 | PSO 2 |
| CO1 | 201 1 1   |     |     |     |     |            |            |     |       |          |         |        |       |       |
| CO2 |   |     |     |     |     |            |            |     |       |          |         |        |       |       |
| CO3 |   |     |     |     |     |            |            |     |       |          |         |        |       |       |
|     | 1=lightly mapped 2= moderately mapped 3=strongly mapped |     |     |     |     |            |            |     |       |          |         |        |       |       |

|                              | T   |
|------------------------------|---|
|                              | Jnit  |
| Local                        | Relevance to the local, national, regional and global |
| Regional                     | needs   |
| National                     |   |
| Global                       |   |
| Employability                | Relevance To the Employability/Entrepreneurship/      |
| Entrepreneurship             | Skin Development                                      |
| Skill Development            |   |
| Professional Ethics          | Relevance to the                                      |
| Gender                       | Professional Ethics,<br>Gender, Human                 |
| Human Values                 | Values,   |
| Environment & Sustainability | Environment &   |
|                              | SDG   |
|                              | NEP   |
|                              | POE/4 <sup>th</sup> IR                                |
|                              |   |

| Unit I      | - | - | To<br>synthesise<br>API to<br>meet<br>Nation<br>need   | To<br>synthesise<br>API for<br>export<br>purpose                  | - | - | Synthesis of<br>Drugs and<br>Intermediate<br>helps to meet<br>industry<br>demand in<br>production of<br>API | - | - | - | - | Skills for Decent Work (SDG 4.4), Ensure sustainable consumptio n and production patterns (SDG 12) | Technical Skills<br>that match<br>Industry Needs                                      | Employ ability                                 |
|-------------|---|---|--|---|---|---|---|---|---|---|---|--|---|--|
| Unit II     |   | - | To Perform Quality control of marketed formulatio ns   | To analyse the import sample by following different assay methods | - | - | Assay of Drugs<br>helps in<br>Quality control<br>of Drugs   | - | - | - | - | Skills for<br>Decent<br>Work<br>(SDG 4.4)  | Practical<br>Courses from<br>Industry/Alumn<br>i                                      | Skill<br>Develo<br>pment,<br>Employ<br>ability |
| Unit<br>III |   | - | To determine Physicoch emical properties, require in Research and developm ent Departme nt of Pharma Industries. |   |   | - | Determination<br>of<br>physicochemic<br>al properties of<br>Drugs assist in<br>Preformulation<br>studies    | - | - | - | - | Skills for<br>Decent<br>Work<br>(SDG 4.4)  | Promoting High-quality research (18.1- 18.9), Practical Courses from Industry/Alumn i | Skill<br>Develo<br>pment,<br>Employ<br>ability |

| BP407P                     | Physical Pharmaceutics-II (Practical) | L | T | P | C |  |  |  |  |  |  |
|----------------------------|---------------------------------------|---|---|---|---|--|--|--|--|--|--|
| Version 2.0                |                                       | 0 | 0 | 4 | 2 |  |  |  |  |  |  |
| <b>Total Contact Hours</b> | 0 Hours                               |   |   |   |   |  |  |  |  |  |  |
| Pre-requisites/Exposure    | Physical Pharmaceutics- I             |   |   |   |   |  |  |  |  |  |  |
| Co-requisites              | Pharmaceutics                         |   |   |   |   |  |  |  |  |  |  |
|                            |                                       |   |   |   |   |  |  |  |  |  |  |

## Upon completion of this course the student should be able to:

- 1. Understand various physicochemical properties of drug molecules in the designing the dosage forms
- 2. Know the principles of chemical kinetics & to use them for stability testing and determination of expiry date of formulations
- 3. Demonstrate use of physicochemical properties in the formulation development and evaluation of dosage forms

## **Course Outcomes (CO)**

## On completion of this course, the student will be able to:

- CO1. State the physicochemical properties of drug molecules
- CO2. Analyse the chemical stability tests of various drug products and determination of expiry date of formulations
- CO3. Have basic knowledge of physicochemical properties in the formulation development and evaluation of dosage forms.

#### **Programme and Course Mapping PO1** PO<sub>2</sub> PO<sub>3</sub> PO4 PO<sub>5</sub> **PO6 PO7** PO8 PO9 PO 10 PO11 | PO12 | PSO 1 PSO 2 CO **CO1** CO<sub>2</sub> 2 **CO3** 3 3 1 1 1=lightly mapped 2= moderately mapped 3=strongly mapped

| Unit   | Relevance to the local, national, | regional and global developmental | Singa    |   | Relevance To the Employability/ | Entrepreneurship/<br>Skill Development | Ι  | Relevance to the Professional Ethics, Gender, Human | values,<br>Environment & | Sustainability |                              | SDG   | NEP   | POE/4 <sup>th</sup> IR                   |
|--------|-----------------------------------|-----------------------------------|----------|---|---------------------------------|--|--|---|--------------------------|----------------|------------------------------|---|---|--|
| Unit I | Local                             | Regional                          | National | By providing essential knowledge and approaches for recognising and understanding the physical properties of particulate materials, such as particle size, shape, surface area, and porosity, micromeritics contributes to society. This information is crucial for the creation and optimisation of a wide range of products and processes in industries including medicine, | · Employability                 | Entrepreneurship                       | Micromeritics assists in the development of profession al skills by instructing profession als in particle characterization techniques | Professional Ethics                                 | ' Gender                 | Human Values   | Environment & Sustainability | Skil<br>ls<br>for<br>Dec<br>ent<br>Wor<br>k<br>(SD<br>G<br>4.4) | Pro mot ing Hig h-qual ity rese arch (18. 1-18.9) | Global<br>Educati<br>on<br>Knowle<br>dge |

| chemicals, and materials     | , data       |  | I |  |
|------------------------------|--------------|--|---|--|
|                              |              |  |   |  |
| science, where innovation is | interpretati |  |   |  |
| promoted, and product        | on, and      |  |   |  |
| performance is enhanced on a | particulate  |  |   |  |
| worldwide scale.             | material     |  |   |  |
|                              | optimisati   |  |   |  |
|                              | on. These    |  |   |  |
|                              | skills       |  |   |  |
|                              | allow        |  |   |  |
|                              | individual   |  |   |  |
|                              | s to         |  |   |  |
|                              | participate  |  |   |  |
|                              |              |  |   |  |
|                              | in process   |  |   |  |
|                              | optimisati   |  |   |  |
|                              | on, quality  |  |   |  |
|                              | assurance,   |  |   |  |
|                              | and          |  |   |  |
|                              | product      |  |   |  |
|                              | developme    |  |   |  |
|                              | nt           |  |   |  |
|                              |              |  |   |  |
|                              | Mastering    |  |   |  |
|                              | these skills |  |   |  |
|                              | enables      |  |   |  |
|                              | profession   |  |   |  |
|                              | als to       |  |   |  |
|                              | address      |  |   |  |
|                              |              |  |   |  |
|                              | complex      |  |   |  |
|                              | formulatio   |  |   |  |
|                              | n            |  |   |  |
|                              | challenges   |  |   |  |
|                              | and drive    |  |   |  |
|                              | innovation   |  |   |  |
|                              | in various   |  |   |  |
|                              | industries.  |  |   |  |
|                              |              |  |   |  |

| Unit II | Ī - | _ | _ | Through a greater                 |  | Rheology    | _ | - | _ | - | Skil | Pro  | Global  |
|---------|-----|---|---|-----------------------------------|--|-------------|---|---|---|---|------|------|---------|
|         |     |   |   | understanding of flow             |  | fosters     |   |   |   |   | ls   | mot  | Educati |
|         |     |   |   | behaviour and viscosity           |  | expertise   |   |   |   |   | for  | ing  | on      |
|         |     |   |   | management, rheology              |  | in          |   |   |   |   | Dec  | Hig  | Knowle  |
|         |     |   |   | contributes to the world by       |  | measuring   |   |   |   |   | ent  | hj-  | dge     |
|         |     |   |   | enhancing the design and          |  | and         |   |   |   |   | Wor  | qual |         |
|         |     |   |   | performance of many items         |  | interpretin |   |   |   |   | k    | ity  |         |
|         |     |   |   | and activities, including paints, |  | g flow      |   |   |   |   | (SD  | rese |         |
|         |     |   |   | cosmetics, food, and oil          |  | behaviour,  |   |   |   |   | G    | arch |         |
|         |     |   |   | drilling. It provides effective   |  | viscosity,  |   |   |   |   | 4.4) | (18. |         |
|         |     |   |   | production, quality control,      |  | and         |   |   |   |   |      | 1-   |         |
|         |     |   |   | and optimisation, which           |  | deformatio  |   |   |   |   |      | 18.9 |         |
|         |     |   |   | promotes improved product         |  | n           |   |   |   |   |      | )    |         |
|         |     |   |   | development and global            |  | properties  |   |   |   |   |      |      |         |
|         |     |   |   | economic progress.                |  | of          |   |   |   |   |      |      |         |
|         |     |   |   |                                   |  | materials,  |   |   |   |   |      |      |         |
|         |     |   |   |                                   |  | enabling    |   |   |   |   |      |      |         |
|         |     |   |   |                                   |  | profession  |   |   |   |   |      |      |         |
|         |     |   |   |                                   |  | als in      |   |   |   |   |      |      |         |
|         |     |   |   |                                   |  | sectors     |   |   |   |   |      |      |         |
|         |     |   |   |                                   |  | like        |   |   |   |   |      |      |         |
|         |     |   |   |                                   |  | cosmetics,  |   |   |   |   |      |      |         |
|         |     |   |   |                                   |  | polymers,   |   |   |   |   |      |      |         |
|         |     |   |   |                                   |  | and         |   |   |   |   |      |      |         |
|         |     |   |   |                                   |  | pharmaceu   |   |   |   |   |      |      |         |
|         |     |   |   |                                   |  | ticals to   |   |   |   |   |      |      |         |
|         |     |   |   |                                   |  | optimise    |   |   |   |   |      |      |         |
|         |     |   |   |                                   |  | formulatio  |   |   |   |   |      |      |         |
|         |     |   |   |                                   |  | ns, solve   |   |   |   |   |      |      |         |
|         |     |   |   |                                   |  | problems,   |   |   |   |   |      |      |         |
|         |     |   |   |                                   |  | and invent  |   |   |   |   |      |      |         |
|         |     |   |   |                                   |  | with        |   |   |   |   |      |      |         |
|         |     |   |   |                                   |  | advanced    |   |   |   |   |      |      |         |
|         |     |   |   |                                   |  | materials,  |   |   |   |   |      |      |         |
|         |     |   |   |                                   |  | improving   |   |   |   |   |      |      |         |

|          |   |   |                               |  | their                 |   |   |   |   |      |      |         |
|----------|---|---|-------------------------------|--|-----------------------|---|---|---|---|------|------|---------|
|          |   |   |                               |  | career                |   |   |   |   |      |      |         |
|          |   |   |                               |  | prospects             |   |   |   |   |      |      |         |
|          |   |   |                               |  | and                   |   |   |   |   |      |      |         |
|          |   |   |                               |  | industry              |   |   |   |   |      |      |         |
|          |   |   |                               |  | contributio           |   |   |   |   |      |      |         |
|          |   |   |                               |  | ns.                   |   |   |   |   |      |      |         |
| Unit III | - | - | To improve the functionality, |  | The ability           | - | - | - | - | Skil | Pro  | Global  |
|          |   |   | appearance, and performance   |  | to                    |   |   |   |   | ls   | mot  | Educati |
|          |   |   | of diverse products including |  | specialise            |   |   |   |   | for  | ing  | on      |
|          |   |   | paints, coatings, and         |  | in methods            |   |   |   |   | Dec  | Hig  | Knowle  |
|          |   |   | emulsions, coarse dispersions |  | including             |   |   |   |   | ent  | h-   | dge     |
|          |   |   | enable the integration of     |  | mixing,               |   |   |   |   | Wor  | qual |         |
|          |   |   | insoluble or immiscible       |  | emulsifica            |   |   |   |   | k    | ity  |         |
|          |   |   | components.                   |  | tion, and             |   |   |   |   | (SD  | rese |         |
|          |   |   |                               |  | particle              |   |   |   |   | Ğ    | arch |         |
|          |   |   |                               |  | size                  |   |   |   |   | 4.4) | (18. |         |
|          |   |   |                               |  | reduction             |   |   |   |   |      | 1-   |         |
|          |   |   |                               |  | through               |   |   |   |   |      | 18.9 |         |
|          |   |   |                               |  | coarse                |   |   |   |   |      | )    |         |
|          |   |   |                               |  | dispersion            |   |   |   |   |      | /    |         |
|          |   |   |                               |  | allows                |   |   |   |   |      |      |         |
|          |   |   |                               |  | profession            |   |   |   |   |      |      |         |
|          |   |   |                               |  | als to                |   |   |   |   |      |      |         |
|          |   |   |                               |  | advance               |   |   |   |   |      |      |         |
|          |   |   |                               |  | their                 |   |   |   |   |      |      |         |
|          |   |   |                               |  | knowledge             |   |   |   |   |      |      |         |
|          |   |   |                               |  | of                    |   |   |   |   |      |      |         |
|          |   |   |                               |  | formulatio            |   |   |   |   |      |      |         |
|          |   |   |                               |  | n creation            |   |   |   |   |      |      |         |
|          |   |   |                               |  | and                   |   |   |   |   |      |      |         |
|          |   |   |                               |  |                       |   |   |   |   |      |      |         |
|          |   |   |                               |  | process<br>optimisati |   |   |   |   |      |      |         |
|          |   |   |                               |  |                       |   |   |   |   |      |      |         |
|          |   |   |                               |  | on. By                |   |   |   |   |      |      |         |
|          |   |   |                               |  | mastering             |   |   |   |   |      |      |         |

| Unit IV | - | - | By facilitating the administration of poorly soluble medications and increasing their bioavailability and therapeutic potency, colloidal dispersions benefit society. Additionally, colloidal dispersions are used in a variety of industries, such as | _ | - | these abilities, people can develop a variety of industries and contribute to the productive production of high-quality goods.  Micromeritics assists in the development of profession al skills by instructing profession | - | - | _ | - | Skil<br>ls<br>for<br>Dec<br>ent<br>Wor<br>k<br>(SD<br>G | Pro mot ing Hig h-qual ity rese arch | Global<br>Educati<br>on<br>Knowle<br>dge |
|---------|---|---|--|---|---|--|---|---|---|---|---|--------------------------------------|--|
|         |   |   | colloidal dispersions benefit society. Additionally, colloidal dispersions are used in a   |   |   | profession<br>al skills by<br>instructing  |   |   |   |   | Wor<br>k<br>(SD   | qual<br>ity<br>rese                  | dge                                      |

|        |   |   |   |                                  |   |   | person's    |   |   |   |    |      |      |         |
|--------|---|---|---|----------------------------------|---|---|-------------|---|---|---|----|------|------|---------|
|        |   |   |   |                                  |   |   | -           |   |   |   |    |      |      |         |
|        |   |   |   |                                  |   |   | career      |   |   |   |    |      |      |         |
|        |   |   |   |                                  |   |   | prospects,  |   |   |   |    |      |      |         |
|        |   |   |   |                                  |   |   | and         |   |   |   |    |      |      |         |
|        |   |   |   |                                  |   |   | industry    |   |   |   |    |      |      |         |
|        |   |   |   |                                  |   |   | contributio |   |   |   |    |      |      |         |
|        |   |   |   |                                  |   |   | ns are      |   |   |   |    |      |      |         |
|        |   |   |   |                                  |   |   | improved    |   |   |   |    |      |      |         |
|        |   |   |   |                                  |   |   | by their    |   |   |   |    |      |      |         |
|        |   |   |   |                                  |   |   | ability to  |   |   |   |    |      |      |         |
|        |   |   |   |                                  |   |   | contribute  |   |   |   |    |      |      |         |
|        |   |   |   |                                  |   |   | to product  |   |   |   |    |      |      |         |
|        |   |   |   |                                  |   |   | developme   |   |   |   |    |      |      |         |
|        |   |   |   |                                  |   |   | nt, quality |   |   |   |    |      |      |         |
|        |   |   |   |                                  |   |   | assurance,  |   |   |   |    |      |      |         |
|        |   |   |   |                                  |   |   | and         |   |   |   |    |      |      |         |
|        |   |   |   |                                  |   |   | process     |   |   |   |    |      |      |         |
|        |   |   |   |                                  |   |   | optimisati  |   |   |   |    |      |      |         |
|        |   |   |   |                                  |   |   | on. They    |   |   |   |    |      |      |         |
|        |   |   |   |                                  |   |   | are used in |   |   |   |    |      |      |         |
|        |   |   |   |                                  |   |   |             |   |   |   |    |      |      |         |
|        |   |   |   |                                  |   |   | industries  |   |   |   |    |      |      |         |
|        |   |   |   |                                  |   |   | including   |   |   |   |    |      |      |         |
|        |   |   |   |                                  |   |   | materials   |   |   |   |    |      |      |         |
|        |   |   |   |                                  |   |   | engineerin  |   |   |   |    |      |      |         |
|        |   |   |   |                                  |   |   | g,          |   |   |   |    |      |      |         |
|        |   |   |   |                                  |   |   | cosmetics,  |   |   |   |    |      |      |         |
|        |   |   |   |                                  |   |   | and         |   |   |   |    |      |      |         |
|        |   |   |   |                                  |   |   | medicines.  |   |   |   |    |      |      |         |
| Unit v | - | - | - | Drug stability makes a           | - | - | By giving   | - | - | - | No | Skil | Pro  | Global  |
|        |   |   |   | difference by preserving the     |   |   | profession  |   |   |   |    | ls   | mot  | Educati |
|        |   |   |   | quality, safety, and efficacy of |   |   | als         |   |   |   |    | for  | ing  | on      |
|        |   |   |   | pharmaceutical products over     |   |   | informatio  |   |   |   |    | Dec  | Hig  | Knowle  |
|        |   |   |   | the course of their shelf lives. |   |   | n and       |   |   |   |    | ent  | h-   | dge     |
|        |   |   |   | It makes it possible for people  |   |   | competenc   |   |   |   |    | Wor  | qual |         |
|        |   |   |   | all over the world to have       |   |   | e in        |   |   |   |    | k    | ity  |         |
|        |   | l |   | an over the world to have        |   |   | C 111       |   | l | l | l  | 11   | ııy  |         |

| access to safe and effective | stability   |  | (SD  | rese |  |
|------------------------------|-------------|--|------|------|--|
| pharmaceuticals, encourages  | testing     |  | Ġ    | arch |  |
| regulatory compliance, and   | procedures  |  | 4.4) | (18. |  |
| supports global standards,   | ,           |  | ŕ    | 1-   |  |
| ultimately leading to an     | degradatio  |  |      | 18.9 |  |
| improvement in patient       | n           |  |      | )    |  |
| outcomes and public health   | mechanis    |  |      |      |  |
| globally.                    | ms, and     |  |      |      |  |
|                              | formulatio  |  |      |      |  |
|                              | n           |  |      |      |  |
|                              | optimisati  |  |      |      |  |
|                              | on,         |  |      |      |  |
|                              | understand  |  |      |      |  |
|                              | ing         |  |      |      |  |
|                              | medicatio   |  |      |      |  |
|                              | n stability |  |      |      |  |
|                              | aids in the |  |      |      |  |
|                              | developme   |  |      |      |  |
|                              | nt of       |  |      |      |  |
|                              | profession  |  |      |      |  |
|                              | al skills.  |  |      |      |  |
|                              | These       |  |      |      |  |
|                              | talents     |  |      |      |  |
|                              | help        |  |      |      |  |
|                              | individual  |  |      |      |  |
|                              | s to        |  |      |      |  |
|                              | improve     |  |      |      |  |
|                              | their       |  |      |      |  |
|                              | capabilitie |  |      |      |  |
|                              | s and       |  |      |      |  |
|                              | contributio |  |      |      |  |
|                              | ns to the   |  |      |      |  |
|                              | industry    |  |      |      |  |
|                              | by .        |  |      |      |  |
|                              | ensuring    |  |      |      |  |

|  | product   |
|--|-----------|
|  | quality,  |
|  | resolving |
|  | stability |
|  | Stability |
|  | problems, |
|  | and       |
|  | making    |
|  | wise      |
|  | decisions |
|  | in        |
|  | pharmaceu |
|  | tical     |
|  | research  |
|  | and       |
|  | developme |
|  | nt        |

| BP408P                     | Pharmacology-I (Practical) | L | T | P | C |
|----------------------------|----------------------------|---|---|---|---|
| Version 2.0                |                            | 0 | 0 | 4 | 2 |
| <b>Total Contact Hours</b> | 60 Hours                   |   |   |   |   |
| Pre-requisites/Exposure    | Pharmacology               |   |   |   |   |
| Co-requisites              | Pathophysiology            |   |   |   |   |

# Upon completion of this course the student should be able to

- 1. Understand the pharmacological actions of different categories of drugs.
- 2. Explain the mechanism of drug action at organ system/sub cellular/macromolecular levels.
- 3. Observe the effect of drugs on animals by simulated experiments.

# **Course Outcomes (CO)**

On completion of this course, the student will be able to:

CO1. Knowledge of the practical aspect of general pharmacological techniques.

CO2. Understand the effect of drugs acting on CNS and PNS using animal simulator.

|     | Programme and Course Mapping                            |     |     |     |     |     |     |     |     |          |      |      |           |       |
|-----|---|-----|-----|-----|-----|-----|-----|-----|-----|----------|------|------|-----------|-------|
| СО  | PO1   | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO<br>10 | PO11 | PO12 | PSO1<br>1 | PSO 2 |
| CO1 |   |     |     |     |     |     |     |     |     |          |      |      |           |       |
| CO2 | 2   |     |     |     |     |     |     | 3   |     |          | 3    |      |           |       |
|     | 1=lightly mapped 2= moderately mapped 3=strongly mapped |     |     |     |     |     |     |     |     |          |      |      |           |       |

| Uni | ance to the<br>national,<br>all and glob | spaau    |          |        | Relevance To the Employability/ | Entrepreneurship/<br>Skill Development |                   | Relevance to the<br>Professional Ethics,<br>Gender, Human | Values,<br>Environment & | Sustainability |                              | SDG | NEP | POE/4 <sup>th</sup> IR |
|-----|--|----------|----------|--------|---------------------------------|--|-------------------|---|--------------------------|----------------|------------------------------|-----|-----|------------------------|
|     | Local                                    | Regional | National | Global | Employability                   | Entrepreneurship                       | Skill Development | Professional Ethics                                       | Gender                   | Human Values   | Environment & Sustainability |     |     |                        |

| Unit |   |   | Pre-     | In          | Skill   |  | Skil | Prof | Skill   |
|------|---|---|----------|-------------|---------|--|------|------|---------|
| I    |   |   | clinical | experimen   | develop |  | ls   | essi | Develo  |
|      |   |   | studies  | tal         | ment    |  | for  | onal | pment   |
|      |   |   | are      | pharmacol   |         |  | Dec  | Edu  |         |
|      |   |   | conduc   | ogy,        |         |  | ent  | cati |         |
|      |   |   | ted      | covers the  |         |  | Wor  | on   |         |
|      |   |   | world    | basic       |         |  | k    | (17. |         |
|      |   |   | wide,    | concepts    |         |  | (SD  | 1-   |         |
|      |   |   | and      | of animal   |         |  | G    | 17.5 |         |
|      |   |   | trained  | laboratorie |         |  | 4.4) | )    |         |
|      |   |   | the      | s animals   |         |  | Skil |      |         |
|      |   |   | student  | commonly    |         |  | ls   |      |         |
|      |   |   | S        | instrument  |         |  | for  |      |         |
|      |   |   |          | s used thus |         |  | Dec  |      |         |
|      |   |   |          | helps in    |         |  | ent  |      |         |
|      |   |   |          | Skill       |         |  | Wor  |      |         |
|      |   |   |          | developme   |         |  | k    |      |         |
|      |   |   |          | nt          |         |  | (SD  |      |         |
|      |   |   |          |             |         |  | G    |      |         |
|      |   |   |          |             |         |  | 4.4) |      |         |
|      |   |   |          |             |         |  |      |      |         |
| Unit | - | - | In this, | This unit   | Skill   |  |      | Prof | Employ  |
| II   |   |   | pharma   | based       | develop |  |      | essi | ability |
|      |   |   | cology   | commonly    | ment    |  |      | onal |         |
|      |   |   | instru   | instrument  |         |  |      | Edu  |         |
|      |   |   | ments    | and their   |         |  |      | cati |         |
|      |   |   | are      | applicatio  |         |  |      | on   |         |
|      |   |   | discuss  | n on        |         |  |      | (17. |         |
|      |   |   | ed with  | research    |         |  |      | 1-   |         |
|      |   |   | basic    | and         |         |  |      | 17.5 |         |
|      |   |   | princip  | developme   |         |  |      | )    |         |
|      |   |   | le and   | nts and     |         |  |      |      |         |
|      |   |   | workin   | this helps  |         |  |      |      |         |
|      |   |   | g,       | in kill     |         |  |      |      |         |
|      |   |   | enable   | developme   |         |  |      |      |         |

|      | Ţ |   | d 41a a     | 4           |  |  |        |
|------|---|---|-------------|-------------|--|--|--------|
|      |   |   | d the       | nt          |  |  |        |
|      |   |   | student     |             |  |  |        |
|      |   |   | s to fit    |             |  |  |        |
|      |   |   | for the     |             |  |  |        |
|      |   |   | profess     |             |  |  |        |
|      |   |   | ional       |             |  |  |        |
|      |   |   | workfo      |             |  |  |        |
|      |   |   | rce         |             |  |  |        |
|      |   |   | globall     |             |  |  |        |
|      |   |   | y           |             |  |  |        |
| Unit |   | - | Globall     | In this,    |  |  | Skill  |
| III  |   |   | у,          | students    |  |  | Develo |
|      |   |   | y,<br>Blood | learned     |  |  | pment  |
|      |   |   | withdr      | and         |  |  | 1      |
|      |   |   | awal,       | trained     |  |  |        |
|      |   |   | serum       | with        |  |  |        |
|      |   |   | and         | Blood       |  |  |        |
|      |   |   | plasma      | withdrawa   |  |  |        |
|      |   |   | separat     | l, serum    |  |  |        |
|      |   |   | ion,        | and         |  |  |        |
|      |   |   | anaesth     | plasma      |  |  |        |
|      |   |   | etics       | separation, |  |  |        |
|      |   |   | and         | anaestheti  |  |  |        |
|      |   |   | euthan      | cs and      |  |  |        |
|      |   |   | asia        | euthanasia  |  |  |        |
|      |   |   |             |             |  |  |        |
|      |   |   | techniq     | techniques  |  |  |        |
|      |   |   | ues         | used for    |  |  |        |
|      |   |   | used in     | animal      |  |  |        |
|      |   |   | researc     | studies     |  |  |        |
|      |   |   | h and       |             |  |  |        |
|      |   |   | develo      |             |  |  |        |
|      |   |   | pment       |             |  |  |        |
|      |   |   | in the      |             |  |  |        |
|      |   |   | clinical    |             |  |  |        |
|      |   |   | and pre     |             |  |  |        |

|           |  | clinical<br>studies   |   |  |            |              |                          |
|-----------|--|---|---|--|------------|--------------|--------------------------|
|           |  |   |   |  |            |              |                          |
| Unit      |  | Globall y, Glauco ma, catarac t and other eye disorde rs are increas ing to many folds, thus trained the student s and make them availab le as skilled researc hers | In this, students will learn about the different drugs available and their effect on rabbit eye |  |            |              | Skill<br>Develo<br>pment |
| Unit<br>v |  | Globall   | In skeletal muscle  |  | Skil<br>ls | Prof<br>essi | Employ ability           |
|           |  | y,<br>Skeleta   | relaxants   |  | for        | onal         |                          |

| 1        | using rota- | Dec  | Edu  |
|----------|-------------|------|------|
| Muscle   | rod         | ent  | cati |
| s        | apparatus   | Wor  | on   |
| disorde  | experimen   | k    | (17. |
| rs over  | t, students | (SD  | 1-   |
| the      | will learn  | G    | 17.5 |
| age,     | the         | 4.4) | )    |
| their    | neurophar   |      | ,    |
| pathog   | macology    |      |      |
| enesis,  | and helps   |      |      |
| and      | in skill    |      |      |
| challen  | developme   |      |      |
| ges to   | nt          |      |      |
| overco   |             |      |      |
| me the   |             |      |      |
| disorde  |             |      |      |
| rs and   |             |      |      |
|          |             |      |      |
| develo   |             |      |      |
| pment    |             |      |      |
| in the   |             |      |      |
| clinical |             |      |      |
| and      |             |      |      |
| pre-     |             |      |      |
| clinical |             |      |      |
| studies  |             |      |      |

| BP409P                     | Pharmacognosy and Phytochemistry-I (Practical) | L | T | P | C |
|----------------------------|--|---|---|---|---|
| Version 2.0                |  | 0 | 0 | 4 | 2 |
| <b>Total Contact Hours</b> | 60 Hours                                       |   |   |   |   |

| Pre-requisites/Exposure | Remedial Biology Practical |
|-------------------------|----------------------------|
| Co-requisites           | Pharmacognosy              |
|                         |                            |

## Upon completion of this course the student should be able to:

- 1. Understand various physicochemical properties of drug molecules in the designing the dosage forms
- 2. Know the principles of chemical kinetics & to use them for stability testing and determination of expiry date of formulations
- 3. Demonstrate use of physicochemical properties in the formulation development and evaluation of dosage forms.

## **Course Outcomes (CO)**

## On completion of this course, the student will be able to:

- CO1. State the physicochemical properties of drug molecules
- CO2. Analyze the chemical stability tests of various drug products and determination of expiry date of formulations
- CO3. Have basic knowledge of physicochemical properties in the formulation development and evaluation of dosage forms.

|                  | Programme and Course Mapping |     |     |     |     |     |  |     |     |       |      |      |       |       |
|------------------|------------------------------|-----|-----|-----|-----|-----|--|-----|-----|-------|------|------|-------|-------|
| CO               | PO1                          | PO2 | PO3 | PO4 | PO5 | PO6 | PO7                                    | PO8 | PO9 | PO 10 | PO11 | PO12 | PSO 1 | PSO 2 |
| CO1              | 3                            | 2   | 1   |     |     |     |  |     |     |       |      |      |       |       |
| CO2              | 3                            | 2   |     |     |     |     |  |     |     |       |      |      |       |       |
| CO3              | 3                            | 3   | 2   |     |     |     |  |     |     |       |      |      |       |       |
| 1=lightly mapped |                              |     |     |     |     |     | 2= moderately mapped 3=strongly mapped |     |     |       |      |      |       |       |

| Unit | vance to the , national, nal and global lopmental s | vance To the<br>loyability/<br>epreneurship/<br>Development | vance to the essional Ethics, ler, Human es, ronment & ainability |     |     | /4 <sup>th</sup> IR |
|------|---|---|---|-----|-----|---------------------|
|      | Relevar<br>local, na<br>regiona<br>develop<br>needs | Relevar<br>Employ<br>Entrepi<br>Skill De                    | Relevar<br>Profess<br>Gender<br>Values,<br>Enviror<br>Sustain     | SDG | NEP | POE/4 <sup>t</sup>  |

|      | Local | Regional | National | Global  | Employability | Entrepreneurship | Skill Development                                       | Professional Ethics | Gender | Human Values | Environment & Sustainability |   |                                    |  |
|------|-------|----------|----------|---|---------------|------------------|---|---------------------|--------|--------------|------------------------------|---|------------------------------------|--|
| Unit |       | -        | -        | Globall ly it will in underst anding the various moder n analyti cal techniq ues to authent icate and quality control of crude drugs. | -             | -                | to know the crude drugs, their uses and chemical nature |                     |        |              |                              | Skil<br>l for<br>dece<br>nt<br>wor<br>k<br>(SD<br>G<br>4.4) | Professional education (17.1-17.5) | Global<br>educati<br>on<br>knowle<br>dge |

| Unit | - | - | _ | _ | _     | Medici   | To know    | _ | _ | _ | _ | Qua   | Prof  | Techni  |
|------|---|---|---|---|-------|----------|------------|---|---|---|---|-------|-------|---------|
| II   |   |   |   |   |       | nal and  | the        |   |   |   |   | lity  | essi  | cal     |
|      |   |   |   |   |       | aromati  | evaluation |   |   |   |   | pri   | onal  | skills  |
|      |   |   |   |   |       | c plants | techniques |   |   |   |   | mar   | edu   | that    |
|      |   |   |   |   |       | is an    | for the    |   |   |   |   | y/se  | cati  | match   |
|      |   |   |   |   |       | approac  | herbal     |   |   |   |   | con   | on    | Industr |
|      |   |   |   |   |       | h of     | drugs      |   |   |   |   | dary  | (17.  | y needs |
|      |   |   |   |   |       | develop  |            |   |   |   |   | edu   | 1-    |         |
|      |   |   |   |   |       | ing      |            |   |   |   |   | cati  | 17.5  |         |
|      |   |   |   |   |       | human    |            |   |   |   |   | on    | )     |         |
|      |   |   |   |   |       | resourc  |            |   |   |   |   | for   |       |         |
|      |   |   |   |   |       | e and    |            |   |   |   |   | all   |       |         |
|      |   |   |   |   |       | train    |            |   |   |   |   | (SD   |       |         |
|      |   |   |   |   |       | the      |            |   |   |   |   | Ġ     |       |         |
|      |   |   |   |   |       | youth    |            |   |   |   |   | 4.1)  |       |         |
|      |   |   |   |   |       | for.     |            |   |   |   |   |       |       |         |
| Unit | - | - | - | - | pha   | -        | to know    | - | - | - | - | Skil  | Adu   | Global  |
| III  |   |   |   |   | rma   |          | the crude  |   |   |   |   | 1 for | lt    | educati |
|      |   |   |   |   | cog   |          | drugs,     |   |   |   |   | dece  | edu   | on      |
|      |   |   |   |   | nos   |          | their uses |   |   |   |   | nt    | cati  | knowle  |
|      |   |   |   |   | У     |          | and        |   |   |   |   | wor   | on    | dge     |
|      |   |   |   |   | help  |          | chemical   |   |   |   |   | k     | and   |         |
|      |   |   |   |   | to    |          | nature     |   |   |   |   | (SD   | lifel |         |
|      |   |   |   |   | test, |          |            |   |   |   |   | G     | ong   |         |
|      |   |   |   |   | defi  |          |            |   |   |   |   | 4.4   | lear  |         |
|      |   |   |   |   | ne,   |          |            |   |   |   |   |       | ning  |         |
|      |   |   |   |   | and   |          |            |   |   |   |   |       | (21.  |         |
|      |   |   |   |   | crea  |          |            |   |   |   |   |       | 1-    |         |
|      |   |   |   |   | te    |          |            |   |   |   |   |       | 21.1  |         |
|      |   |   |   |   | nov   |          |            |   |   |   |   |       | 0)    |         |
|      |   |   |   |   | el    |          |            |   |   |   |   |       |       |         |
|      |   |   |   |   | med   |          |            |   |   |   |   |       |       |         |
|      |   |   |   |   | icati |          |            |   |   |   |   |       |       |         |
|      |   |   |   |   | ons   |          |            |   |   |   |   |       |       |         |
|      |   |   |   |   | for   |          |            |   |   |   |   |       |       |         |

|       |   |   |   |         | the       |   |             |   |   |   |   |       |          |         |
|-------|---|---|---|---------|-----------|---|-------------|---|---|---|---|-------|----------|---------|
|       |   |   |   |         | trea      |   |             |   |   |   |   |       |          |         |
|       |   |   |   |         |           |   |             |   |   |   |   |       |          |         |
|       |   |   |   |         | tme<br>nt |   |             |   |   |   |   |       |          |         |
|       |   |   |   |         | of        |   |             |   |   |   |   |       |          |         |
|       |   |   |   |         | hu        |   |             |   |   |   |   |       |          |         |
|       |   |   |   |         |           |   |             |   |   |   |   |       |          |         |
|       |   |   |   |         | man       |   |             |   |   |   |   |       |          |         |
|       |   |   |   |         | illn      |   |             |   |   |   |   |       |          |         |
| TT '4 |   |   |   | C1 1 11 | ess       |   | . 1         |   |   |   |   |       | Г        | T. 1 .  |
| Unit  | - | - | - | Globall | -         | - | to know     | - | - | - | - | Qua   | Equ      | Techni  |
| IV    |   |   |   | ly it   |           |   | the         |   |   |   |   | lity  | itabl    | cal     |
|       |   |   |   | will in |           |   | techniques  |   |   |   |   | pri   | e        | skills  |
|       |   |   |   | underst |           |   | in the      |   |   |   |   | mar   | and      | that    |
|       |   |   |   | anding  |           |   | cultivation |   |   |   |   | y/se  | Incl     | match   |
|       |   |   |   | the .   |           |   | and         |   |   |   |   | con   | usiv     | Industr |
|       |   |   |   | various |           |   | production  |   |   |   |   | dary  | e        | y needs |
|       |   |   |   | moder   |           |   | of crude    |   |   |   |   | edu   | Edu      |         |
|       |   |   |   | n       |           |   | drugs       |   |   |   |   | cati  | cati     |         |
|       |   |   |   | analyti |           |   |             |   |   |   |   | on    | on:      |         |
|       |   |   |   | cal     |           |   |             |   |   |   |   | for   | Lea      |         |
|       |   |   |   | techniq |           |   |             |   |   |   |   | all   | rnin     |         |
|       |   |   |   | ues to  |           |   |             |   |   |   |   | (SD   | g<br>for |         |
|       |   |   |   | authent |           |   |             |   |   |   |   | G     |          |         |
|       |   |   |   | icate   |           |   |             |   |   |   |   | 4.1)  | all      |         |
|       |   |   |   | and     |           |   |             |   |   |   |   |       | (6.1     |         |
|       |   |   |   | quality |           |   |             |   |   |   |   |       | -        |         |
|       |   |   |   | control |           |   |             |   |   |   |   |       | 6.20     |         |
|       |   |   |   | of      |           |   |             |   |   |   |   |       | )        |         |
|       |   |   |   | crude   |           |   |             |   |   |   |   |       |          |         |
|       |   |   |   | drugs.  |           |   |             |   |   |   |   |       |          |         |
| Unit  | - | - | - | -       | -         | - | to know     | - | - | - | - | Skil  | Adu      | Global  |
| V     |   |   |   |         |           |   | the crude   |   |   |   |   | 1 for | lt       | educati |
|       |   |   |   |         |           |   | drugs,      |   |   |   |   | dece  | edu      | on      |
|       |   |   |   |         |           |   | their uses  |   |   |   |   | nt    | cati     | knowle  |
|       |   |   |   |         |           |   | and         |   |   |   |   | wor   | on       | dge     |

|      |   |   |   |         |   |   | chemical   |   |   |   |   | k     | and   |         |
|------|---|---|---|---------|---|---|------------|---|---|---|---|-------|-------|---------|
|      |   |   |   |         |   |   | nature     |   |   |   |   | (SD   | lifel |         |
|      |   |   |   |         |   |   |            |   |   |   |   | Ġ     | ong   |         |
|      |   |   |   |         |   |   |            |   |   |   |   | 4.4   | lear  |         |
|      |   |   |   |         |   |   |            |   |   |   |   |       | ning  |         |
|      |   |   |   |         |   |   |            |   |   |   |   |       | (21.  |         |
|      |   |   |   |         |   |   |            |   |   |   |   |       | 1-    |         |
|      |   |   |   |         |   |   |            |   |   |   |   |       | 21.1  |         |
|      |   |   |   |         |   |   |            |   |   |   |   |       | 0)    |         |
| Unit | - | - | - |         | - | - | to         | - | - | - | - | Qua   | Prof  | Global  |
| VI   |   |   |   |         |   |   | understand |   |   |   |   | lity  | essi  | educati |
|      |   |   |   |         |   |   | the        |   |   |   |   | pri   | onal  | on      |
|      |   |   |   |         |   |   | microscop  |   |   |   |   | mar   | edu   | knowle  |
|      |   |   |   |         |   |   | ic and     |   |   |   |   | y/se  | cati  | dge     |
|      |   |   |   |         |   |   | morpholog  |   |   |   |   | con   | on    |         |
|      |   |   |   |         |   |   | ical       |   |   |   |   | dary  | (17.  |         |
|      |   |   |   |         |   |   | evaluation |   |   |   |   | edu   | 1-    |         |
|      |   |   |   |         |   |   | of crude   |   |   |   |   | cati  | 17.5  |         |
|      |   |   |   |         |   |   | drugs      |   |   |   |   | on    | )     |         |
|      |   |   |   |         |   |   |            |   |   |   |   | for   |       |         |
|      |   |   |   |         |   |   |            |   |   |   |   | all   |       |         |
|      |   |   |   |         |   |   |            |   |   |   |   | (SD   |       |         |
|      |   |   |   |         |   |   |            |   |   |   |   | G     |       |         |
|      |   |   |   |         |   |   |            |   |   |   |   | 4.1)  |       |         |
| Unit | - | - | - | Globall | - | - | To know    | - | - | - | - | Skil  | Adu   | Global  |
| VII  |   |   |   | ly it   |   |   | the        |   |   |   |   | 1 for | lt    | educati |
|      |   |   |   | will in |   |   | evaluation |   |   |   |   | dece  | edu   | on      |
|      |   |   |   | underst |   |   | techniques |   |   |   |   | nt    | cati  | knowle  |
|      |   |   |   | anding  |   |   | for the    |   |   |   |   | wor   | on    | dge     |
|      |   |   |   | the     |   |   | herbal     |   |   |   |   | k     | and   |         |
|      |   |   |   | various |   |   | drugs      |   |   |   |   | (SD   | lifel |         |
|      |   |   |   | moder   |   |   |            |   |   |   |   | G     | ong   |         |
|      |   |   |   | n       |   |   |            |   |   |   |   | 4.4)  | lear  |         |
|      |   |   |   | analyti |   |   |            |   |   |   |   |       | ning  |         |
|      |   |   |   | cal     |   |   |            |   |   |   |   |       | (21.  |         |

|      |  | techniq ues to authent icate and quality control of crude drugs.   |  |   |  |   |   | 1-<br>21.1<br>0)   |  |
|------|--|--|--|---|--|---|---|--|--|
| Unit |  | Pharm acogno sy is used by pharma ceutica l compa nies to test, charact erise, and develo p new drugs for the treatme nt of human sicknes s. |  | to know the crude drugs, their uses and chemical nature |  | - | Qua<br>lity<br>pri<br>mar<br>y/se<br>con<br>dary<br>edu<br>cati<br>on<br>for<br>all<br>(SD<br>G<br>4.1) | Equitable and Inclusive Education: Learning for all (6.1 - 6.20) | Global<br>educati<br>on<br>knowle<br>dge |

| Unit      |   |   | - | It will help people compre hend the many contem porary analyti cal approa ches to authent icate and control the quality of crude pharma ceutica ls on a global scale. |   |   | to know the techniques in the cultivation and production of crude drugs |   |   | - |   | Skil<br>l for<br>dece<br>nt<br>wor<br>k<br>(SD<br>G<br>4.4) | Adu lt edu cati on and lifel ong lear ning (21. 1- 21.1 0) | Technical skills that match Industry needs   |
|-----------|---|---|---|---|---|---|---|---|---|---|---|---|--|--|
| Unit<br>X | - | - | - | Globall y it will in underst anding the various moder   | - | - | to understand the microscop ic and morpholog ical evaluation            | - | ı | - | - | Qua<br>lity<br>pri<br>mar<br>y/se<br>con<br>dary<br>edu     | Equitable e and Inclusive Edu                              | Techni cal skills that match Industr y needs |

|  | n       | of crude |  | cati | cati |  |
|--|---------|----------|--|------|------|--|
|  | analyti | drugs    |  | on   | on:  |  |
|  | cal     |          |  | for  | Lea  |  |
|  | techniq |          |  | all  | rnin |  |
|  | ues to  |          |  | (SD  | g    |  |
|  | authent |          |  | G    | for  |  |
|  | icate   |          |  | 4.1) | all  |  |
|  | and     |          |  |      | (6.1 |  |
|  | quality |          |  |      | -    |  |
|  | control |          |  |      | 6.20 |  |
|  | of      |          |  |      | )    |  |
|  | crude   |          |  |      |      |  |
|  | drugs.  |          |  |      |      |  |

# **Semester-V**

| BP501T                     | Medicinal Chemistry-II (Theory) | L | T | P | С |
|----------------------------|---------------------------------|---|---|---|---|
| Version 2.0                |                                 | 3 | 1 | 0 | 4 |
| <b>Total Contact Hours</b> | 45 Hours                        |   |   |   |   |
| Pre-requisites/Exposure    | Medicinal Chemistry             |   |   |   |   |
| Co-requisites              | Chemical Synthesis              |   |   |   |   |

# **Upon completion of the course the student shall be able to:**

- 1. Understand the chemistry of drugs with respect to their pharmacological activity
- 2. Understand the drug metabolic pathways, adverse effect and therapeutic value of drugs
- 3. Know the Structural Activity Relationship of different class of drugs
- 4. Study the chemical synthesis of selected drugs

#### **Course Outcomes (CO)**

# On completion of this course, the student will be able to:

- CO1. Get familiar with the chemistry and synthesis of medicinal substances.
- CO2. Understand the concept of structure activity relationships of drugs, importance of physicochemical properties and metabolism of drugs.
- CO3. Learn about hormone related drugs.
- CO4. To impart fundamental knowledge on the structure, chemistry, and therapeutic value of drugs.
- CO5. Acquire knowledge regarding Cardiovascular drugs and their structures

|     |     |     |     |     |         |         |     | Pro | gramn  | ne and C   | ourse M | <b>Lapping</b> |           |          |
|-----|-----|-----|-----|-----|---------|---------|-----|-----|--------|------------|---------|----------------|-----------|----------|
| CO  | PO1 | PO2 | PO3 | PO4 | PO5     | PO6     | PO7 | PO8 | PO9    | PO 10      | PO11    | PO12           | PSO 1     | PSO 2    |
| CO1 | 1   |     |     |     |         |         |     |     |        |            |         |                |           |          |
| CO2 |     | 2   |     |     |         |         |     |     |        |            |         |                |           |          |
| CO3 |     | 1   |     |     | 2       |         |     |     |        | 2          |         | 2              |           |          |
| CO4 | 2   |     | 1   |     |         |         |     |     |        |            |         |                |           |          |
| CO5 | 2   |     |     |     |         | 2       |     |     |        |            |         |                |           |          |
|     |     |     |     |     | 1=light | ly mapı | oed | 2   | = mode | erately ma | apped   |                | 3=strongl | y mapped |

| Unit | Relevance to the local, national, regional and global developmental | needs    |            |   | Relevance To the Employability/                    | Entrepreneurship/<br>Skill Development |   | Relevance to the<br>Professional Ethics,<br>Gender, Human                        | Values,<br>Environment &             | Sustainability |                              | SDG   | NEP | POE/4 <sup>th</sup> IR   |
|------|---|----------|------------|---|--|--|---|--|--------------------------------------|----------------|------------------------------|---|-----|--|
| Unit | Local   | Regional | • National | Antihis taminic agents and anticancer agents are used globall y to tackle the menac | The product ion of these drugs can gen erate a lot | ' Entrepreneurship                     | The production and quality control of these drugs helps in developin g and honing technical skills. | Usage and quality control of these drugs requires a lot of professi onal ethics. | The se ty pe s of dr u gs ar e us ed | Human Values   | Environment & Sustainability | The se type s of drug s ensu re heal thy live s and pro | -   | The product ion and quality control of these drugs helps in develop ing a lot of technic al skills and |

|      |   |   |   | C        | - C  | I |            |          | C- |   |   |      |   | 4            |
|------|---|---|---|----------|------|---|------------|----------|----|---|---|------|---|--------------|
|      |   |   |   | e of     | of   |   |            |          | fo |   |   | mot  |   | generat<br>· |
|      |   |   |   | cancer   | emp  |   |            |          | r  |   |   | es   |   | ing a        |
|      |   |   |   | ,        | loy  |   |            |          | ev |   |   | well |   | lot          |
|      |   |   |   | allergie | men  |   |            |          | er |   |   | bein |   | employ       |
|      |   |   |   | s ,cold  | t.   |   |            |          | У  |   |   | g of |   | ment         |
|      |   |   |   | cough    |      |   |            |          | ty |   |   | peo  |   | across       |
|      |   |   |   | etc.     |      |   |            |          | pe |   |   | ples |   | the          |
|      |   |   |   |          |      |   |            |          | of |   |   | acro |   | globe.       |
|      |   |   |   |          |      |   |            |          | ge |   |   | SS   |   |              |
|      |   |   |   |          |      |   |            |          | n  |   |   | all  |   |              |
|      |   |   |   |          |      |   |            |          | de |   |   | ages |   |              |
|      |   |   |   |          |      |   |            |          | r. |   |   | .SD  |   |              |
|      |   |   |   |          |      |   |            |          |    |   |   | G3   |   |              |
| Unit | _ | - | _ | Anti-    | The  | _ | The        | Usage    | Т  | _ | _ | The  | _ | The          |
| II   |   |   |   | anginal  | pro  |   | production | and      | he |   |   | se   |   | product      |
|      |   |   |   | and      | duct |   | and        | quality  | se |   |   | type |   | ion and      |
|      |   |   |   | anti-    | ion  |   | quality    | control  | ty |   |   | s of |   | quality      |
|      |   |   |   | hyperte  | of   |   | control of | of these | pe |   |   | drug |   | control      |
|      |   |   |   | nsive    | thes |   | these      | drugs    | S  |   |   | S    |   | of these     |
|      |   |   |   | drugsar  | e    |   | drugs      | requires | of |   |   | ensu |   | drugs        |
|      |   |   |   | e used   | dru  |   | helps in   | a lot of | dr |   |   | re   |   | helps in     |
|      |   |   |   | globall  |      |   | developin  | professi | u  |   |   | heal |   | develop      |
|      |   |   |   | y to     | gs c |   | g and      | onal     |    |   |   | thy  |   | ing a        |
|      |   |   |   | tackle   | an   |   | honing     | ethics.  | gs |   |   | live |   | lot of       |
|      |   |   |   | the      | gen  |   | technical  | eunes.   | ar |   |   |      |   | technic      |
|      |   |   |   |          | erat |   | skills.    |          | e  |   |   | S    |   | al skills    |
|      |   |   |   | attack   | e a  |   | SKIIIS.    |          | us |   |   | and  |   |              |
|      |   |   |   | of .     | lot  |   |            |          | ed |   |   | pro  |   | and          |
|      |   |   |   | angina   | of   |   |            |          | fo |   |   | mot  |   | generat<br>· |
|      |   |   |   | and      | emp  |   |            |          | r  |   |   | es   |   | ing a        |
|      |   |   |   | blood    | loy  |   |            |          | ev |   |   | well |   | lot          |
|      |   |   |   | pressur  | men  |   |            |          | er |   |   | bein |   | employ       |
|      |   |   |   | e.       | t.   |   |            |          | У  |   |   | g of |   | ment         |
|      |   |   |   |          |      |   |            |          | ty |   |   | peo  |   | across       |
|      |   |   |   |          |      |   |            |          | pe |   |   | ples |   | the          |
|      |   |   |   |          |      |   |            |          | of |   |   | acro |   | globe.       |

|            |   |   |   |  |  |   |   |  | ge<br>n<br>de<br>r   |   |   | ss<br>all<br>ages<br>.SD<br>G3   |   |  |
|------------|---|---|---|--|--|---|---|--|--|---|---|--|---|--|
| Unit       |   |   |   | Antiarrhyth mic and antihyperli pidemi c drugs used globall y to treat the arrhym ia and high chloest erol disorde rs. | The pro duct ion of these e dru gs c an gen erat e a lot of emp loy men t. |   | The production and quality control of these drugs helps in developin g and honing technical skills. | Usage and quality control of these drugs requires a lot of professi onal ethics. | The se ty pe s of dr u gs ar e us ed fo r ev er y ty pe of ge n de r |   |   | The se type s of drug s ensu re heal thy live s and pro mot es well bein g of peo ples acro ss all ages .SD G3 |   | The product ion and quality control of these drugs helps in develop ing a lot of technic al skills and generat ing a lot employ ment across the globe. |
| Unit<br>IV | - | - | - | Steroid<br>al and<br>thyroid   | The pro duct   | - | The production and  | Usage<br>and<br>quality  | T<br>he<br>se  | - | - | The se type  | 1 | The product ion and  |

|      |   |   |   | drugs   | ion  |   | quality    | control  | ty |   |   | s of |   | quality   |
|------|---|---|---|---------|------|---|------------|----------|----|---|---|------|---|-----------|
|      |   |   |   | are     | of   |   | control of | of these | pe |   |   | drug |   | control   |
|      |   |   |   | used    | thes |   | these      | drugs    | S  |   |   | S    |   | of these  |
|      |   |   |   | globall | e    |   | drugs      | requires | of |   |   | ensu |   | drugs     |
|      |   |   |   | y as    | dru  |   | helps in   | a lot of | dr |   |   | re   |   | helps in  |
|      |   |   |   | contrac | gs c |   | developin  | professi | u  |   |   | heal |   | develop   |
|      |   |   |   | eptives | an   |   | g and      | onal     | gs |   |   | thy  |   | ing a     |
|      |   |   |   | , as    | gen  |   | honing     | ethics.  | ar |   |   | live |   | lot of    |
|      |   |   |   | anti-   | erat |   | technical  |          | e  |   |   | S    |   | technic   |
|      |   |   |   | inflam  | e a  |   | skills.    |          | us |   |   | and  |   | al skills |
|      |   |   |   | matory  | lot  |   |            |          | ed |   |   | pro  |   | and       |
|      |   |   |   | agents  | of   |   |            |          | fo |   |   | mot  |   | generat   |
|      |   |   |   | and     | emp  |   |            |          | r  |   |   | es   |   | ing a     |
|      |   |   |   | also    | loy  |   |            |          | ev |   |   | well |   | lot       |
|      |   |   |   | used to | men  |   |            |          | er |   |   | bein |   | employ    |
|      |   |   |   | cure    | t.   |   |            |          | y  |   |   | g of |   | ment      |
|      |   |   |   | thyroid |      |   |            |          | ty |   |   | peo  |   | across    |
|      |   |   |   | cancer. |      |   |            |          | pe |   |   | ples |   | the       |
|      |   |   |   |         |      |   |            |          | of |   |   | acro |   | globe.    |
|      |   |   |   |         |      |   |            |          | ge |   |   | SS   |   |           |
|      |   |   |   |         |      |   |            |          | n  |   |   | all  |   |           |
|      |   |   |   |         |      |   |            |          | de |   |   | ages |   |           |
|      |   |   |   |         |      |   |            |          | r  |   |   | .SD  |   |           |
|      |   |   |   |         |      |   |            |          |    |   |   | G3   |   |           |
| Unit | - | - | - | Anti -  | The  | - | The        | Usage    | T  | - | - | The  | - | The       |
| V    |   |   |   | diabeti | pro  |   | production | and      | he |   |   | se   |   | product   |
|      |   |   |   | c and   | duct |   | and        | quality  | se |   |   | type |   | ion and   |
|      |   |   |   | local   | ion  |   | quality    | control  | ty |   |   | s of |   | quality   |
|      |   |   |   | anaesth | of   |   | control of | of these | pe |   |   | drug |   | control   |
|      |   |   |   | etics   | thes |   | these      | drugs    | S  |   |   | S    |   | of these  |
|      |   |   |   | drugs   | e    |   | drugs      | requires | of |   |   | ensu |   | drugs     |
|      |   |   |   | are     | dru  |   | helps in   | a lot of | dr |   |   | re   |   | helps in  |
|      |   |   |   | used    | gs c |   | developin  | professi | u  |   |   | heal |   | develop   |
|      |   |   |   | globall | an   |   | g and      | onal     | gs |   |   | thy  |   | ing a     |
|      |   |   |   | y to    | gen  |   | honing     | ethics.  | ar |   |   | live |   | lot of    |

| 44      | 4    | 411       |    |      | 41        |
|---------|------|-----------|----|------|-----------|
| treat   | erat | technical | e  | S    | technic   |
| diabete | e a  | skills.   | us | and  | al skills |
| S       | lot  |           | ed | pro  | and       |
| which   | of   |           | fo | mot  | generat   |
| is      | emp  |           | r  | es   | ing a     |
| called  | loy  |           | ev | well | lot       |
| as a    | men  |           | er | bein | employ    |
| silent  | t.   |           | y  | g of | ment      |
| killer. |      |           | ty | peo  | across    |
| Local   |      |           | pe | ples | the       |
| anaesth |      |           | of | acro | globe.    |
| etics   |      |           | ge | SS   |           |
| are     |      |           | n  | all  |           |
| used to |      |           | de | ages |           |
| provid  |      |           | r  | .SD  |           |
| e       |      |           |    | G3   |           |
| anaesth |      |           |    |      |           |
| esia.   |      |           |    |      |           |

| BP502T                     | Industrial Pharmacy-I (Theory) | L | T | P | C |
|----------------------------|--------------------------------|---|---|---|---|
| Version 2.0                |                                | 3 | 1 | 0 | 4 |
| <b>Total Contact Hours</b> | 45 Hours                       |   |   |   |   |
| Pre-requisites/Exposure    | Pharmaceutics                  |   |   |   |   |
| Co-requisites              | Industrial Pharmacy            |   |   |   |   |

## Upon completion of this course the student should be able to:

- 1. Know the various pharmaceutical dosage forms and their manufacturing techniques.
- 2. Know various considerations in development of pharmaceutical dosage forms.
- 3. Formulate solid, liquid and semisolid dosage forms and evaluate them for their Quality.

#### **Course Outcomes (CO)**

# On completion of this course, the student will be able to:

CO1: To understand and appreciate the influence of pharmaceutical additives and various pharmaceutical dosage forms on the performance of the drug product.

CO2: To get familiar with Pre formulation studies

CO3: To know formulation and evaluation of solid dosage form like tablets, capsules

CO4: To get familiar with aseptic conditions and formulation of parenteral preparation.

CO5: To understand various considerations in development of cosmetics.

|     | Programme and Course Mapping                            |     |     |     |     |     |     |     |     |       |      |      |       |       |  |  |  |  |  |  |  |  |  |
|-----|---|-----|-----|-----|-----|-----|-----|-----|-----|-------|------|------|-------|-------|--|--|--|--|--|--|--|--|--|
| CO  | PO1   | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO 10 | PO11 | PO12 | PSO 1 | PSO 2 |  |  |  |  |  |  |  |  |  |
| CO1 |   |     | 1   |     | 1   |     | 3   |     | 3   |       | 3    |      |       |       |  |  |  |  |  |  |  |  |  |
| CO2 | 1   |     |     |     |     |     |     |     |     |       |      |      |       | 3     |  |  |  |  |  |  |  |  |  |
| CO3 |   | 1   |     |     |     | 2   |     |     |     |       |      | 3    |       |       |  |  |  |  |  |  |  |  |  |
| CO4 |   |     | 1   |     | 2   |     |     | 3   |     | 3     |      |      |       |       |  |  |  |  |  |  |  |  |  |
| CO5 |   |     |     |     |     |     |     |     |     |       |      |      |       |       |  |  |  |  |  |  |  |  |  |
|     | 1=lightly mapped 2= moderately mapped 3=strongly mapped |     |     |     |     |     |     |     |     |       |      |      |       |       |  |  |  |  |  |  |  |  |  |

| Unit   | Relevance to the local, national, | regional and global<br>developmental<br>needs |               |  | Relevance To the<br>Employability/<br>Entrepreneurship/<br>Skill Development  |                  |                   | Relevance to the    | Gender, Human | Values,<br>Environment & | Sustainability               | SDG  | NEP  | POE/4 <sup>th</sup> IR                   |
|--------|-----------------------------------|---|---------------|--|---|------------------|-------------------|---------------------|---------------|--------------------------|------------------------------|--|--|--|
| Unit I | Local                             | Regional                                      | National<br>' | Preformulation studies play a vital role in drug development by investigating the physicochemical properties of drug substances, aiming to understand their behaviour and stability. By providing valuable data and insights, preformulation | Preformulation studies offer a valuable opportunity for skill development in the pharmaceutical industry, enhancing knowledge and expertise in the characterization and analysis of | Entrepreneurship | Skill Development | Professional Ethics | ' Gender      | Human Values             | Environment & Sustainability | "En sure heal thy live s and pro mot e well - bein g | Pro mot ing Hig hj-qual ity rese arch (18. 1-18.9) | Global<br>Educati<br>on<br>Knowle<br>dge |

|         |   |   | studies contribute<br>globally to the<br>development of safe<br>and effective<br>pharmaceutical<br>products.   | drug substances, formulation development, and optimization techniques. By actively engaging in preformulation studies, individuals can acquire practical skills that are highly relevant for a successful career in pharmaceutical research and development. |  |   |   |     |  | for<br>all<br>at<br>all<br>ages<br>(SD<br>G 3)                  |  |  |
|---------|---|---|--|--|--|---|---|-----|--|---|--|--|
| Unit II | - | - | Tablets contribute globally by providing a convenient, portable, and easily administered dosage form, facilitating widespread access to medication and improving patient compliance, thereby positively impacting public health on a global scale. | Tables can contribute to employability by providing a platform for organizing and presenting information in a structured manner, enabling individuals to showcase their skills, qualifications, and experiences effectively.                                 | Tables can support entrepren eurship by aiding in business planning, financial analysis, and data organizat ion, empower ing entrepren | - | - | N C |  | "En sure heal thy live s and pro mot e well - bein g for all at | Pro mot ing Hig hj-qual ity rese arch (18. 1-18.9) | Global<br>Educati<br>on<br>Knowle<br>dge |

|            |   | eurs to make informed decisions , communi cate their ideas, and drive the growth of their   |   |        | all<br>ages<br>(SD<br>G 3)  |  |  |
|------------|---|---|---|--------|---|--|--|
| Unit III - | Liquid orals contribute globally by providing a more accessible and user-friendly medication option, especially for vulnerable populations like children and the elderly. Their ease of administration and accurate dosing improve patient compliance, leading to better health outcomes worldwide. | ventures.  Liquid orals contribut e to entrepren eurship by offering opportun ities for formulati on develop ment, product innovatio n, and niche market creation, allowing entrepren | - | N<br>o | "En sure heal thy live s and pro mot e well bein g for all at all ages (SD G 3) " | Pro mot ing Hig hj-qual ity rese arch (18. 1-18.9) | Global<br>Educati<br>on<br>Knowle<br>dge |

| Unit IV | Capsules contribute globally by providing an efficient and versatile dosage form, allowing for precise and convenient drug delivery. They offer flexibility in formulation, ease of swallowing, and compatibility with various active ingredients, contributing to global access to medication | Capsules contribute to employability by creating job opportunities in pharmaceutical manufacturing, formulation development, quality control, and regulatory affairs, requiring specialized skills and expertise. The widespread | eurs to tap into the growing demand for liquid medicati ons and establish their own pharmac eutical ventures. | - | - | - | No | - | "En sure heal thy live s and pro mot e well bein g for | Pro mot ing Hig hj-qual ity rese arch (18. 1-18.9) | Global<br>Educati<br>on<br>Knowle<br>dge |
|---------|--|--|---|---|---|---|----|---|--|--|--|
|         | contributing to global access to medication and improved patient   | and expertise. The widespread use of capsules  |   |   |   |   |    |   | g<br>for<br>all  | )  |  |
|         | compliance.  | also increases<br>demand for<br>professionals in<br>sales, marketing,  |   |   |   |   |    |   | at<br>all<br>ages<br>(SD                               |  |  |
|         |  | and distribution, further  |   |   |   |   |    |   | G 3)   |  |  |

|        |  |   |  | enhancing<br>employability in<br>the<br>pharmaceutical<br>industry.  |  |   |     |   |  |  |
|--------|--|---|--|--|--|---|-----|---|--|--|
| Unit V |  | - | They play a critical role in emergency care, disease treatment, and patient management, thereby improving healthcare outcomes on a global scale. | The specialized knowledge and expertise required in parenteral preparation offer diverse career prospects in pharmaceutical manufacturing, clinical research, and healthcare settings, enhancing employability in the pharmaceutical industry. |  | - | - N | "En sure heal thy live s and pro mot e well bein g for all at all ages (SD G 3) " | Pro mot ing Hig hj-qual ity rese arch (18. 1-18.9) | Global<br>Educati<br>on<br>Knowle<br>dge |

| BP503T                     | Pharmacology-II (Theory)   | L | T | P | C |
|----------------------------|----------------------------|---|---|---|---|
| Version 2.0                |                            | 3 | 1 | 0 | 4 |
| <b>Total Contact Hours</b> | 45 Hours                   |   |   |   |   |
| Pre-requisites/Exposure    | Pharmacology-I             |   |   |   |   |
| Co-requisites              | HAP-II and Pathophysiology |   |   |   |   |
|                            |                            |   |   |   |   |

## Upon completion of this course the student should be able to:

- 1. Understand the mechanism of drug action and its relevance in the treatment of different diseases
- 2. Demonstrate isolation of different organs/tissues from the laboratory animals by simulated experiments
- 3. Demonstrate the various receptor actions using isolated tissue preparation
- 4. Appreciate correlation of pharmacology with related medical sciences

# **Course Outcomes (CO)**

## On completion of this course, the student will be able to:

- CO1. To impart the fundamental knowledge on various aspects (classification, mechanism of action, therapeutic effects, clinical uses, side effects and contraindications) of drugs acting on different systems of body.
- CO2. To emphasis on the basic concepts of bioassay.
- CO3. Apprise the students with the various effects of drugs on human body.
- CO4. Acquire knowledge about Metabolism & excretion of drugs, principles of Clinical Pharmacokinetics.
- CO5. Understand the pharmacology of CVS.

|     | Programme and Course Mapping |     |     |     |     |     |     |     |     |       |      |      |       |       |
|-----|------------------------------|-----|-----|-----|-----|-----|-----|-----|-----|-------|------|------|-------|-------|
| CO  | PO1                          | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO 10 | PO11 | PO12 | PSO 1 | PSO 2 |
| CO1 | 1                            |     |     | 2   |     |     | 3   |     |     |       |      |      |       |       |
| CO2 |                              | 1   |     |     |     | 2   |     |     |     |       | 3    |      |       |       |
| CO3 |                              |     | 1   |     | 2   |     |     |     | 3   |       |      | 3    |       | 3     |
| CO4 |                              | 1   | 1   | 2   |     |     |     |     |     |       |      |      |       |       |

| CO5 |  |  |        |                     |      |        |           |        |         |            |  |
|-----|--|--|--------|---------------------|------|--------|-----------|--------|---------|------------|--|
|     |  |  | 1=ligh | tly ma <sub>l</sub> | pped | 2= mod | acraicry. | mapped | 3=stron | gly mapped |  |

| Unit | Relevance to the local, national, regional and global developmental | needs    |          |   | Relevance To the<br>Employability/ | Entrepreneurship/<br>Skill Development |   | Relevance to the<br>Professional Ethics | Gender, Human | Values,<br>Environment & | Sustainability               | SDG   | NEP  | POE/4 <sup>th</sup> IR                   |
|------|---|----------|----------|---|------------------------------------|--|---|---|---------------|--------------------------|------------------------------|---|--|--|
| Unit | Local   | Regional | National | Studies related to the mechanism of drug action and its relevance in the treatment of diseases related to cardiovascular system | ' Employability                    | Entrepreneurship                       | Understanding basics of drug related to cardiovascular system | Professional Ethics                     | Gender        | Human Values             | Environment & Sustainability | Ensure healthy lives and promote well-being for all at all ages SDG 3 and Skills for Decent | Prof<br>essi<br>onal<br>edu<br>cati<br>on(<br>17.1 | Global<br>educati<br>on<br>knowle<br>dge |

|             |   |   |   |   |   |   |   |   |   |   |   | Work SDG<br>4.4  | 17.5  |  |
|-------------|---|---|---|---|---|---|---|---|---|---|---|--|---|--|
| Unit<br>II  | - | - | - | Emphasize on general principles related to drugs used in therapy of shock, hemtinics, coagulants, anticoagulants, fibrinolytics, anti-platelet and plasma volume expanders as well as on urinary system | - | - | The basic pharmacology of drug therapy of shock, hemtinics, coagulants, anticoagulants, fibrinolytics, anti-platelet and plasma volume expanders as well as on urinary system | - | - | - | - | Ensure<br>healthy lives<br>and promote<br>well-being<br>for all at all<br>ages SDG 3                     | Prof<br>essi<br>onal<br>edu<br>cati<br>on(<br>17.1<br>-<br>17.5 | Global<br>educati<br>on<br>knowle<br>dge |
| Unit<br>III |   | - | - | Studies related to<br>autocoids and related<br>drugs plays an important<br>role in creating awareness<br>on mechanism and<br>pharmacological action of<br>these drugs                                   |   |   | Understanding<br>basics of drug<br>related to<br>autocoids and<br>related drugs   | - | - | - | - | Ensure healthy lives and promote well-being for all at all ages SDG 3 and Skills for Decent Work SDG 4.4 | Professional education(17.1-17.5)                               | Global<br>educati<br>on<br>knowle<br>dge |
| Unit<br>IV  | - | - | - | Emphasize to drugs acting on endocrine system plays an important role in creating awareness on mechanism and pharmacological action of drugs  |   |   | Understanding<br>basics of drug<br>acting on<br>endocrine<br>system   | - | - | - | - | Ensure<br>healthy lives<br>and promote<br>well-being<br>for all at all<br>ages SDG 3                     | Prof<br>essi<br>onal<br>edu<br>cati<br>on(<br>17.1              | Global<br>educati<br>on<br>knowle<br>dge |

|      |   |   |   |  |  |   |   |   |   |   |  | -<br>17.5<br>)                    |  |
|------|---|---|---|--|--|---|---|---|---|---|--|-----------------------------------|--|
| Unit | - | - | - | Understanding of general principles, applications and principles related to bioassay |  | To understand<br>the basic<br>knowledge<br>related to<br>bioassay | - | - | - | - | Ensure healthy lives and promote well-being for all at all ages SDG 3 and Skills for Decent Work SDG 4.4 | Professional education(17.1-17.5) | Global<br>educati<br>on<br>knowle<br>dge |

| BP504T                     | Pharmacognosy and Phytochemistry II—<br>Theory | L | T | P | C |
|----------------------------|--|---|---|---|---|
| Version 2.0                |  | 3 | 1 | 0 | 4 |
| <b>Total Contact Hours</b> | 45 Hours                                       |   |   |   |   |
| Pre-requisites/Exposure    | Pharmacognosy & Phytochemistry-I               |   |   |   |   |
| Co-requisites              | Remedial Biology                               |   |   |   |   |

# Upon completion of this course the student should be able to:

- 1. To know the modern extraction techniques, characterization and identification of the herbal drugs and phytoconstituents
- 2. To understand the preparation and development of herbal formulation.
- 3. To understand the herbal drug interactions
- 4. To carryout isolation and identification of phytoconstituents.

## **Course Outcomes (CO)**

# On completion of this course, the student will be able to:

CO1. Impart the students the knowledge of how the secondary metabolites are produced in the crude drugs.

- CO2. Get familiar with isolation and identification and industrially production of secondary metabolites.
- CO3. Understand study of producing the plants and phytochemicals through plant tissue culture.
- CO4. To give knowledge about application of latest analytical techniques.
- CO5. To understand basic principles of traditional system of medicine.

|     | Programme and Course Mapping                            |     |     |     |     |     |     |     |     |          |      |      |          |       |
|-----|---|-----|-----|-----|-----|-----|-----|-----|-----|----------|------|------|----------|-------|
| СО  | PO1   | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO<br>10 | PO11 | PO12 | PSO<br>1 | PSO 2 |
| CO1 | 1   |     |     | 2   |     |     |     | 2   |     |          |      |      |          | 1     |
| CO2 |   |     |     |     |     |     |     |     | 2   |          |      |      |          |       |
| CO3 |   | 1   | 1   | 2   | 2   |     |     |     |     |          |      | 2    |          | 2     |
| CO4 |   |     | 1   |     |     |     | 2   |     |     |          |      |      |          |       |
| CO5 | CO5   |     |     |     |     |     |     |     |     |          |      |      |          |       |
|     | 1=lightly mapped 2= moderately mapped 3=strongly mapped |     |     |     |     |     |     |     |     |          |      |      |          |       |

| Unit | evance to the l., national, ional and global elopmental ds | evance To the<br>ployability/<br>repreneurship/<br>Il Development | evance to the fessional Ethics, oder, Human ues, rironment & tainability | 75  | Ь   | E/4 <sup>th</sup> IR |
|------|--|---|--|-----|-----|----------------------|
|      | Relev<br>local,<br>develoneds<br>needs                     | Relev<br>Empl<br>Entre<br>Skill                                   |  | SDG | NEP | POE/                 |

| Unit       | ' Local | Regional | National | Rnowl edge of Format ion of Second ary metabo lites | Employability | Entrepreneurship | Skills enhanced with respect to production of secondary metabolite s | Professional Ethics | Gender | an la values Human Values | Environment & Sustainability | Skil<br>ls<br>for<br>Dec<br>ent<br>Wor<br>k<br>(SD<br>G<br>4.4) | Prof essi onal Edu cati on (17. 1-17.5) | Global<br>Educati<br>on<br>Knowle<br>dge<br>Techni<br>cal<br>Skills<br>that<br>match<br>Industr<br>y<br>Needs,<br>Skill<br>Develo |
|------------|---------|----------|----------|---|---------------|------------------|--|---------------------|--------|---------------------------|------------------------------|---|---|---|
| Unit<br>II | _       | -        | -        | Knowl<br>edge of<br>Medici<br>nal<br>import         |               |                  | Skills<br>enhanced<br>with<br>respect to<br>usage of                 |                     |        | M ed ic in al             |                              | Skil<br>ls<br>for<br>Dec<br>ent                                 | Prof<br>essi<br>onal<br>Edu<br>cati     | Global<br>Educati<br>on<br>Knowle<br>dge  |

|      |   |   |   | ance of  | secondary  | V  | Wor  | on   | Techni  |
|------|---|---|---|----------|------------|----|------|------|---------|
|      |   |   |   | Second   | metabolite | al | k    | (17. | cal     |
|      |   |   |   | ary      | S          | ue | (SD  | 1-   | Skills  |
|      |   |   |   | metabo   |            |    | Ġ    | 17.5 | that    |
|      |   |   |   | lites    |            |    | 4.4) | )    | match   |
|      |   |   |   |          |            |    | ,    |      | Industr |
|      |   |   |   |          |            |    |      |      | y       |
|      |   |   |   |          |            |    |      |      | Needs,  |
|      |   |   |   |          |            |    |      |      | Skill   |
|      |   |   |   |          |            |    |      |      | Develo  |
|      |   |   |   |          |            |    |      |      | pment   |
| Unit | - | - | - | Knowl    | Skills     | M  | Skil | Prof | Global  |
| III  |   |   |   | edge of  | enhanced   | ed | ls   | essi | Educati |
|      |   |   |   | Isolatio | with       | ic | for  | onal | on      |
|      |   |   |   | n,       | respect to | in | Dec  | Edu  | Knowle  |
|      |   |   |   | Identifi | usage of   | al | ent  | cati | dge     |
|      |   |   |   | cation   | phytoconst | V  | Wor  | on   | Techni  |
|      |   |   |   | and      | ituents    | al | k    | (17. | cal     |
|      |   |   |   | analysi  |            | ue | (SD  | 1-   | Skills  |
|      |   |   |   | s of     |            |    | G    | 17.5 | that    |
|      |   |   |   | phytoc   |            |    | 4.4) | )    | match   |
|      |   |   |   | onstitu  |            |    |      |      | Industr |
|      |   |   |   | ents     |            |    |      |      | y       |
|      |   |   |   |          |            |    |      |      | Needs,  |
|      |   |   |   |          |            |    |      |      | Skill   |
|      |   |   |   |          |            |    |      |      | Develo  |
|      |   |   |   |          |            |    |      |      | pment   |
| Unit | - | - | - | Knowl    | Skills     | M  | Skil | Prof | Global  |
| IV   |   |   |   | edge of  | enhanced   | ed | ls   | essi | Educati |
|      |   |   |   | Industr  | with       | ic | for  | onal | on      |
|      |   |   |   | ial      | respect to | in | Dec  | Edu  | Knowle  |
|      |   |   |   | produc   | Industrial | al | ent  | cati | dge     |
|      |   |   |   | tion of  | production | I  | Wor  | on   | Techni  |
|      |   |   |   | Phytoc   | of         | m  | k    | (17. | cal     |
|      |   |   |   | onstitu  | secondary  | p  | (SD  | 1-   | Skills  |

|      |  |  |          | <u> </u> |            |    | T . | ~    | 45.5 |         |
|------|--|--|----------|----------|------------|----|-----|------|------|---------|
|      |  |  | ents     |          | metabolite | or |     | G    | 17.5 | that    |
|      |  |  |          |          | S          | ta |     | 4.4) | )    | match   |
|      |  |  |          |          |            | nc |     |      |      | Industr |
|      |  |  |          |          |            | e  |     |      |      | y       |
|      |  |  |          |          |            |    |     |      |      | Needs,  |
|      |  |  |          |          |            |    |     |      |      | Skill   |
|      |  |  |          |          |            |    |     |      |      | Develo  |
|      |  |  |          |          |            |    |     |      |      | pment   |
| Unit |  |  | knowle   |          | Skills     | M  |     | Skil | Prof | Global  |
| v    |  |  | dge of   |          | enhanced   | ed |     | ls   | essi | Educati |
|      |  |  | moder    |          | with       | ic |     | for  | onal | on      |
|      |  |  | n        |          | respect to | in |     | Dec  | Edu  | Knowle  |
|      |  |  | method   |          | Extraction | al |     | ent  | cati | dge     |
|      |  |  | of       |          | of         | V  |     | Wor  | on   | Techni  |
|      |  |  | extracti |          | secondary  | al |     | k    | (17. | cal     |
|      |  |  | on &     |          | metabolite | ue |     | (SD  | 1-   | Skills  |
|      |  |  | analysi  |          | S          |    |     | G    | 17.5 | that    |
|      |  |  | s of     |          |            |    |     | 4.4) | )    | match   |
|      |  |  | Phytoc   |          |            |    |     | ,    | ŕ    | Industr |
|      |  |  | onstitu  |          |            |    |     |      |      | y       |
|      |  |  | ents     |          |            |    |     |      |      | Needs,  |
|      |  |  |          |          |            |    |     |      |      | Skill   |
|      |  |  |          |          |            |    |     |      |      | Develo  |
|      |  |  |          |          |            |    |     |      |      | pment   |

| BP505T                             | Pharmaceutical Jurisprudence (Theory) | L | Т | P | С |  |  |  |  |  |
|------------------------------------|---------------------------------------|---|---|---|---|--|--|--|--|--|
| Version 2.0                        |                                       | 3 | 1 | 0 | 4 |  |  |  |  |  |
| <b>Total Contact Hours</b>         | 45 Hours                              |   |   |   |   |  |  |  |  |  |
| Pre-requisites/Exposure            | Jurisprudence                         |   |   |   |   |  |  |  |  |  |
| Co-requisites Rules and Regulation |                                       |   |   |   |   |  |  |  |  |  |
| Course Objectives                  |                                       |   |   |   |   |  |  |  |  |  |

## **Upon completion of this course the student should be able to:**

- 1. The Pharmaceutical legislations and their implications in the development and marketing of pharmaceuticals.
- 2. Various Indian pharmaceutical Acts and Laws.
- 3. Regulatory authorities & agencies governing the manufacture & sale of Pharmaceuticals.
- 4. The code of ethics during the pharmaceutical practice

#### **Course Outcomes (CO)**

## On completion of this course, the student will be able to:

- CO1. This subject is designed to impart fundamental knowledge on Various Act.
- CO2. The subject provides the basic knowledge required to understand the various disciplines of pharmacy.
- CO3. This subject deals with MTP act.
- CO4. Provide Knowledge about Indian Pharmacopoeia, British Pharmacopeia and other Regulatory agencies.
- CO5. Provide Knowledge about Narcotic and Psychotropic substance act.

|     | Programme and Course Mapping                            |     |     |     |     |     |     |     |     |          |      |      |          |       |
|-----|---|-----|-----|-----|-----|-----|-----|-----|-----|----------|------|------|----------|-------|
| СО  | PO1   | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO<br>10 | PO11 | PO12 | PSO<br>1 | PSO 2 |
| CO1 |   |     | 2   |     | 2   |     | 2   |     |     |          | 3    |      |          |       |
| CO2 | 1   |     | 1   | 2   |     | 3   |     |     | 2   |          | 3    |      |          |       |
| CO3 |   |     |     |     |     |     |     |     | 2   |          |      |      |          |       |
| CO4 | 3   |     | 1   |     |     | 3   |     |     |     |          | 1    | 3    |          |       |
| CO5 |   | 2   |     |     | 2   |     | 1   |     | 1   |          |      |      |          |       |
|     | 1=lightly mapped 2= moderately mapped 3=strongly mapped |     |     |     |     |     |     |     |     |          |      |      |          |       |

| Unit       | Relevance to the local, national, regional and global developmental | Reecus   |   |        | Relevance To the<br>Employability/<br>Entrepreneurship/<br>Skill Development   |                  |                   | Relevance to the<br>Professional Ethics,<br>Gender, Human                                     | Values,<br>Environment & | Sustainability |                              | SDG                      | NEP   | POE/4 <sup>th</sup> IR  |
|------------|---|----------|---|--------|--|------------------|-------------------|---|--------------------------|----------------|------------------------------|--------------------------|---|---|
| BP5<br>05T | ocal  | Regional | National  | Global | Employability  | Entrepreneurship | Skill Development | Professional Ethics   | Gender                   | Human Values   | Environment & Sustainability |                          |   |   |
| Unit<br>I  |   |          | To regulate the import, manufacture, distribution and sale of drugs & cosmetics through licensing. Manufactur e, distribution and sale of drugs and cosmetics by qualified persons only. To prevent substandard in drugs, presumably for maintaining high |        | Pharmaceutical jurisprudence provides professionals with valuable legal and regulatory knowledge, enhancing employability in various sectors of the pharmaceutical industry. |                  |                   | The integrati on of pharmac eutical jurispru dence and professi onal ethics enhance s employa | -                        | -              |                              | (SD<br>G<br>1.2,<br>4.4) | Prof<br>essi<br>onal<br>Edu<br>cati<br>on<br>(17.<br>1-<br>17.5<br>),<br>Tra<br>nsfo<br>rmi<br>ng | Employ ability, Global Educati on Knowle dge, Techni cal Skills that match Indust |

| Unit<br>II  | - | Packaging and labelling directly impact sales and profits as they offer detailed information on the price, quality, quantity, usage, ingredients, and features of the products. They also display the brand logo and message that help the   | Understanding the legal frameworks, compliance requirements, and ethical considerations within the field positions individuals for success in roles that require adherence to regulations, protection of intellectual property, and | bility by equippin g individu als with the knowled ge, skills, and values necessar y to make ethical decision s,               | the Reg ulat ory Syst em (20. 1- 20.1 5) |
|-------------|---|--|---|--|--|
| Unit<br>III | - | customer find the product easily by creating a recall value.  An Act to regulate the profession of pharmacy. Whereas it is expedient to make better provision for the regulation of the profession and practice of pharmacy and for that purpose to constitute Pharmacy Councils". | ethical decision-making.  | comply with regulatio ns, and prioritiz e patient welfare. Employ ers seek professi onals who can navigate the complex ethical |  |

| Unit | - | The global impact of  |  | landscap  |  |  |  |
|------|---|-----------------------|--|-----------|--|--|--|
| IV   |   | these acts and        |  | e of the  |  |  |  |
|      |   | regulations lies in   |  | pharmac   |  |  |  |
|      |   | promoting public      |  | eutical   |  |  |  |
|      |   | health, ensuring the  |  | industry, |  |  |  |
|      |   | safety and efficacy   |  | building  |  |  |  |
|      |   | of pharmaceutical     |  | trust,    |  |  |  |
|      |   | products, protecting  |  | and       |  |  |  |
|      |   | animal welfare, and   |  | maintain  |  |  |  |
|      |   | enhancing access to   |  | ing high  |  |  |  |
|      |   | essential medicines.  |  | standard  |  |  |  |
|      |   | They establish        |  | s of      |  |  |  |
|      |   | guidelines and        |  | professi  |  |  |  |
|      |   | standards that        |  | onalism.  |  |  |  |
|      |   | influence healthcare  |  |           |  |  |  |
|      |   | practices, research   |  |           |  |  |  |
|      |   | ethics, and pricing   |  |           |  |  |  |
|      |   | policies not only     |  |           |  |  |  |
|      |   | within the country of |  |           |  |  |  |
|      |   | origin but also       |  |           |  |  |  |
|      |   | potentially in        |  |           |  |  |  |
|      |   | international         |  |           |  |  |  |
|      |   | contexts. These       |  |           |  |  |  |
|      |   | regulations           |  |           |  |  |  |
|      |   | contribute to the     |  |           |  |  |  |
|      |   | overall well-being of |  |           |  |  |  |
|      |   | individuals, animals, |  |           |  |  |  |
|      |   | and healthcare        |  |           |  |  |  |
|      |   | systems globally.     |  | <u> </u>  |  |  |  |
| Unit |   | The global impact of  |  |           |  |  |  |
| V    |   | these legislations is |  |           |  |  |  |
|      |   | significant. They     |  |           |  |  |  |
|      |   | ensure the safety,    |  |           |  |  |  |
|      |   | quality, and          |  |           |  |  |  |
|      |   | accessibility of      |  |           |  |  |  |

| ·                       |  |  |  |  | 1 |
|-------------------------|--|--|--|--|---|
| pharmaceutical          |  |  |  |  |   |
| products, promote       |  |  |  |  |   |
| ethical practices,      |  |  |  |  |   |
| protect patient rights, |  |  |  |  |   |
| influence healthcare    |  |  |  |  |   |
| policies, and           |  |  |  |  |   |
| stimulate research      |  |  |  |  |   |
| and development in      |  |  |  |  |   |
| the pharmaceutical      |  |  |  |  |   |
| sector. These           |  |  |  |  |   |
| legislations            |  |  |  |  |   |
| contribute to           |  |  |  |  |   |
| improved healthcare     |  |  |  |  |   |
| outcomes,               |  |  |  |  |   |
| innovation, and the     |  |  |  |  |   |
| overall well-being of   |  |  |  |  |   |
| individuals globally.   |  |  |  |  |   |

| BP506P Industrial Pharmacy (Practical) |  | L   | T | P | C |  |  |  |  |  |
|--|--|-----|---|---|---|--|--|--|--|--|
| Version 2.0                            |  | 0   | 0 | 4 | 2 |  |  |  |  |  |
| <b>Total Contact Hours</b>             | Total Contact Hours 60 Hours                             |     |   |   |   |  |  |  |  |  |
| Pre-requisites/Exposure Pharmaceutics  |  |     |   |   |   |  |  |  |  |  |
| Co-requisites                          | Pharmaceutics  |     |   |   |   |  |  |  |  |  |
|  | Course Objectives  |     |   |   |   |  |  |  |  |  |
| <b>Upon completion of this o</b>       | course the student should be able to:                    |     |   |   |   |  |  |  |  |  |
| 1. To get familiarize wit              | h technology and production of pharmaceutical dosage for | rm. |   |   |   |  |  |  |  |  |
|  | Course Outcomes (CO)                                     |     |   |   |   |  |  |  |  |  |
| On completion of this cou              | rrse, the student will be able to:                       |     |   |   |   |  |  |  |  |  |

CO1: Get familiarize with technology and production of pharmaceutical dosage form.

CO2: Learn Elementary Idea on Quality control test of (as per IP) marketed tablets and capsules Inorganic Qualitative Analysis.

CO3: Learn to prepare and evaluate tablets, capsule, cold / vanishing cream, ointment.

CO4: Learn to test containers.

CO5: Learn to prepare eye drops and eye ointment.

|     | Programme and Course Mapping                            |     |     |     |     |     |     |     |     |       |      |          |          |       |
|-----|---|-----|-----|-----|-----|-----|-----|-----|-----|-------|------|----------|----------|-------|
| СО  | PO1   | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO 10 | PO11 | PO1<br>2 | PSO<br>1 | PSO 2 |
| CO1 | 1   |     |     |     |     | 1   |     |     |     |       |      | 3        |          |       |
| CO2 |   | 1   |     | 2   |     |     |     | 2   |     |       |      |          |          |       |
| CO3 |   |     |     |     |     |     | 1   |     |     |       | 3    |          |          |       |
| CO4 |   | 1   |     |     | 1   |     |     |     |     |       |      |          | 1        |       |
| CO5 | 2   |     |     |     |     | 3   |     | 2   |     |       |      |          |          |       |
|     | 1=lightly mapped 2= moderately mapped 3=strongly mapped |     |     |     |     |     |     |     |     |       |      |          |          |       |

| U | to da ota  | Fo<br>lity<br>sur<br>nt                |                          |    |                 |
|---|--|--|--------------------------|----|-----------------|
| n | an an nei  | ce ce ence ence me                     |                          |    | H H             |
| i | levand<br>local<br>ional<br>ional<br>bal<br>relopr   | vane<br>ploys<br>repr<br>/ Ski         | ler,<br>lan<br>es,       |    | 4 <sup>th</sup> |
| t | elevan<br>e loca<br>ntiona<br>giona<br>obal<br>velop | telev<br>he<br>Ampl<br>Antre<br>hip/ B | ender<br>luman<br>alues, | ರ  | E/              |
|   | Rel<br>nat<br>reg<br>glol<br>dev                     | Re<br>the<br>En<br>En<br>En<br>En      | Ge Ge                    | SD |                 |

| Local<br>Negional<br>Ivational | Global   | Employability  | Entrepreneurship | экин реуелоринени | Oeildei | пинан уансэ |   |  |   |
|--------------------------------|--|--|------------------|-------------------|---------|-------------|---|--|---|
| U n i t I                      | Preformulation studies play a vital role in drug development by investigating the physicochemical properties of drug substances, aiming to understand their behaviour and stability. By providing valuable data and insights, preformulation studies contribute globally to the development of safe and effective pharmaceutical products. | Preformulation studies offer a valuable opportunity for skill development in the pharmaceutical industry, enhancing knowledge and expertise in the characterization and analysis of drug substances, formulation development, and optimization techniques. By actively engaging in preformulation studies, individuals can acquire practical skills that are highly relevant for a successful career in pharmaceutical research and development. |                  |                   |         |             | SDG 3: Good Health and Well-being: Parenteral formulations, such as injections and infusions, play a critical role in delivering medications and treatments for various health conditions. They help ensure access to essential medicines and healthcare, contributing to the goal of achieving good health and well-being for all. | Promoti ng High- quality research (18.1- 18.9) [Rheolo gy being a importa nt compon ent in formulat ion develop ment leads to conducti on of | Sk ill E m be dd ed Co urs es De vel op me nt |

| U n i t I | - 1 - |       | Tablets contribute globally by providing a convenient, portable, and easily administered dosage form, facilitating widespread access to medication and improving patient compliance, thereby positively impacting public health on a global scale.  Capsules contribute | Tables can contribute to employability by providing a platform for organizing and presenting information in a structured manner, enabling individuals to showcase their skills, qualifications, and experiences effectively. | Tables can support entrepreneurship by aiding in business planning, financial analysis, and data organization, empowering entrepreneurs to make informed decisions, communicate their ideas, and drive the growth of their ventures. | - | - |   |   |   | SDG 3: Good Health and Well-being: Parenteral formulations, such as injections and infusions, play a critical role in delivering medications and treatments for various health conditions. They help ensure access to essential medicines and healthcare, contributing to the goal of achieving good health and wellbeing for all. | research work]  Promoting High-quality research (18.1-18.9) [Rheology being a important component in formulation development leads to conduction of research work] | Sk ill E m be dd ed Co urs es De vel op me nt |
|-----------|-------|-------|---|--|--|---|---|---|---|---|--|--|---|
|           |       |       | _ <u>*</u>  |  |  |   |   |   |   |   | •  |  |   |
| n .       | -   - | -   - | globally by providing an  | for the preparation and  | -  | - | - | - | - | - | Innovation, and  | ng   | ill   |
| i         |       |       | efficient and versatile   | evaluation of Tetracycline   |  |   |   |   |   |   | Infrastructure: The  | High-  | Е   |
| t         |       |       | dosage form, allowing for   | capsules, ensuring their   |  |   |   | 1 |   |   | development and  | quality  | m   |

| IIIII            | precise and convenient drug delivery. They offer flexibility in formulation, ease of swallowing, and compatibility with various active ingredients, contributing to global access to medication and improved patient compliance.                    | quality and compliance with established standards. The quality control tests performed on marketed capsules help assess their employability and suitability for use in clinical practice.  |  | production of parenteral formulations require robust pharmaceutical industry infrastructure and innovative manufacturing processes. Meeting the demand for parenteral formulations can drive technological advancements, promote research and development, and enhance manufacturing capabilities, thereby contributing to SDG 9. | research (18.1- 18.9) [Rheolo gy being a importa nt compon ent in formulat ion develop ment leads to conducti on of research work] | be dd ed Co urs es De vel op me nt |
|------------------|---|--|--|---|--|------------------------------------|
| U<br>n<br>i<br>t | The global need for the preparation of eye drops and eye ointments is driven by the necessity to provide appropriate and effective treatments for ocular conditions, thereby improving patient comfort, visual health, and overall quality of life. | The role of Unit IV in the employability of individuals lies in providing them with specialized skills and knowledge related to the preparation of Calcium Gluconate injections, Ascorbic Acid injections, and Eye drops/Eye ointments. These skills |  | SDG 3: Good Health and Well-being: Parenteral formulations, such as injections and infusions, play a critical role in delivering medications and treatments for various health conditions. They help ensure access to essential medicines and healthcare, contributing to   | Promoti<br>ng<br>High-<br>quality<br>research<br>(18.1-<br>18.9)<br>[Rheolo<br>gy<br>being a<br>importa                            | Sk ill E m be dd ed Co urs es De   |

|                  |   | open up opportunities for employment in various sectors of the pharmaceutical industry, ensuring a steady demand for professionals who can effectively and safely prepare these pharmaceutical formulations.  Unit V enhances the   | the goal of achieving good health and wellbeing for all.  | nt compon ent in formulat ion develop ment leads to conducti on of research work]                            | vel<br>op<br>me<br>nt                         |
|------------------|---|---|---|--|---|
| U<br>n<br>i<br>t | Unit V addresses the global need for the preparation of creams (cold/vanishing cream) and the evaluation of glass containers. Professionals trained in these areas contribute to meeting the demand for effective skincare formulations and ensuring the safety and integrity of pharmaceutical products during storage and transportation. | employability of individuals by providing them with specialized skills and knowledge in the preparation of creams (cold/vanishing cream) and the evaluation of glass containers. The global need for effective skincare products and reliable pharmaceutical packaging creates numerous employment opportunities in various sectors of the pharmaceutical industry for individuals trained in | SDG 3: Good Health and Well-being: Parenteral formulations, such as injections and infusions, play a critical role in delivering medications and treatments for various health conditions. They help ensure access to essential medicines and healthcare, contributing to the goal of achieving good health and well-being for all. | ng High- quality research (18.1- 18.9) [Rheolo gy being a importa nt compon ent in formulat ion develop ment | Sk ill E m be dd ed Co urs es De vel op me nt |

|  |  | these areas. |  | ĺ | ĺ | leads to |  |
|--|--|--------------|--|---|---|----------|--|
|  |  |              |  |   |   | conducti |  |
|  |  |              |  |   |   | on of    |  |
|  |  |              |  |   |   | research |  |
|  |  |              |  |   |   | work]    |  |
|  |  |              |  |   |   |          |  |

| BP507P                     | Pharmacology-II (Practical)                        | L  | T | P | C |  |  |  |  |  |  |
|----------------------------|--|----|---|---|---|--|--|--|--|--|--|
| Version 2.0                |  | 0  | 0 | 4 | 2 |  |  |  |  |  |  |
| <b>Total Contact Hours</b> | 60 Hours   |    |   |   |   |  |  |  |  |  |  |
| Pre-requisites/Exposure    | Pre-requisites/Exposure Pharmacology-I (Practical) |    |   |   |   |  |  |  |  |  |  |
| Co-requisites              | HAP  |    |   |   |   |  |  |  |  |  |  |
|                            | C OL:  | 4: |   |   |   |  |  |  |  |  |  |

Upon completion of this course the student should be able to:

This subject will apprise the students with the following:

- 1. To get familiar with various effects of drugs on human body.
- 2. To demonstrate laboratory techniques and animal experiments by simulated experiments by softwares and videos

#### **Course Outcomes (CO)**

- CO1. Apprise the students with the various effects of drugs on human body.
- CO2. Use of computer simulated CDs or Video cassettes for pharmacology practical.
- CO3. Learn about different routes of administration of drugs in mice/rats.
- CO4. Learn to do bioassay of various drug.
- CO5. Know about *in-vitro* pharmacology and physiological salt solutions.

|       |                  |     |     |     |     |     |     | Pro | gramn  | ne and   | Course | Mappin | ıg       |             |
|-------|------------------|-----|-----|-----|-----|-----|-----|-----|--------|----------|--------|--------|----------|-------------|
| СО    | PO1              | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9    | PO<br>10 | PO11   | PO12   | PSO<br>1 | PSO 2       |
| CO1 1 |                  |     |     |     |     |     |     |     |        |          |        |        |          |             |
| CO2   |                  |     |     |     |     |     |     |     | 2      |          | 3      |        | 3        |             |
| CO3   |                  |     |     | 1   |     |     |     |     |        |          |        |        |          |             |
| CO4   |                  |     |     |     |     |     |     |     |        |          |        |        |          |             |
| CO5   | 1                |     |     |     | 1   |     |     |     |        | 2        |        |        |          |             |
|       | 1=lightly mapped |     |     |     |     |     | ed  | 2   | = mode | erately  | mapped |        | 3=stro   | ngly mapped |

| Unit      | Relevance to the local, national, regional and global developmental | Relevance to the local, national, regional and globa developmental needs |          |  | Relevance To the<br>Employability/ | Entrepreneurship/<br>Skill Development |                                | Relevance to the<br>Professional Ethics | Gender, Human | Values,<br>Environment & | Sustainability               | SDG               | NEP          | POE/4 <sup>th</sup> IR |
|-----------|---|--|----------|--|------------------------------------|--|--------------------------------|---|---------------|--------------------------|------------------------------|-------------------|--------------|------------------------|
|           | Local   | Regional   | National | Global   | Employability                      | Entrepreneurship                       | Skill Development              | Professional Ethics                     | Gender        | Human Values             | Environment & Sustainability |                   |              |                        |
| Unit<br>I | -   | -  | -        | To focus on studies related introduction to in-vitro | -                                  | -                                      | Understanding of basics of in- | -                                       | -             | -                        | -                            | Skills for Decent | Prof<br>essi | Global educati         |

|             |   |   |   | pharmacology and<br>physiology salt solutions<br>as well as effect of drugs<br>on frog heart, blood<br>pressure and heart rate of<br>dog   |   |   | vitro pharmacology and physiology salt solutions as well as effect of drugs on frog heart, blood pressure and heart rate of dog |   |   |   |   | Work SDG<br>4.4                         | onal<br>edu<br>cati<br>on(<br>17.1<br>-<br>17.5                 | on<br>knowle<br>dge                      |
|-------------|---|---|---|--|---|---|---|---|---|---|---|---|---|--|
| Unit        |   |   | - | In elaboration of diuretic activity of drugs using rats/mice as well as DRC of acetylcholine using frog rectus abdominis muscle and effect of physostigmine and atropine on DRC of acetylcholine using frog rectus                                       | - | • | To gain basic<br>knowledge<br>related to<br>different models<br>of DRC  | - | - |   |   | Skills for<br>Decent<br>Work SDG<br>4.4 | Professional education(17.1-17.5)                               | Global<br>educati<br>on<br>knowle<br>dge |
| Unit<br>III |   | - | - | To understand the basic studies related to bioassay of histamine using guinea pig ileum by matching method, bioassay of oxytocin using rat uterine horn by interpolation method and bioassay of serotonin using rat fundus strip by three point bioassay |   |   | To gain understanding basics of bioassay of histamine, oxytocin and serotonin.  | - | - | - | ı | Skills for<br>Decent<br>Work SDG<br>4.4 | Prof<br>essi<br>onal<br>edu<br>cati<br>on(<br>17.1<br>-<br>17.5 | Global<br>educati<br>on<br>knowle<br>dge |
| Unit<br>IV  | - | - | - | It emphasis on studies related to bioassay of acetylcholine using rat ileum/colon by four point  |   |   | To<br>understanding<br>basics of<br>bioassay and  | - | - | - | - | Skills for<br>Decent<br>Work SDG<br>4.4 | Prof<br>essi<br>onal<br>edu                                     | Global<br>educati<br>on<br>knowle        |

|      |   |   |   | bioassay, determination of  | determination of  |   |   |   |   |            | cati | dge     |
|------|---|---|---|-----------------------------|-------------------|---|---|---|---|------------|------|---------|
|      |   |   |   | PA2 value of prazosin       | PA2 and PD2       |   |   |   |   |            | on(  |         |
|      |   |   |   | using rat anococcygeus      | value using rat   |   |   |   |   |            | 17.1 |         |
|      |   |   |   | muscle and determination    | anococcygeus      |   |   |   |   |            | -    |         |
|      |   |   |   | of PD2 value using guinea   | muscle and        |   |   |   |   |            | 17.5 |         |
|      |   |   |   | pig ileum.                  | guinea pig        |   |   |   |   |            | )    |         |
|      |   |   |   |                             | ileum.            |   |   |   |   |            |      |         |
| Unit | - | - | - | It elaborates the effect of | The basic         | - | - | - | - | Skills for | Prof | Global  |
| v    |   |   |   | spasmogens and              | knowledge         |   |   |   |   | Decent     | essi | educati |
|      |   |   |   | spasmolytics using rabbit   | related to effect |   |   |   |   | Work SDG   | onal | on      |
|      |   |   |   | jejunum, anti-              | spasmogens and    |   |   |   |   | 4.4        | edu  | knowle  |
|      |   |   |   | inflammatory activity of    | spasmolytics      |   |   |   |   |            | cati | dge     |
|      |   |   |   | drugs using carrageenan     | and anti-         |   |   |   |   |            | on(  |         |
|      |   |   |   | induced paw-edema model     | inflammatory      |   |   |   |   |            | 17.1 |         |
|      |   |   |   | and analgesic activity of   | and analgesic     |   |   |   |   |            | -    |         |
|      |   |   |   | drug using central and      | activity of drug  |   |   |   |   |            | 17.5 |         |
|      |   |   |   | peripheral methods          |                   |   |   |   |   |            | )    |         |

| BP508P                                   | Pharmacognosy and Phytochemistry-II<br>(Practical) | L | Т | P | C |  |  |  |  |  |  |  |  |
|--|--|---|---|---|---|--|--|--|--|--|--|--|--|
| Version 2.0                              |  | 0 | 0 | 4 | 2 |  |  |  |  |  |  |  |  |
| <b>Total Contact Hours</b>               | 60 Hours   |   |   |   |   |  |  |  |  |  |  |  |  |
| Pre-requisites/Exposure                  | Pharmacognosy & Phytochemistry-I Practical         |   |   |   |   |  |  |  |  |  |  |  |  |
| Co-requisites Remedial Biology Practical |  |   |   |   |   |  |  |  |  |  |  |  |  |
|  | Course Objectives                                  |   |   |   |   |  |  |  |  |  |  |  |  |

# **Upon completion of this course the student should be able to:**

- 1. To know the modern extraction techniques, characterization and identification of the herbal drugs and phytoconstituents
- 2. To understand the preparation and development of herbal formulation.

- 3. To understand the herbal drug interactions
- 4. To carryout isolation and identification of phytoconstituents

#### **Course Outcomes (CO)**

- CO1. Get familiar with the practical aspects of characterization and identification of the herbal drugs and phytoconstituents
- CO2. Learn about isolation and identification of phytoconstituents
- CO3. Learn the preparation and development of herbal formulation.
- CO4. Understand Analysis of crude drugs by chemical tests.
- CO5. Get familiar with TLC of herbal extracts.

|     | Programme and Course Mapping |   |  |  |          |        |    |    |        |           |    |     |           |        |  |
|-----|------------------------------|---|--|--|----------|--------|----|----|--------|-----------|----|-----|-----------|--------|--|
|     |                              |   |  |  |          |        |    |    |        |           |    |     |           | PSO 2  |  |
| CO1 |                              |   |  |  |          |        |    |    |        |           |    |     |           |        |  |
| CO2 |                              |   |  |  |          |        |    |    |        |           |    |     |           |        |  |
| CO3 | 1                            |   |  |  | 3        |        |    | 1  |        |           | 2  |     |           |        |  |
| CO4 |                              |   |  |  |          |        |    |    |        |           |    |     |           | 2      |  |
| CO5 |                              |   |  |  |          |        |    |    |        |           |    |     |           |        |  |
|     |                              | • |  |  | 1=lightl | y mapp | ed | 2= | modera | tely mapp | ed | 3=s | trongly r | napped |  |

| Unit | evance to the al, national, ional and global elopmental ds | evance To the<br>ployability/<br>repreneurship/<br>II Development | evance to the fessional Ethics, oder, Human ues, vironment & tainability | C   | P   | E/4 <sup>th</sup> IR |
|------|--|---|--|-----|-----|----------------------|
|      |  | Relev<br>Empl<br>Entre<br>Skill                                   | Relev<br>Profe<br>Gend<br>Valu<br>Envi<br>Susta                          | SDG | NEP | POE,                 |

|      | Local | Regional | National | Global   | Employability | Entrepreneurship | Skill Development  | Professional Ethics | Gender | W Human Values        | Environment & Sustainability |   |                                    |   |
|------|-------|----------|----------|--|---------------|------------------|--|---------------------|--------|-----------------------|------------------------------|---|------------------------------------|---|
| Unit |       |          |          | Identifi<br>cation<br>&<br>extracti<br>on of<br>crude<br>drugs |               |                  | Skills enhanced with respect to extraction of secondary metabolite s |                     |        | M ed ic in al va lu e |                              | Skil<br>ls<br>for<br>Dec<br>ent<br>Wor<br>k<br>(SD<br>G<br>4.4) | Professional Education (17.1-17.5) | Global Educati on Knowle dge Practic al Course s from Industr y/Alum ni Techni cal Skills that match Industr y Needs, Skill |

|             |   |   |   |  |  |                       |   |   | Develo<br>pment  |
|-------------|---|---|---|--|--|-----------------------|---|---|--|
| Unit        |   |   |   | Isolatio n & Identifi cation of phytoc onstitu ents            | Skills enhanced with respect to isolation of secondary metabolite s            | M ed ic in al va lu e | Skil<br>ls<br>for<br>Dec<br>ent<br>Wor<br>k<br>(SD<br>G<br>4.4) | Professional Education (17.1-17.5)                | Global Educati on Knowle dge Practic al Course s from Industr y/Alum ni Techni cal Skills that match Industr y Needs, Skill Develo pment |
| Unit<br>III | - | - | - | Chrom<br>atograp<br>hic<br>evaluat<br>ion of<br>crude<br>drugs | Skills<br>enhanced<br>with<br>respect to<br>chromatog<br>raphic<br>analysis of | M ed ic in al va lu   | Skil<br>ls<br>for<br>Dec<br>ent<br>Wor<br>k                     | Prof<br>essi<br>onal<br>Edu<br>cati<br>on<br>(17. | Global<br>Educati<br>on<br>Knowle<br>dge<br>Practic<br>al  |

|  |  |  | crude |  | e | (SD  | 1-   | Course  |
|--|--|--|-------|--|---|------|------|---------|
|  |  |  | drugs |  |   | G    | 17.5 | s from  |
|  |  |  |       |  |   | 4.4) | )    | Industr |
|  |  |  |       |  |   |      |      | y/Alum  |
|  |  |  |       |  |   |      |      | ni      |
|  |  |  |       |  |   |      |      | Techni  |
|  |  |  |       |  |   |      |      | cal     |
|  |  |  |       |  |   |      |      | Skills  |
|  |  |  |       |  |   |      |      | that    |
|  |  |  |       |  |   |      |      | match   |
|  |  |  |       |  |   |      |      | Industr |
|  |  |  |       |  |   |      |      | y       |
|  |  |  |       |  |   |      |      | Needs,  |
|  |  |  |       |  |   |      |      | Skill   |
|  |  |  |       |  |   |      |      | Develo  |
|  |  |  |       |  |   |      |      | pment   |

# **Semester-VI**

| BP601T                     | Medicinal Chemistry-III (Theory)     | L                                    | Т | P | C |  |  |  |  |  |  |  |  |
|----------------------------|--------------------------------------|--------------------------------------|---|---|---|--|--|--|--|--|--|--|--|
| Version 2.0                |                                      | 3 1 0 4                              |   |   |   |  |  |  |  |  |  |  |  |
| <b>Total Contact Hours</b> | 5 Hours                              |                                      |   |   |   |  |  |  |  |  |  |  |  |
| Pre-requisites/Exposure    | Medicinal Chemistry and Pharmacology | Medicinal Chemistry and Pharmacology |   |   |   |  |  |  |  |  |  |  |  |
| Co-requisites              | QSAR Drug design                     |                                      |   |   |   |  |  |  |  |  |  |  |  |
| Course Objectives          |                                      |                                      |   |   |   |  |  |  |  |  |  |  |  |

#### **Upon completion of this course the student should be able to:**

- 1. Understand the importance of drug design and different techniques of drug design.
- 2. Understand the chemistry of drugs with respect to their biological activity.
- 3. Know the metabolism, adverse effects and therapeutic value of drugs.
- 4. Know the importance of SAR of drugs.

#### **Course Outcomes (CO)**

## On completion of this course, the student will be able to:

- CO 1. Understand fundamental knowledge on the structure, function and significance of Drugs.
- CO 2. discuss various mechanism of action of drugs
- CO 3. Provide knowledge of Synthesis and Metabolism of drugs.
- CO 4. Provide knowledge of Structure Activity Relationships (SAR) therapeutic uses of drugs.
- CO 5. Provide knowledge of marketed preparation.

# **Programme and Course Mapping**

| CO  | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO 10 | PO11 | PO12 | PSO 1 | PSO 2 |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-------|------|------|-------|-------|
| CO1 | 3   |     |     |     |     |     |     |     |     |       |      |      | 3     |       |
| CO2 |     |     |     |     | 3   |     |     |     |     |       |      |      |       |       |
| CO3 |     | 2   |     |     | 3   | 3   |     |     |     |       |      |      |       | 1     |

| CO4 |   |  |         |         |     |    |         |           | 3   | 3   |            |        |  |
|-----|---|--|---------|---------|-----|----|---------|-----------|-----|-----|------------|--------|--|
| CO5 | 2 |  |         |         |     |    |         |           |     | 3   |            |        |  |
|     |   |  | 1=light | ly mapp | oed | 2= | = moder | ately map | ped | 3=8 | strongly n | napped |  |

| Unit | Relevance to the local, national, regional and global developmental needs |          |          |         | Relevance To the Employability/ | Entrepreneurshi<br>p/ Skill<br>Development |                   | Relevance to the<br>Professional<br>Ethics, Gender, | Human Values, | Environment & Sustainability | •                            | SDG  | NEP | POE/4 <sup>th</sup> IR |
|------|---|----------|----------|---------|---------------------------------|--|-------------------|---|---------------|------------------------------|------------------------------|------|-----|------------------------|
|      | Local   | Regional | National | Global  | Employability                   | Entrepreneurship                           | Skill Development | Professional Ethics                                 | Gender        | Human Values                 | Environment & Sustainability |      |     |                        |
| Unit | -   | -        | -        | Antibi  | Pro                             | -  | Antibiotic        | Usage of  | A             | -                            | -                            | Ens  | -   | It helps               |
| I    |   |          |          | otics   | duct                            |  | S                 | any   | nt            |                              |                              | ure  |     | in                     |
|      |   |          |          | are     | ion                             |  | developed         | medicin   | ib            |                              |                              | heal |     | develop                |
|      |   |          |          | used    | of                              |  | synthetical       | e   | io            |                              |                              | thy  |     | ing                    |
|      |   |          |          | globall | anti                            |  | ly , helps        | especiall   | ti            |                              |                              | live |     | technic                |

|      |   |   |   | y to    | biot  | in honir   | g y        | cs |   |   | s for | al skills |
|------|---|---|---|---------|-------|------------|------------|----|---|---|-------|-----------|
|      |   |   |   | treat   | ics   | the        | antibioti  | ar |   |   | all   | that      |
|      |   |   |   | lethal  | acro  | technical  | cs is      | e  |   |   | and   | industr   |
|      |   |   |   | infecti | SS    | skill ar   | d based on | us |   |   | at    | y         |
|      |   |   |   | ons.    | the   | expertise  | appropri   | ed |   |   | all   | require   |
|      |   |   |   |         | glo   | in         | ate        | fo |   |   | ages  | s .And    |
|      |   |   |   |         | be    | production | n professi | r  |   |   | SD    | thus      |
|      |   |   |   |         | pro   |            | nonal      | ev |   |   | G3.   | helps in  |
|      |   |   |   |         | vide  |            | ehics.     | er |   |   |       | creatin   |
|      |   |   |   |         | s a   |            |            | y  |   |   |       | g         |
|      |   |   |   |         | lot   |            |            | ty |   |   |       | employ    |
|      |   |   |   |         | of    |            |            | pe |   |   |       | ment.     |
|      |   |   |   |         | emp   |            |            | of |   |   |       |           |
|      |   |   |   |         | loy   |            |            | ge |   |   |       |           |
|      |   |   |   |         | men   |            |            | n  |   |   |       |           |
|      |   |   |   |         | t.    |            |            | de |   |   |       |           |
|      |   |   |   |         |       |            |            | r. |   |   |       |           |
| Unit | - | - | - | Antibi  | Pro - | Antibioti  | Usage of   | A  | - | - | Ens   | It helps  |
| II   |   |   |   | otics   | duct  | s          | any        | nt |   |   | ure   | in        |
|      |   |   |   | and     | ion   | develope   | l medicin  | ib |   |   | heal  | develop   |
|      |   |   |   | antimal | of    | synthetic  | ıl e       | io |   |   | thy   | ing       |
|      |   |   |   | arial   | anti  | ly , helps | especiall  | ti |   |   | live  | technic   |
|      |   |   |   | drugs   | biot  | in honing  |            | cs |   |   | s for | al skills |
|      |   |   |   | are     | ics   | the        | antibioti  | an |   |   | all   | that      |
|      |   |   |   | used    | acro  | technical  | cs is      | d  |   |   | and   | industr   |
|      |   |   |   | globall | SS    | skill and  | based on   | an |   |   | at    | у         |
|      |   |   |   | y to    | the   | expertise  | appropri   | ti |   |   | all   | require   |
|      |   |   |   | treat   | glo   | in         | ate        | m  |   |   | ages  | s .And    |
|      |   |   |   | lethal  | be    | production | n professi | al |   |   | SD    | thus      |
|      |   |   |   | infecti | pro   |            | nonal      | ar |   |   | G3.   | helps in  |

|      |   |   |   | ons     | vide |   |             | ehics.    | ia |   |   |       |   | creatin   |
|------|---|---|---|---------|------|---|-------------|-----------|----|---|---|-------|---|-----------|
|      |   |   |   | caused  | s a  |   |             |           | ls |   |   |       |   | g         |
|      |   |   |   | by      | lot  |   |             |           | dr |   |   |       |   | employ    |
|      |   |   |   | Plasmo  | of   |   |             |           | u  |   |   |       |   | ment      |
|      |   |   |   | dium .  | emp  |   |             |           | gs |   |   |       |   |           |
|      |   |   |   |         | loy  |   |             |           | ar |   |   |       |   |           |
|      |   |   |   |         | men  |   |             |           | e  |   |   |       |   |           |
|      |   |   |   |         | t.   |   |             |           | us |   |   |       |   |           |
|      |   |   |   |         |      |   |             |           | ed |   |   |       |   |           |
|      |   |   |   |         |      |   |             |           | fo |   |   |       |   |           |
|      |   |   |   |         |      |   |             |           | r  |   |   |       |   |           |
|      |   |   |   |         |      |   |             |           | ev |   |   |       |   |           |
|      |   |   |   |         |      |   |             |           | er |   |   |       |   |           |
|      |   |   |   |         |      |   |             |           | у  |   |   |       |   |           |
|      |   |   |   |         |      |   |             |           | ty |   |   |       |   |           |
|      |   |   |   |         |      |   |             |           | pe |   |   |       |   |           |
|      |   |   |   |         |      |   |             |           | of |   |   |       |   |           |
|      |   |   |   |         |      |   |             |           | ge |   |   |       |   |           |
|      |   |   |   |         |      |   |             |           | n  |   |   |       |   |           |
|      |   |   |   |         |      |   |             |           | de |   |   |       |   |           |
|      |   |   |   |         |      |   |             |           | r  |   |   |       |   |           |
| Unit | - | - | - | Antitu  | Pro  | - | Antituberc  | Usage of  | A  | - | - | Ens   | - | It helps  |
| III  |   |   |   | bercula | duct |   | ular and    |           | nt |   |   | ure   |   | in        |
|      |   |   |   | r and   | ion  |   | anti viral  |           | i  |   |   | heal  |   | develop   |
|      |   |   |   | antivir | of   |   | drugs       | e         | tu |   |   | thy   |   | ing       |
|      |   |   |   | aldrugs | anti |   | developed   | especiall | be |   |   | live  |   | technic   |
|      |   |   |   | are     | tube |   | synthetical |           | rc |   |   | s for |   | al skills |
|      |   |   |   | used    | rcul |   | ly , helps  |           | ul |   |   | all   |   | that      |
|      |   |   |   | globall | ar   |   | in honing   | cs is     | ar |   |   | and   |   | industr   |
|      |   |   |   | y to    | and  |   | the         | based on  | an |   |   | at    |   | У         |

|      |   |   |   | treat   | anti |   | technical   | appropri | d  |   |   | all  |   | require  |
|------|---|---|---|---------|------|---|-------------|----------|----|---|---|------|---|----------|
|      |   |   |   | lethal  | vira |   | skill and   | ate      | an |   |   | ages |   | s .And   |
|      |   |   |   | infecti | 1    |   | expertise   | professi | ti |   |   | SD   |   | thus     |
|      |   |   |   | ons     | dru  |   | in          | nonal    | vi |   |   | G3.  |   | helps in |
|      |   |   |   | caused  | gs   |   | production  | ehics    | ra |   |   |      |   | creatin  |
|      |   |   |   | by      | acro |   |             |          | 1  |   |   |      |   | g        |
|      |   |   |   | Mycob   | SS   |   |             |          | dr |   |   |      |   | employ   |
|      |   |   |   | acteriu | the  |   |             |          | u  |   |   |      |   | ment.    |
|      |   |   |   | m       | glo  |   |             |          | gs |   |   |      |   |          |
|      |   |   |   | tubercu | be   |   |             |          | ar |   |   |      |   |          |
|      |   |   |   | lae and | pro  |   |             |          | e  |   |   |      |   |          |
|      |   |   |   | AIDS    | vide |   |             |          | us |   |   |      |   |          |
|      |   |   |   | virus . | s a  |   |             |          | ed |   |   |      |   |          |
|      |   |   |   |         | lot  |   |             |          | fo |   |   |      |   |          |
|      |   |   |   |         | of   |   |             |          | r  |   |   |      |   |          |
|      |   |   |   |         | emp  |   |             |          | ev |   |   |      |   |          |
|      |   |   |   |         | loy  |   |             |          | er |   |   |      |   |          |
|      |   |   |   |         | men  |   |             |          | У  |   |   |      |   |          |
|      |   |   |   |         | t.   |   |             |          | ty |   |   |      |   |          |
|      |   |   |   |         |      |   |             |          | pe |   |   |      |   |          |
|      |   |   |   |         |      |   |             |          | of |   |   |      |   |          |
|      |   |   |   |         |      |   |             |          | ge |   |   |      |   |          |
|      |   |   |   |         |      |   |             |          | n  |   |   |      |   |          |
|      |   |   |   |         |      |   |             |          | de |   |   |      |   |          |
|      |   |   |   |         |      |   |             |          | r  |   |   |      |   |          |
| Unit | - | - | - | Anti    | Pro  | - | Anti        | Usage of | A  | - | - | Ens  | - | It helps |
| IV   |   |   |   | fungal  | duct |   | fungal      | any      | nt |   |   | ure  |   | in       |
|      |   |   |   | drugs   | ion  |   | drugs       | medicin  | i  |   |   | heal |   | develop  |
|      |   |   |   | are     | of   |   | developed   | e is     | fu |   |   | thy  |   | ing      |
|      |   |   |   | used    | anti |   | synthetical | based on | n  |   |   | live |   | technic  |

|      |   |   |   | globall | fun  |   | ly , helps | appropri | ga |   | s for |   | al skills |
|------|---|---|---|---------|------|---|------------|----------|----|---|-------|---|-----------|
|      |   |   |   | y to    | gal  |   | in honing  | ate      | ld |   | all   |   | that      |
|      |   |   |   | treat   | acro |   | the        | professi | ru |   | and   |   | industr   |
|      |   |   |   | lethal  | SS   |   | technical  | nonal    | gs |   | at    |   | y         |
|      |   |   |   | infecti | the  |   | skill and  | ehics    | ar |   | all   |   | require   |
|      |   |   |   | ons     | glo  |   | expertise  |          | e  |   | ages  |   | s .And    |
|      |   |   |   | caused  | be   |   | in         |          | us |   | SD    |   | thus      |
|      |   |   |   | by      | pro  |   | production |          | ed |   | G3.   |   | helps in  |
|      |   |   |   | various | vide |   |            |          | fo |   |       |   | creatin   |
|      |   |   |   | fungus  | s a  |   |            |          | r  |   |       |   | g         |
|      |   |   |   | like    | lot  |   |            |          | ev |   |       |   | employ    |
|      |   |   |   | Candid  | of   |   |            |          | er |   |       |   | ment.     |
|      |   |   |   | a and   | emp  |   |            |          | У  |   |       |   |           |
|      |   |   |   | Tricho  | loy  |   |            |          | ty |   |       |   |           |
|      |   |   |   | noma    | men  |   |            |          | pe |   |       |   |           |
|      |   |   |   | etc.    | t    |   |            |          | of |   |       |   |           |
|      |   |   |   |         |      |   |            |          | ge |   |       |   |           |
|      |   |   |   |         |      |   |            |          | n  |   |       |   |           |
|      |   |   |   |         |      |   |            |          | de |   |       |   |           |
|      |   |   |   |         |      |   |            |          | r  |   |       |   |           |
| Unit | - | - | - | Conce   | Dru  | - | Docking    | Drug     | -  | - | Ens   | - | It helps  |
| V    |   |   |   | pt of   | g    |   | techniques | designin |    |   | ure   |   | in        |
|      |   |   |   | Drug    | desi |   | helps in   | g sector |    |   | heal  |   | develop   |
|      |   |   |   | design  | gni  |   | acing      | is       |    |   | thy   |   | ing       |
|      |   |   |   | an      | ng   |   | technical  | complie  |    |   | live  |   | technic   |
|      |   |   |   | Combi   | wit  |   | skill,     | d with a |    |   | s for |   | al skills |
|      |   |   |   | natoria | h    |   |            | huge     |    |   | all   |   | that      |
|      |   |   |   | 1 .     | the  |   |            | professi |    |   | and   |   | industr   |
|      |   |   |   | chemis  | help |   |            | onal     |    |   | at    |   | У .       |
|      |   |   |   | try is  | of   |   |            | ethics.  |    |   | all   |   | require   |

|  |  | used    | doc  |  |  |  | ages | s .And   |
|--|--|---------|------|--|--|--|------|----------|
|  |  | globall | kin  |  |  |  | SD   | thus     |
|  |  | y to    | g    |  |  |  | G3.  | helps in |
|  |  | develo  | gen  |  |  |  |      | creatin  |
|  |  | p new   | erat |  |  |  |      | g        |
|  |  | drug    | es   |  |  |  |      | employ   |
|  |  | molecu  | plet |  |  |  |      | ment.    |
|  |  | les     | hor  |  |  |  |      |          |
|  |  | uding   | a of |  |  |  |      |          |
|  |  | dockin  | emp  |  |  |  |      |          |
|  |  | g       | loy  |  |  |  |      |          |
|  |  | techniq | men  |  |  |  |      |          |
|  |  | ues.    | t.   |  |  |  |      |          |

| BP602T                     | Pharmacology-III (Theory)  | L | T | P | С |
|----------------------------|----------------------------|---|---|---|---|
| Version 2.0                |                            | 3 | 1 | 0 | 4 |
| <b>Total Contact Hours</b> | 45 Hours                   | 1 |   |   |   |
| Pre-requisites/Exposure    | Pharmacology-II            |   |   |   |   |
| Co-requisites              | HAP-II and Pathophysiology |   |   |   |   |

#### **Upon completion of this course the student should be able to:**

- 1. Get familiar with the basic biochemical aspects of human body and its relation to diseases.
- 2. Understand various drugs used for various ailments.
- 3. Understand mechanism of action adverse drug reactions.
- 4. Understand the basic strategies to manage the poisoning.

#### **Course Outcomes (CO)**

#### On completion of this course, the student will be able to:

- CO 1. Understand the mechanism of drug action and its relevance in the treatment of different infectious diseases
- CO 2. Comprehend the principles of toxicology and treatment of various poisonings
- CO 3. Appreciate correlation of pharmacology with related medical sciences
- CO 4. Know the toxicity of the Drugs and their treatments.
- CO 5. Know the Concepts of Chronopharmacology

#### **Programme and Course Mapping**

| CO  | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO 10 | PO11 | PO12 | PSO 1 | PSO 2 |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-------|------|------|-------|-------|
| CO1 | 3   |     |     |     |     |     |     |     |     |       |      |      | 3     |       |
| CO2 |     |     |     |     | 3   |     |     |     |     |       |      |      |       |       |
| CO3 |     |     | 2   |     | 3   | 3   |     |     |     |       |      |      |       |       |
| CO4 |     |     | 1   |     |     |     |     |     |     |       | 3    | 3    | 2     |       |
| CO5 |     |     |     |     |     |     |     |     |     |       |      |      |       |       |

| 1=lightly mapped | 2= moderately mapped | 3=strongly mapped |  |
|------------------|----------------------|-------------------|--|
|                  |                      |                   |  |

| Unit | Relevance to the local, national, regional and global developmental | needs      |          |   | Relevance To the<br>Employability/ | Entrepreneurship/<br>Skill Development |   | Relevance to the    | Gender, Human | Values,<br>Environment & | Sustainability               | SDG  | NEP                                       | POE/4 <sup>th</sup> IR                   |
|------|---|------------|----------|---|------------------------------------|--|---|---------------------|---------------|--------------------------|------------------------------|--|---|--|
| Unit | ' Local   | ' Regional | National | To focus on studies related to drugs acting on respiratory system and gastrointestinal tract plays an important role in creating awareness on mechanism and pharmacological action of drugs | ' Employability                    | - Entrepreneurship                     | Understanding basics of drug related to respiratory system and gastrointestinal tract | Professional Ethics | , Gender      | Human Values             | Environment & Sustainability | Ensure healthy lives and promote well-being for all at all ages SDG 3 and Skills for Decent Work SDG 4.4 | Prof essi onal edu cati on( 17.1 - 17.5 ) | Global<br>educati<br>on<br>knowle<br>dge |

| Unit<br>II  | - | - | - | To emphazise general principles related to chemotherapy and antibiotics   | - | - | The basic pharmacology of antibiotics and chemotherapy  | - | - | _ | - | Ensure<br>healthy lives<br>and promote<br>well-being<br>for all at all<br>ages SDG 3                     | Prof essi onal edu cati on( 17.1 - 17.5 )                       | Global<br>educati<br>on<br>knowle<br>dge |
|-------------|---|---|---|---|---|---|---|---|---|---|---|--|---|--|
| Unit<br>III |   | - | - | To understand the studies related to drugs acting on anti-tubercular, anti-leprotic, anti-fungal, anti-viral, anthelmintics, anti-malarial and anti-amoebic agents plays an important role in creating awareness on mechanism and pharmacological action of drugs |   |   | Elaboration of basics of drug related to antitubercular, antileprotic, antifungal, antiviral, anthelmintics, anti-malarial and antiamoebic agents | - | - | - | - | Ensure healthy lives and promote well-being for all at all ages SDG 3 and Skills for Decent Work SDG 4.4 | Prof<br>essi<br>onal<br>edu<br>cati<br>on(<br>17.1<br>-<br>17.5 | Global<br>educati<br>on<br>knowle<br>dge |
| Unit<br>IV  |   | - | - | To emphasize Studies related to drugs acting in urinary tract infections, sexually transmitted diseases and as immunomodulators plays an important role in creating awareness on mechanism and pharmacological action of drugs                                    |   |   | Understanding basics of drug related to urinary tract infections, sexually transmitted diseases and as immunomodulat ors                          | - | - | - | - | Ensure<br>healthy lives<br>and promote<br>well-being<br>for all at all<br>ages SDG 3                     | Prof<br>essi<br>onal<br>edu<br>cati<br>on(<br>17.1<br>-<br>17.5 | Global<br>educati<br>on<br>knowle<br>dge |
| Unit<br>v   | - | - | - | To gain knowledge related to general principles related to toxicology and   |   |   | The basic<br>knowledge<br>related to  | - | - | - | - | Ensure<br>healthy lives<br>and promote   | Prof<br>essi<br>onal  | Global<br>educati<br>on                  |

|  |  | chronopharmacology | toxicity studies |  | well-being     | edu  | knowle |
|--|--|--------------------|------------------|--|----------------|------|--------|
|  |  |                    | as well as       |  | for all at all | cati | dge    |
|  |  |                    | chronopharmaco   |  | ages SDG 3     | on(  |        |
|  |  |                    | logy             |  | and Skills     | 17.1 |        |
|  |  |                    |                  |  | for Decent     | -    |        |
|  |  |                    |                  |  | Work SDG       | 17.5 |        |
|  |  |                    |                  |  | 4.4            | )    |        |

| BP603T  | Herbal Drug Technology (Theory)              | L | T | P | C |  |  |  |  |  |  |  |
|---|--|---|---|---|---|--|--|--|--|--|--|--|
| Version 2.0   | 3 1 0 4                                      |   |   |   |   |  |  |  |  |  |  |  |
| <b>Total Contact Hours</b>                                | rs 45 Hours                                  |   |   |   |   |  |  |  |  |  |  |  |
| Pre-requisites/Exposure                                   | Pharmacognosy & Phytochemistry – II (Theory) |   |   |   |   |  |  |  |  |  |  |  |
| Co-requisites Pharmacognosy & Phytochemistry – I (Theory) |  |   |   |   |   |  |  |  |  |  |  |  |
| Course Objectives   |  |   |   |   |   |  |  |  |  |  |  |  |

# **Upon completion of this course the student should be able to:**

- 1. Know to evaluate the quality of raw material.
- 2. Know the guidelines for quality of herbal drug.
- 3. Know about herbal cosmetics, natural sweeteners etc.
- 4. Know about modern concepts such as nutraceuticals

# **Course Outcomes (CO)**

- CO 1. Understand raw material as source of herbal drugs from cultivation to herbal drug product.
- CO 2. Know the WHO and ICH guidelines for evaluation of herbal drugs.
- CO 3. Know the herbal cosmetics, natural sweeteners, nutraceuticals.
- CO 4. Appreciate patenting of herbal drugs, GMP.
- CO 5. Know about the raw materials used in Herbal cosmetics, and the various excipients used in Herbal cosmetics and to know the significance of neutraceuticals.

|     | Programme and Course Mapping |     |     |     |        |                          |     |     |            |               |      |        |          |       |
|-----|------------------------------|-----|-----|-----|--------|--------------------------|-----|-----|------------|---------------|------|--------|----------|-------|
| CO  | PO1                          | PO2 | PO3 | PO4 | PO5    | PO6                      | PO7 | PO8 | PO9        | PO 10         | PO11 | PO12   | PSO 1    | PSO 2 |
| CO1 | 3                            |     |     |     |        |                          |     |     |            |               |      |        | 1        |       |
| CO2 |                              |     |     |     | 2      |                          |     |     |            |               |      |        | 1        | 2     |
| CO3 |                              |     |     |     | 2      | 3                        |     |     |            |               |      |        | 3        |       |
| CO4 |                              |     |     |     |        |                          |     | 2   |            |               | 3    | 3      |          |       |
| CO5 | 3                            |     |     |     |        |                          |     |     |            |               |      | 3      |          |       |
|     |                              |     |     |     | l=ligh | <br>tly map <sub>l</sub> | ped | 2=  | <br>modera | <br>tely mapp | ed   | 3=stro | ngly map | ped   |

| Unit       | Relevance to the | local, national,    | developmental | 70   | Relevance To the | Entrepreneurship/  |  | Relevance to the      | Professional Ethics, | Values,        | Environment &<br>Sustainability |                                    |                                  | /4 <sup>th</sup> IR                           |
|------------|------------------|---------------------|---------------|--|------------------|--------------------|--|-----------------------|----------------------|----------------|---------------------------------|------------------------------------|----------------------------------|---|
|            | Relev            | ocal,               | level         | needs  | Relev<br>Tmn     | Sntr<br>Shin       |  | Relev                 | Profe                | Values,        | Envii<br>Susta                  | SDG                                | NEP                              | POE/4 <sup>th</sup> ]                         |
| BP6<br>03T | Local            | Regional   Regional | National      | The study of "Herbs as a raw material" provides students with knowledge about the medicinal properties and applications of herbs, enabling them to contribute to the development of natural remedies. Understanding "Biodynamic agriculture" promotes sustainable farming practices, | Employability R  | Entrepreneurship E | The study of "Herbs as a raw material" helps students develop skills in identifying, cultivating, and processing medicinal plants, enhancing their knowledge of herbal remedies. "Biodynamic agriculture" provides students with skills in sustainable | Professional Ethics R |                      | Human Values V | Environment & Sustainability S. | Rev itali ze the glob al part ners | Pro fess ion al Edu cati on (17. | Techni cal Skills that match Industr y Needs, |
|            |                  |                     |               | benefiting the environment and human health. Exploring the "Indian system  |                  |                    | farming practices, organic cultivation, and holistic   |                       |                      |                |                                 | hip<br>for                         | 1-<br>17.5                       | Entrepr<br>eneursh                            |
|            |                  |                     |               | of medicine" offers students insights  |                  |                    | approaches to agriculture. The   |                       |                      |                |                                 | sust                               | )                                | ip,   |
|            |                  |                     |               | into traditional healing methods,  |                  |                    | study of "Indian system of   |                       |                      |                |                                 | aina                               | Pro                              | Employ  |
|            |                  |                     |               | expanding their understanding of healthcare practices worldwide.   |                  |                    | medicine" equips students with knowledge of traditional healing  |                       |                      |                |                                 | ble<br>dev                         | mot<br>ing                       | ability                                       |

|      |   |   | Overall, these studies equip students with diverse perspectives and skills for global health and sustainability.  | methods, Ayurvedic principles, and herbal formulations, enhancing their understanding of holistic healthcare practices.  |  | elop<br>men<br>t<br>(Rol<br>e of<br>all<br>Sch<br>ools<br>,<br>KR<br>MU<br>)<br>(SD<br>G<br>17) | Hig<br>hj-<br>qua<br>lity<br>rese<br>arc<br>h<br>(18.<br>1-<br>18.9 |   |
|------|---|---|---|--|--|---|---|---|
| Unit | - | - | The study of nutraceuticals, herbs in food, and herbs-drugs can greatly benefit students globally by providing them with a comprehensive understanding of natural health and wellness. This knowledge equips students with insights into the potential therapeutic properties of certain foods and herbs, enabling them to make informed dietary choices and explore alternative approaches to healthcare. Such understanding can enhance personal well-being and support their future professional endeavors in fields related to nutrition and holistic medicine. | Studying "Nutraceuticals" and "Herbs-Food & Herbs-Drugs" can help students in skill development by enhancing their understanding of natural remedies and their effects on health. It cultivates knowledge in the fields of nutrition, pharmacology, and herbal medicine, fostering critical thinking, research skills, and the ability to assess the safety and efficacy of these products. This knowledge equips students with valuable expertise in the growing field of alternative medicine. |  |   |   | Global<br>Educati<br>on<br>Knowle<br>dge<br>, |

| Unit |   |          |   | The study of herbal cosmetics, herbal   | The study of herbal cosmetics,    |      | 1.a   |
|------|---|----------|---|---|-----------------------------------|------|-------|
| III  |   | _        | - | excipients, and herbal formulations     | herbal excipients, and herbal     |      | Ens   |
| 111  |   |          |   | *                                       |                                   |      |       |
|      |   |          |   | can benefit students globally by        | formulation helps students        |      | ure   |
|      |   |          |   | providing them with a comprehensive     | develop skills in natural product |      | sign  |
|      |   |          |   | understanding of natural ingredients    | development, formulation          |      | ifica |
|      |   |          |   | and their applications in the beauty    | design, and understanding of      |      | nt    |
|      |   |          |   | and pharmaceutical industries. This     | herbal ingredients. It enhances   |      | mob   |
|      |   |          |   | knowledge equips students with the      | their knowledge of plant-based    |      | iliza |
|      |   |          |   | skills to develop and manufacture       | remedies, extraction techniques,  |      | tion  |
|      |   |          |   | effective, safe, and sustainable herbal | and quality control. These skills |      | of    |
|      |   |          |   | products, meeting the growing demand    | enable students to excel in the   |      | reso  |
|      |   |          |   | for natural alternatives worldwide.     | field of cosmetic science,        |      | urce  |
|      |   |          |   |   | pharmaceuticals, and herbal       |      | S     |
|      |   |          |   |   | product development,              |      | fro   |
|      |   |          |   |   | contributing to the growing       |      | m a   |
|      |   |          |   |   | demand for natural and            |      | vari  |
|      |   |          |   |   | sustainable beauty and            |      | ety   |
|      |   |          |   |   | healthcare solutions.             |      | of    |
|      |   |          |   |   |                                   |      | sour  |
|      |   |          |   |   |                                   |      | ces   |
|      |   |          |   |   |                                   |      |       |
|      |   |          |   |   |                                   |      |       |
| Unit |   | -        | - | The study of "Evaluation of Drug"       | Studying the evaluation of        | Ens  | Tec   |
| IV   |   |          |   | helps students globally understand the  | drugs, patenting and regulatory   | ure  | hnol  |
|      |   |          |   | process of testing and analysing the    | requirements of natural products, | heal | ogy   |
|      |   |          |   | effectiveness and safety of drugs,      | and regulatory issues helps       | thy  | Use   |
|      |   |          |   | ensuring their quality and efficacy.    | students develop essential skills | live | &     |
|      |   |          |   | "Patenting and Regulatory               | in the pharmaceutical and         | s    | Inte  |
|      |   |          |   | requirements of natural products"       | biotechnology fields. These       | and  | grat  |
|      |   |          |   | educates students on legal aspects and  | subjects provide knowledge        | pro  | ion   |
|      |   |          |   | protection of natural products.         | about the process of evaluating   | mot  | (23.  |
|      |   |          |   | "Regulatory Issues" provides insight    | drug efficacy and safety,         | e    | 1-    |
|      |   |          |   | into the complex regulations            | protecting intellectual property  | well | 23.1  |
|      |   |          |   | governing pharmaceuticals, preparing    | rights, and navigating regulatory | -    | 3)    |
|      |   |          |   | students for careers in the global      | frameworks. Such skills are       | bein |       |
|      | 1 | <u> </u> |   |   |                                   |      |       |

|      | healthcare industry.   | crucial for careers in research, development, and compliance within the healthcare industry.  | g for all at all age (SI G S En ure sus ain ble con um tion and product on pat erm (SI G G G G G G G G G G G G G G G G G G G | t t a s p h d d i t s s          |  |
|------|--|---|--|----------------------------------|--|
|      |  |   | G<br>12)   |                                  |  |
| Unit | The study of "Schedule T - Good Manufacturing Practice of Indian systems of medicine" can help students globally by providing them with insights into the manufacturing practices and quality standards followed in the Indian systems of medicine. This knowledge can be beneficial for students pursuing | The study of "Schedule T – Good Manufacturing Practice of Indian systems of medicine" helps students in skill development by providing them with a comprehensive understanding of the manufacturing practices and quality standards specific to | En ure sus ain ble con um tion and   | hnol ogy Use & Inte p grat i ion | Corpor<br>ate<br>Allianc<br>es to<br>provide<br>Big<br>Sister/<br>Big<br>Brother |

| careers in pharmaceuticals, healthcare, | Indian systems of medicine. This | prod 1- Connec  |
|---|----------------------------------|-----------------|
| or research, allowing them to           | knowledge equips them with the   | ucti 23.1 tions |
| understand and incorporate best         | necessary skills to ensure the   | on 3)           |
| practices from Indian medicine into     | safety, efficacy, and quality of | patt            |
| their own work.                         | herbal medicines and traditional | erns            |
|   | remedies, thereby enhancing      | (SD             |
|   | their competence in the field.   | G               |
|   |                                  | 12)             |
|   |                                  |                 |

| BP604T                     | <b>Biopharmaceutics And Pharmacokinetics (Theory)</b> | L | T | P        | C        |
|----------------------------|---|---|---|----------|----------|
| Version 2.0                |   | 3 | 1 | 0        | 4        |
| <b>Total Contact Hours</b> | 45 Hours  |   |   | <u> </u> | <u>I</u> |
| Pre-requisites/Exposure    | Pharmaceutics   |   |   |          |          |
| Co-requisites              |   |   |   |          |          |
|                            | C Ohi4'   |   |   |          |          |

# **Upon completion of this course the student should be able to:**

- 1. Understand the basic concepts in Biopharmaceutics and Pharmacokinetics and their significance.
- 2. Understand the use of plasma drug concentration-time data to calculate the pharmacokinetic parameters to describe the kinetics of drug absorption, distribution, metabolism, excretion, elimination.
- 3 Understand the concepts of bioavailability and bioequivalence of drug products and their significance.

## **Course Outcomes (CO)**

- CO 1. Understand the basic concepts in Biopharmaceutics and Pharmacokinetics and their significance.
- CO 2. Understand the Use of plasma drug concentration-time data to calculate the pharmacokinetic parameters to describe the kinetics of drug absorption, distribution, metabolism, excretion, elimination.
- CO 3. Understand the concepts of bioavailability and bioequivalence of drug products and their significance.
- CO 4. Understand various pharmacokinetic parameters, their significance & applications

| Programme and Course Mapping |   |     |     |     |     |     |     |     |     |       |      |      |       |       |
|------------------------------|---|-----|-----|-----|-----|-----|-----|-----|-----|-------|------|------|-------|-------|
| CO                           | PO1   | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO 10 | PO11 | PO12 | PSO 1 | PSO 2 |
| CO1                          | 3   |     |     |     |     |     |     |     |     |       |      |      | 3     |       |
| CO2                          |   |     |     |     | 3   |     |     |     |     |       |      |      |       | 2     |
| CO3                          |   |     |     |     | 3   | 3   |     |     |     |       |      |      |       |       |
| CO4                          | 3   |     |     |     |     |     |     |     |     |       |      | 3    |       |       |
|                              | 1=lightly mapped 2= moderately mapped 3=strongly mapped |     |     |     |     |     |     |     |     |       |      |      |       |       |

| Unit | evance to the al, national, ional and global elopmental ds | evance To the ployability/repreneurship/ | evance to the fessional Ethics, nder, Human lues, vironment & stainability | Ŋ     | P   | E/4 <sup>th</sup> IR |
|------|--|--|--|-------|-----|----------------------|
|      | Relev local, regior develor needs                          |  |  | ( ' ) | NEP | POE/                 |

|      | Local | Regional | National | Global   | Employability   | Entrepreneurship | Skill Development | Professional Ethics | Gender | Human Values | Environment & Sustainability |  |                                    |  |
|------|-------|----------|----------|--|---|------------------|-------------------|---------------------|--------|--------------|------------------------------|--|------------------------------------|--|
| Unit |       |          |          | Global Health care Needs. It will give the abosrpt ion of all the oral dosage forms, in order to make the better formul ations | It will brin g emp loya bilit y opp urtu niti es in the CR Os | -                |                   |                     |        |              | -                            | Ens<br>ure<br>heal<br>thy<br>live<br>s<br>and<br>pro<br>mot<br>e<br>well<br>-<br>bein<br>g<br>for<br>all<br>at<br>all<br>ages<br>(SD<br>G 3) | Professional Education (17.1-17.5) | Techni cal Skills that match Industr y Needs |

|             |   |   | produc<br>ts.   |   |   |   |   |   |   |   |  |   |   |
|-------------|---|---|---|---|---|---|---|---|---|---|--|---|---|
| Unit        |   | - | Global Health care Needs. It will give the distrib ution of all the oral dosage forms, in order to make the better formul ations produc ts. | It will brin g emp loya bilit y opp urtu niti es in the CR Os |   |   | - | - | - |   | Ens<br>ure<br>heal<br>thy<br>live<br>s<br>and<br>pro<br>mot<br>e<br>well<br>-<br>bein<br>g<br>for<br>all<br>at<br>all<br>ages<br>(SD<br>G 3) | Professional Education (17.1-17.5)                | Techni<br>cal<br>Skills<br>that<br>match<br>Industr<br>y<br>Needs |
| Unit<br>III | - | - | Global<br>Health<br>care<br>Needs.<br>It will<br>give<br>the  | It will brin g emp loya bilit                                 | - | - | - | - | - | - | Ens<br>ure<br>heal<br>thy<br>live<br>s<br>and  | Prof<br>essi<br>onal<br>Edu<br>cati<br>on<br>(17. | Techni cal Skills that match Industr y                            |

|      |   |   | elimina | y     |   |   |   |   |   |   | nro         | 1-   | Needs   |
|------|---|---|---------|-------|---|---|---|---|---|---|-------------|------|---------|
|      |   |   | tion of |       |   |   |   |   |   |   | pro<br>mot  | 17.5 | riccus  |
|      |   |   | all the | opp   |   |   |   |   |   |   |             | 17.5 |         |
|      |   |   |         | urtu  |   |   |   |   |   |   | e           | )    |         |
|      |   |   | oral    | niti  |   |   |   |   |   |   | well        |      |         |
|      |   |   | dosage  | es    |   |   |   |   |   |   | -           |      |         |
|      |   |   | forms,  | in    |   |   |   |   |   |   | bein        |      |         |
|      |   |   | in      | the   |   |   |   |   |   |   | g<br>for    |      |         |
|      |   |   | order   | CR    |   |   |   |   |   |   | for         |      |         |
|      |   |   | to      | Os    |   |   |   |   |   |   | all         |      |         |
|      |   |   | make    |       |   |   |   |   |   |   | at          |      |         |
|      |   |   | the     |       |   |   |   |   |   |   | all         |      |         |
|      |   |   | better  |       |   |   |   |   |   |   | ages        |      |         |
|      |   |   | formul  |       |   |   |   |   |   |   | ages<br>(SD |      |         |
|      |   |   | ations  |       |   |   |   |   |   |   | G 3)        |      |         |
|      |   |   | produc  |       |   |   |   |   |   |   | ·           |      |         |
|      |   |   | ts.     |       |   |   |   |   |   |   |             |      |         |
| Unit | - | - | Global  | It    | - | - | - | - | - | - | Ens         | Prof | Techni  |
| IV   |   |   | Health  | will  |   |   |   |   |   |   | ure         | essi | cal     |
|      |   |   | care    | brin  |   |   |   |   |   |   | heal        | onal | Skills  |
|      |   |   | Needs.  | g     |   |   |   |   |   |   | thy         | Edu  | that    |
|      |   |   | It will | emp   |   |   |   |   |   |   | live        | cati | match   |
|      |   |   | give    | loya  |   |   |   |   |   |   | S           | on   | Industr |
|      |   |   | the     | bilit |   |   |   |   |   |   | and         | (17. | у       |
|      |   |   | pharma  | y     |   |   |   |   |   |   | pro         | 1-   | Needs   |
|      |   |   | cokinet | opp   |   |   |   |   |   |   | mot         | 17.5 | riccus  |
|      |   |   | ics of  | urtu  |   |   |   |   |   |   | e           | 17.5 |         |
|      |   |   | all the | niti  |   |   |   |   |   |   | well        | ,    |         |
|      |   |   | oral    |       |   |   |   |   |   |   | well        |      |         |
|      |   |   |         | es    |   |   |   |   |   |   |             |      |         |
|      |   |   | dosage  | in    |   |   |   |   |   |   | bein        |      |         |
|      |   |   | forms,  | the   |   |   |   |   |   |   | g<br>for    |      |         |
|      |   |   | in      | CR    |   |   |   |   |   |   |             |      |         |
|      |   |   | order   | Os    |   |   |   |   |   |   | all         |      |         |
|      |   |   | to      |       |   |   |   |   |   |   | at          |      |         |
|      |   |   | make    |       |   |   |   |   |   |   | all         |      |         |
|      |   |   | the     |       |   |   |   |   |   |   | ages        |      |         |

|      |  | better<br>formul<br>ations<br>produc   |   |  |  |  | (SD<br>G 3)  |  |   |
|------|--|--|---|--|--|--|--|--|---|
| Unit |  | ts. Global Health care Needs. It will give the non- linear pharma cokinet ics of all the oral dosage forms, in order to make the better formul ations produc ts. | It will brin g emp loya bilit y opp urtu niti es in the CR Os |  |  |  | Ens ure heal thy live s and pro mot e well bein g for all at all ages (SD G 3) | Prof<br>essi<br>onal<br>Edu<br>cati<br>on<br>(17.<br>1-<br>17.5) | Techni cal Skills that match Industry Needs |

| BP605T                      | Pharmaceutical Biotechnology (Theory) | L | T | P | С |  |  |  |  |  |  |  |
|-----------------------------|---------------------------------------|---|---|---|---|--|--|--|--|--|--|--|
| Version 2.0                 |                                       | 3 | 1 | 0 | 4 |  |  |  |  |  |  |  |
| <b>Total Contact Hours</b>  | 45 Hours                              |   |   |   |   |  |  |  |  |  |  |  |
| Pre-requisites/Exposure     | Pharmaceutical Microbiology           |   |   |   |   |  |  |  |  |  |  |  |
| Co-requisites Pharmaceutics |                                       |   |   |   |   |  |  |  |  |  |  |  |
| Course Objectives           |                                       |   |   |   |   |  |  |  |  |  |  |  |

# **Upon completion of this course the student should be able to:**

- 1. Understand the importance of Immobilized enzymes in Pharmaceutical Industries
- 2. Genetic engineering applications in relation to production of pharmaceuticals
- 3. Importance of Monoclonal antibodies in Industries
- 4. Appreciate the use of microorganisms in fermentation technology.

#### **Course Outcomes (CO)**

- CO1. Understanding the importance of Immobilized enzymes in Pharmaceutical Industries
- CO2. Applications of genetic engineering and protein engineering in relation to production of pharmaceuticals.
- CO3. Importance of Monoclonal antibodies in Industries.
- CO4. Appreciate the use of microorganisms in fermentation technology.

|     | Programme and Course Mapping |     |     |     |     |     |     |     |     |       |      |      |       |       |
|-----|------------------------------|-----|-----|-----|-----|-----|-----|-----|-----|-------|------|------|-------|-------|
| CO  | PO1                          | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO 10 | PO11 | PO12 | PSO 1 | PSO 2 |
| CO1 | 3                            |     |     |     |     |     |     |     |     |       |      |      | 3     |       |
| CO2 |                              |     |     |     | 3   |     |     |     |     |       |      |      |       |       |
| CO3 |                              |     |     |     | 3   | 3   |     |     |     |       |      |      |       |       |
| CO4 | 3                            |     |     |     |     |     |     |     |     |       |      | 3    |       |       |
| CO5 |                              |     |     |     |     |     |     |     |     |       | 3    | 3    |       |       |

| Unit | evance to the al, national, ional and global elopmental ds | evance To the<br>ployability/<br>trepreneurship/<br>Il Development | evance to the sfessional Ethics, nder, Human lues, vironment & tainability G |  |
|------|--|--|--|--|
|      | Rele<br>loca<br>regi<br>deve<br>neec                       | Rele<br>Emp<br>Entra<br>Skill                                      | Rele<br>Prof<br>Gen<br>Value<br>Env<br>Suet                                  |  |

|      | Local | Regional | National | Global  | Employability | Entrepreneurship | Skill Development   | Professional Ethics | Gender | Human Values | Environment & Sustainability |  |   |  |
|------|-------|----------|----------|---|---------------|------------------|---|---------------------|--------|--------------|------------------------------|--|---|--|
| Unit |       | -        |          | The relevance of immobilized enzymes and genetic engineering in pharmaceutical industries extends globally. Immobilized enzymes offer cost-effective and efficient solutions for pharmaceutical production, benefiting industries worldwide. Genetic engineering enables the development of advanced pharmaceutical products, personalized medicine, and innovative treatments, contributing to global healthcare advancements and addressing diverse patient needs on a global |               |                  | Develop a range of skills, including scientific and technical skills, critical thinking, laboratory techniques, and knowledge in areas such as immunology, biotechnology, and clinical practices. |                     |        |              |                              | "Ensu re health y lives and promo te well-being for all at all ages (SDG 3)" | Towards a More Holistic and Multidisciplinary Education (11.1- 11.13) | Technical<br>Skills that<br>match<br>Industry<br>Needs |

|            |      | scale.  |      |  |      |      |  |   |  |
|------------|------|---|------|--|------|------|--|---|--|
|            |      |   |      |  |      |      |  |   |  |
| Unit<br>II | <br> | <br>Globally genetic engineering has revolutionized the understanding and treatment of diseases, paving the way for personalized medicine, targeted therapies, and advancements in healthcare outcomes.   | <br> | Recombinant DNA technology, and applications in medicine can develop skills in molecular biology techniques, genetic engineering, experimental design, and data analysis, which are valuable in various research, medical, and biotechnology fields.                                   | <br> | <br> | "Ensu re health y lives and promo te well-being for all at all ages (SDG 3)" | Towards a More<br>Holistic and<br>Multidisciplinary<br>Education<br>(11.1- 11.13) | Technical<br>Skills that<br>match<br>Industry<br>Needs |
| Unit       | <br> | <br>Have various applications in research, diagnosis, and therapeutic interventions. Appropriate use of vaccines, toxoids, antitoxins, blood products and plasma substitutes are crucial in healthcare systems worldwide to support patient care and improve outcomes in critical situations. | <br> | Interdisciplinary thinking, analytical techniques, experimental design, problem-solving, and knowledge of molecular biology and industrial biotechnology. These skills are valuable in research, development, and production roles in the pharmaceutical and biotechnology industries. |      | <br> | "Ensu re health y lives and promo te well-being for all at all ages (SDG 3)" | Towards a More<br>Holistic and<br>Multidisciplinary<br>Education<br>(11.1- 11.13) | Technical<br>Skills that<br>match<br>Industry<br>Needs |

| Unit<br>IV | <br> | <br>It provides insights into gene regulation, evolutionary processes, biotechnological applications, and the development of diagnostic tools, contributing to advancements in research and disease diagnosis.                | <br> | Develop a range of skills, including laboratory techniques, molecular biology, problem-solving, research design, and biotechnological applications, which are valuable in academic, research, and industry settings   | <br> | <br> | "Ensu re health y lives and promo te well-being for all at all ages (SDG 3)" | Towards a More<br>Holistic and<br>Multidisciplinary<br>Education<br>(11.1- 11.13) | Technical<br>Skills that<br>match<br>Industry<br>Needs |
|------------|------|---|------|---|------|------|--|---|--|
| Unit<br>v  | <br> | <br>Efficient and safe production of pharmaceuticals, optimizing fermentation processes, understanding the production of specific compounds, and maintaining the quality and availability of blood products for clinical use. | <br> | Technical proficiency, laboratory techniques, process optimization, quality assurance, problem-solving, attention to detail, research, and data analysis, which are valuable in pharmaceutical and biotechnology industries, research institutions, and regulatory bodies | <br> | <br> | "Ensu re health y lives and promo te well-being for all at all ages (SDG 3)" | Towards a More<br>Holistic and<br>Multidisciplinary<br>Education<br>(11.1- 11.13) | Technical<br>Skills that<br>match<br>Industry<br>Needs |

| l . | I | 1 |  |
|-----|---|---|--|

| BP606T   | Pharmaceutical Quality Assurance (Theory) | L | T | P | С |
|--|---|---|---|---|---|
| Version 2.0  |   | 3 | 1 | 0 | 4 |
| <b>Total Contact Hours</b>   | 45 Hours                                  |   |   |   |   |
| Pre-requisites/Exposure  | Industrial Pharmacy - I                   |   |   |   |   |
| Co-requisites  | Pharmaceutics                             |   |   |   |   |
| Course Objectives  |   |   |   |   |   |
| Upon completion of this course the student should be able to:                                |   |   |   |   |   |
| 1. Understand the cGMP aspects in a pharmaceutical industry                                  |   |   |   |   |   |
| 2. Appreciate the importance of documentation  |   |   |   |   |   |
| 3. Understand the scope of quality certifications applicable to pharmaceutical               |   |   |   |   |   |
| 4. Understand the responsibilities of QA□□Industries & QC departments                        |   |   |   |   |   |
| Course Outcomes (CO)   |   |   |   |   |   |
| On completion of this course, the student will be able to:                                   |   |   |   |   |   |
| CO 1. Understand the concept of Quality Control and Quality Assurance.                       |   |   |   |   |   |
| CO 2. Appreciate the importance of documentation   |   |   |   |   |   |
| CO 3. Understand the scope of quality certifications applicable to pharmaceutical industries |   |   |   |   |   |
| CO 4. Understand the responsibilities of QA & QC departments                                 |   |   |   |   |   |
| CO 5. Understand the concept of validation and warehousing practices.                        |   |   |   |   |   |
| Programme and Course Mapping   |   |   |   |   |   |

| CO  | PO1   | PO2 | PO3 | PO4 | PO5 | PO6 | <b>PO7</b> | PO8 | PO9 | PO 10 | PO11 | PO12 | PSO 1 | PSO 2 |
|-----|---|-----|-----|-----|-----|-----|------------|-----|-----|-------|------|------|-------|-------|
| CO1 | 3   | 3   |     |     |     |     |            |     |     |       |      |      | 3     |       |
| CO2 |   | 3   |     |     | 3   |     |            |     |     |       |      |      |       | 3     |
| CO3 |   |     |     |     | 3   | 3   |            |     |     |       |      |      |       |       |
| CO4 | 3   |     |     |     |     |     |            | 3   |     |       |      | 3    |       |       |
| CO5 |   |     |     |     |     |     |            |     |     |       | 3    | 3    |       |       |
|     | 1=lightly mapped 2= moderately mapped 3=strongly mapped |     |     |     |     |     |            |     |     |       |      |      |       |       |

| Unit | bal  | e lip/                       | ics,                                       |     |          |                  |
|------|--|------------------------------|--|-----|----------|------------------|
|      | II, all gglol  | the ski                      | the Ethinan nan t & t                      |     |          |                  |
|      | ona ona nd genta   | To illity leur lop.          | Se m e H                                   |     |          | ~                |
|      | ati ati mu   | nce<br>yab;<br>ren<br>evel   | non num num num num num num num num num nu |     |          | (l <sub>tt</sub> |
|      | iona<br>iona<br>iona<br>iona<br>iona<br>iona<br>de<br>ds   | evaj<br>ploj<br>rep          | eva<br>fess<br>ide<br>ide<br>riro<br>tain  | ر ا | <b>L</b> | E/4              |
|      | Rele local region of the l | Rele<br>Emp<br>Entr<br>Skill | Relo                                       | SD( | NE.      | PO]              |

|        | Local | Regional | National | Global  | Employability   | Entrepreneurship | Skill Development | Professional Ethics  | Gender | Human Values | Environment & Sustainability |   |  |  |
|--------|-------|----------|----------|---|---|------------------|-------------------|--|--------|--------------|------------------------------|---|--|--|
| Unit I | -     | -        | -        | Quality assurance and quality management concepts, along with Total Quality Management (TQM) principles, contribute globally by ensuring the consistent production of high-quality pharmaceutical products, improving patient safety, and meeting regulatory requirements. Adherence to ICH guidelines harmonizes global standards, facilitating international collaboration and ensuring the safety, efficacy, and quality of pharmaceuticals worldwide. | Professionals with expertise in ensuring compliance, quality control, and continuous improvement of pharmaceutical processes are in high demand in the pharmaceutical industry, enhancing employability and contributing to the success of pharmaceutical companies and their products. These professionals | _                | -                 | Quality assurance and quality managemen t concepts, Total Quality Manageme nt (TQM) principles, and adherence to ICH guidelines contribute to professiona l ethics by promoting a culture of transparenc |        | _            | _                            | Skil<br>ls<br>for<br>Dec<br>ent<br>Wor<br>k<br>(SD<br>G<br>4.4) | Pro mot ing Hig hj- qual ity rese arch (18. 1- 18.9) | Techni cal Skills that match Industr y Needs |

|         |   |   |   |  | should also be    |   |   | y,           |   |   |      |      |         |
|---------|---|---|---|--|-------------------|---|---|--------------|---|---|------|------|---------|
|         |   |   |   |  | familiar with ICH |   |   | accountabili |   |   |      |      |         |
|         |   |   |   |  | guidelines and    |   |   | ty, and      |   |   |      |      |         |
|         |   |   |   |  | Total Quality     |   |   | integrity in |   |   |      |      |         |
|         |   |   |   |  | Management        |   |   | the          |   |   |      |      |         |
|         |   |   |   |  | (TQM) principles. |   |   | pharmaceut   |   |   |      |      |         |
|         |   |   |   |  | (1QM) principles. |   |   | ical         |   |   |      |      |         |
|         |   |   |   |  |                   |   |   | industry.    |   |   |      |      |         |
|         |   |   |   |  |                   |   |   | They         |   |   |      |      |         |
|         |   |   |   |  |                   |   |   | ensure the   |   |   |      |      |         |
|         |   |   |   |  |                   |   |   |              |   |   |      |      |         |
|         |   |   |   |  |                   |   |   | ethical      |   |   |      |      |         |
|         |   |   |   |  |                   |   |   | production,  |   |   |      |      |         |
|         |   |   |   |  |                   |   |   | testing, and |   |   |      |      |         |
|         |   |   |   |  |                   |   |   | distribution |   |   |      |      |         |
|         |   |   |   |  |                   |   |   | of           |   |   |      |      |         |
|         |   |   |   |  |                   |   |   | pharmaceut   |   |   |      |      |         |
|         |   |   |   |  |                   |   |   | ical         |   |   |      |      |         |
|         |   |   |   |  |                   |   |   | products,    |   |   |      |      |         |
|         |   |   |   |  |                   |   |   | safeguardin  |   |   |      |      |         |
|         |   |   |   |  |                   |   |   | g patient    |   |   |      |      |         |
|         |   |   |   |  |                   |   |   | safety and   |   |   |      |      |         |
|         |   |   |   |  |                   |   |   | trust in the |   |   |      |      |         |
|         |   |   |   |  |                   |   |   | global       |   |   |      |      |         |
|         |   |   |   |  |                   |   |   | healthcare   |   |   |      |      |         |
|         |   |   |   |  |                   |   |   | system.      |   |   |      |      |         |
| Unit II | - | - | - | Efficient organization and personnel   | By fostering a    | - | - | Effective    | - | - | Skil | Pro  | Techni  |
|         |   |   |   | management contribute globally by      | structured and    |   |   | organizatio  |   |   | ls   | mot  | cal     |
|         |   |   |   | fostering productivity, collaboration, | productive work   |   |   | n and        |   |   | for  | ing  | Skills  |
|         |   |   |   | and employee engagement across         | environment,      |   |   | personnel    |   |   | Dec  | Hig  | that    |
|         |   |   |   | international teams, leading to        | encouraging       |   |   | managemen    |   |   | ent  | hj-  | match   |
|         |   |   |   | streamlined operations, effective      | teamwork, skill   |   |   | t contribute |   |   | Wor  | qual | Industr |
|         |   |   |   | project execution, and a positive      | development, and  |   |   | to           |   |   | k    | ity  | y       |
|         |   |   |   | work culture, ultimately driving       | employee          |   |   | professiona  |   |   | (SD  | rese | Needs   |
|         |   |   |   | global business success and            | happiness,        |   |   | l ethics by  |   |   | G    | arch |         |
|         |   |   |   |  |                   |   |   |              |   |   |      |      |         |

|          |   |   |  | organisation and    |   |   | clear        |   |   |   |      | 1-   |         |
|----------|---|---|--|---------------------|---|---|--------------|---|---|---|------|------|---------|
|          |   |   |  | personnel           |   |   | policies,    |   |   |   |      | 18.9 |         |
|          |   |   |  | management          |   |   | promoting    |   |   |   |      | )    |         |
|          |   |   |  | contribute to       |   |   | fair         |   |   |   |      | ,    |         |
|          |   |   |  | employability and   |   |   | treatment,   |   |   |   |      |      |         |
|          |   |   |  | lead to improved    |   |   | and          |   |   |   |      |      |         |
|          |   |   |  | productivity,       |   |   | fostering a  |   |   |   |      |      |         |
|          |   |   |  | professional        |   |   | culture of   |   |   |   |      |      |         |
|          |   |   |  | progress, and job   |   |   | integrity,   |   |   |   |      |      |         |
|          |   |   |  | retention rates.    |   |   | thereby      |   |   |   |      |      |         |
|          |   |   |  | retention rates.    |   |   | ensuring     |   |   |   |      |      |         |
|          |   |   |  |                     |   |   | ethical      |   |   |   |      |      |         |
|          |   |   |  |                     |   |   | conduct,     |   |   |   |      |      |         |
|          |   |   |  |                     |   |   | respect for  |   |   |   |      |      |         |
|          |   |   |  |                     |   |   | diversity,   |   |   |   |      |      |         |
|          |   |   |  |                     |   |   | and          |   |   |   |      |      |         |
|          |   |   |  |                     |   |   | accountabili |   |   |   |      |      |         |
|          |   |   |  |                     |   |   |              |   |   |   |      |      |         |
|          |   |   |  |                     |   |   | ty in the    |   |   |   |      |      |         |
|          |   |   |  |                     |   |   | workplace,   |   |   |   |      |      |         |
|          |   |   |  |                     |   |   | enhancing    |   |   |   |      |      |         |
|          |   |   |  |                     |   |   | trust and    |   |   |   |      |      |         |
|          |   |   |  |                     |   |   | upholding    |   |   |   |      |      |         |
|          |   |   |  |                     |   |   | ethical      |   |   |   |      |      |         |
|          |   |   |  |                     |   |   | standards    |   |   |   |      |      |         |
|          |   |   |  |                     |   |   | globally.    |   |   |   |      | _    |         |
| Unit III | - | - | Quality assurance and adherence to     | By giving           | - | - | Quality      | - | - | - | Skil | Pro  | Techni  |
|          |   |   | Good Laboratory Practices (GLP)        | professionals       |   |   | control and  |   |   |   | ls   | mot  | cal     |
|          |   |   | contribute globally by ensuring        | practical           |   |   | adherence    |   |   |   | for  | ing  | Skills  |
|          |   |   | reliable and accurate scientific data, | experience with     |   |   | to Good      |   |   |   | Dec  | Hig  | that    |
|          |   |   | promoting reproducibility and          | analytical          |   |   | Laboratory   |   |   |   | ent  | hj-  | match   |
|          |   |   | credibility in research, development,  | methods, data       |   |   | Practices    |   |   |   | Wor  | qual | Industr |
|          |   |   | and regulatory assessments. This       | interpretation, and |   |   | (GLP)        |   |   |   | k    | ity  | У       |
|          |   |   | supports global harmonization,         | quality assurance   |   |   | contribute   |   |   |   | (SD  | rese | Needs   |
|          |   |   | facilitates knowledge exchange, and    | principles, quality |   |   | to           |   |   |   | G    | arch |         |
|          |   |   | enhances public trust in scientific    | control and         |   |   | professiona  |   |   |   | 4.4) | (18. |         |

|         |   |   |   | findings, driving advancements in various fields and improving global scientific standards.  | adherence to Good Laboratory Practises (GLP) contribute to skill development. These abilities promote competence and professional progression in the disciplines of laboratory science and quality management and are crucial for accurate testing, regulatory compliance, and maintaining product safety. |   |   | l ethics by promoting accuracy, reliability, and integrity in scientific testing and data reporting. They ensure compliance with ethical standards, prevent fraud and misconduct, and uphold the credibility and trustworthiness of research and laboratory practices |   |   |   |  | 1-<br>18.9<br>)                         |                                      |
|---------|---|---|---|--|--|---|---|---|---|---|---|--|---|--------------------------------------|
|         |   |   |   |  |  |   |   | laboratory practices globally.  |   |   |   |  |   |                                      |
| Unit IV | - | - | - | Effective management of complaints and proper document maintenance in the pharmaceutical industry contributes globally by ensuring transparency, accountability, and continuous improvement in product | Professionals skilled in managing complaints and document maintenance in the   | - | - | Proper managemen t of complaints and thorough   | - | - | - | Skil<br>ls<br>for<br>Dec<br>ent<br>Wor | Pro<br>mot<br>ing<br>Hig<br>hj-<br>qual | Techni cal Skills that match Industr |

| quality, safety, and regulatory compliance. It fosters customer satisfaction, regulatory compliance, and knowledge sharing, thereby enhancing global public health and trust in pharmaceutical products. | pharmaceutical industry are sought after as they contribute to effective customer relationship management, regulatory compliance, and process improvement, enhancing employability and career opportunities in quality assurance, regulatory affairs, and customer service roles. | document maintenanc e in the pharmaceut ical industry contribute to professiona l ethics by ensuring transparenc y, accountabili ty, and adherence to regulatory standards, promoting integrity, and trust in dealing with customer concerns |  | k<br>(SD<br>G<br>4.4) | ity rese arch (18. 1- 18.9 ) | y<br>Needs |
|--|---|--|--|-----------------------|------------------------------|------------|
|  |   | integrity,<br>and trust in<br>dealing<br>with  |  |                       |                              |            |

| Unit v | - | - | - | Calibration and validation processes contribute globally by ensuring accurate and reliable measurement and testing results, which are crucial for maintaining quality standards, regulatory compliance, and global harmonization in various industries, including pharmaceuticals, manufacturing, and scientific research. | Professionals skilled in calibration and validation techniques are highly sought after in industries that require accurate measurements and reliable data, | - | - Calibration and validation contribute to professiona l ethics by ensuring the integrity and   | - | - | - | Skil<br>ls<br>for<br>Dec<br>ent<br>Wor<br>k<br>(SD<br>G<br>4.4) | Pro mot ing Hig hj-qual ity rese arch (18. | Techni cal Skills that match Industr y Needs |
|--------|---|---|---|--|--|---|---|---|---|---|---|--|--|
|        |   |   |   |  | laboratory management, and regulatory compliance roles.  |   | processes, promoting transparenc y, accountabili ty, and adherence to regulatory standards, thereby upholding ethical standards and maintaining trust in scientific research and data analysis. |   |   |   |   |  |  |

| BP607P                            | Medicinal Chemistry-III (Practical) | L       | T | P | C |  |  |  |  |  |  |  |  |
|-----------------------------------|-------------------------------------|---------|---|---|---|--|--|--|--|--|--|--|--|
| Version 2.0                       |                                     | 0       | 0 | 4 | 2 |  |  |  |  |  |  |  |  |
| <b>Total Contact Hours</b>        | 60 Hours                            |         |   |   |   |  |  |  |  |  |  |  |  |
| Pre-requisites/Exposure           | Medicinal Chemistry-III (Practical) |         |   |   |   |  |  |  |  |  |  |  |  |
| Co-requisites Medicinal Chemistry |                                     |         |   |   |   |  |  |  |  |  |  |  |  |
|                                   | Course Obje                         | ectives |   |   |   |  |  |  |  |  |  |  |  |

# **Upon completion of this course the student should be able to:**

- 1. Understand the importance of drug design and different techniques of drug design.
- 2. Understand the chemistry of drugs with respect to their biological activity.
- 3. Know the metabolism, adverse effects and therapeutic value of drugs.
- 4. Know the importance of SAR of drugs.

## **Course Outcomes (CO)**

# On completion of this course, the student will be able to:

CO 1. Understand fundamental knowledge on the structure, function and significance of Drugs.

- CO 2. Discuss various mechanism of action of drugs
- CO 3. Provide knowledge of Synthesis and Metabolism of drugs.
- CO 4. Provide knowledge of Structure Activity Relationships (SAR) therapeutic uses of drugs.
- CO 5. Provide knowledge of marketed preparation.

# **Programme and Course Mapping**

|     |   |     | ı   |     |     |     | 1   | 1   | 1   | 1     | 1    |      | 1     |       |
|-----|---|-----|-----|-----|-----|-----|-----|-----|-----|-------|------|------|-------|-------|
| CO  | PO1   | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO 10 | PO11 | PO12 | PSO 1 | PSO 2 |
|     |   |     |     |     |     |     |     |     |     |       |      |      |       |       |
| CO1 | 3   |     |     |     |     |     |     |     |     |       |      |      | 3     |       |
|     |   |     |     |     |     |     |     |     |     |       |      |      |       |       |
| CO2 |   |     |     |     | 3   |     |     |     |     |       |      |      |       |       |
|     |   |     |     |     |     |     |     |     |     |       |      |      |       |       |
| CO3 |   |     |     |     | 3   | 3   |     |     |     |       |      |      |       |       |
|     |   |     |     |     |     |     |     |     |     |       |      |      |       |       |
| CO4 |   |     |     |     |     |     |     |     |     |       | 3    | 3    |       |       |
|     |   |     |     |     |     |     |     |     |     |       |      |      |       |       |
| CO5 |   |     |     |     |     |     |     |     |     |       |      | 3    |       | 1     |
|     |   |     |     |     |     |     |     |     |     |       |      |      |       |       |
|     | 1=lightly mapped 2= moderately mapped 3=strongly mapped |     |     |     |     |     |     |     |     |       |      |      |       |       |

| Relevance to the local, national, regional and global developmental needs | Relevance To the Employability/ Entrepreneurshi p/ Skill Development | Relevance to the Professional Ethics, Gender, Human Values, Environment & Sustainability | SDG | NEP | POE/4 <sup>th</sup> IR |  |
|---|--|--|-----|-----|------------------------|--|
|---|--|--|-----|-----|------------------------|--|

|            | Local | Regional | National | Global   | Employability                                | Entrepreneurship   | Skill Development   | Professional Ethics | Gender | Human Values | Environment & Sustainability   |   |  |                          |
|------------|-------|----------|----------|--|--|--|---|---------------------|--------|--------------|--|---|--|--------------------------|
| Unit       |       |          |          | The aim of synthesizing medicinally important compounds is to advance drug discovery, development, and healthcare by identifying new therapeutic agents, optimizing drug properties, elucidating structure-activity relationships, and addressing unmet medical needs. | Employ<br>ability<br>in<br>Researc<br>h labs | Entre prene urship in area of drug devel opme nt and resear ch | Hands on training of different techniques, s that students can learn the different synthetic techniques |                     |        |              | Learning of chemical hazardous and handling help in environme ntal sustainabil ity | Revitalize the global partnership for sustainable developmen t (Role of all Schools, KRMU) (SDG 17) | Promoting<br>High-quality<br>research<br>(18.1-18.9)   | Skill<br>Develo<br>pment |
| Unit<br>II |       | 1        | -        | Hands on training of<br>Analytical techniques  | Employ<br>ability<br>in<br>Researc<br>h labs | Entre prene urship in area                                     | Hands on<br>training of<br>Analytical<br>techniques   |                     |        |              |  | -   | - Promoting<br>High-quality<br>research<br>(18.1-18.9) | Skill<br>Develo<br>pment |

|            |   |   |   |  | of<br>drug<br>devel<br>opme<br>nt and                             |  |  |   |   |                          |
|------------|---|---|---|--|---|--|--|---|---|--------------------------|
|            |   |   |   |  | resear  |  |  |   |   |                          |
| Unit       | - | - | Hands on training of Synthetic techniques     | Employ<br>ability<br>in<br>Researc<br>h labs | ch Entre prene urship in area of drug devel opme nt and resear ch | Hands on training of different techniques, s that students can learn the advanced synthetic techniques |  | Skills for<br>Decent<br>Work<br>(SDG 4.4) | Effective<br>Governance &<br>Leadership<br>(19.1- 19.5) | Skill<br>Develo<br>pment |
| Unit<br>IV | - | - | In silico drug designing<br>Skill development | Employ<br>ability<br>in<br>Researc<br>h labs | Entre prene urship in area of drug devel opme nt and resear       | Hands on training of different in silico techniques  |  | -   | -   | Skill<br>Develo<br>pment |

| Unit<br>v |  | Designing of In silico<br>studies helps the students<br>to get the training on lead<br>optimization Skill<br>development | ability | Entre prene urship in area of                   | Hands on training of different in silico techniques |  |  | Revitalize<br>the global<br>partnership<br>for<br>sustainable<br>developmen | Transforming the Regulatory System (20.1-20.15) | Skill<br>Develo<br>pment |
|-----------|--|--|---------|---|---|--|--|---|---|--------------------------|
|           |  |  |         | drug<br>devel<br>opme<br>nt and<br>resear<br>ch |   |  |  | t (Role<br>of all<br>Schools,<br>KRMU)<br>(SDG 17)                          |   |                          |

| BP608P                                   | Pharmacology-III (Practical) | L | T | P | C |  |  |  |  |  |  |  |
|--|------------------------------|---|---|---|---|--|--|--|--|--|--|--|
| Version 2.0                              |                              | 0 | 0 | 4 | 2 |  |  |  |  |  |  |  |
| <b>Total Contact Hours</b>               | 60 Hours                     |   |   |   |   |  |  |  |  |  |  |  |
| Pre-requisites/Exposure                  | Pharmacology-II (Practical)  |   |   |   |   |  |  |  |  |  |  |  |
| Co-requisites HAP-II and Pathophysiology |                              |   |   |   |   |  |  |  |  |  |  |  |
| Course Objectives                        |                              |   |   |   |   |  |  |  |  |  |  |  |

# **Upon completion of this course the student should be able to:**

1. Get familiar with the pre-clinical studies in animals

- 2. Know the animal handling techniques, methods of drugs administration.
- 3. Understand Dose calculation and administration of drug through IM,IV routes
- 4. Able to learn and understand CCSEA guidelines
- 5. Know about the various disease models in order to discover a new drug

## **Course Outcomes (CO)**

### On completion of this course, the student will be able to:

- CO 1. Understanding pharmacology experiments demonstration by simulated experiments / videos.
- CO 2. Understand knowledge of dose calculation and acute oral toxicity in pharmacology experiments
- CO 3. Study various effects of drugs like anti-ulcer, GIT mobility and anti-allergic activity using various assay based on video recordings
- CO 4. Know the biostatistics methods in experimental pharmacology like ANOVA, Chi square test, Wilcoxon Signed Rank test)

# **Programme and Course Mapping**

| CO  | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO 10 | PO11 | PO12 | PSO 1 | PSO 2 |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-------|------|------|-------|-------|
| CO1 | 3   |     |     |     |     |     |     |     |     |       |      |      | 3     |       |
| CO2 |     | 3   |     |     |     |     |     |     |     |       |      |      |       | 2     |
| CO3 |     |     |     |     |     | 3   |     |     |     |       |      |      |       |       |
| CO4 |     |     |     |     |     |     |     |     |     |       |      | 3    |       |       |

1=lightly mapped

2= moderately mapped

3=strongly mapped

| Unit<br>II  | - | - | - | To understand the effect of drugs on gastrointestinal motility, agonist and antagonists on guinea pig ileum and estimation of serum biochemical parameters by using semiautoanalyser which helps                                 | - | - | The basic knowledge related to drugs on gastrointestinal motility, agonist and antagonist as well as                   | - | - | - | - | Skills for<br>Decent<br>Work SDG<br>4.4 | Prof<br>essi<br>onal<br>edu<br>cati<br>on(<br>17.1              | Global<br>educati<br>on<br>knowle<br>dge |
|-------------|---|---|---|--|---|---|--|---|---|---|---|---|---|--|
|             |   |   |   | in basic understanding of experimental pharmacology  |   |   | biochemical parameters   |   |   |   |   |   | 17.5  |  |
| Unit<br>III |   | - | - | Emphasize on studies related to saline purgative on frog intestine, Insulin hypoglycemic effect in rabbit as well as test for pyrogens which enhances basic pharmacological knowledge  |   |   | Gaining basics<br>of purgative on<br>frog intestine,<br>insulin<br>hypoglycemic<br>effect and<br>pyrogens              | - | - | - | - | Skills for<br>Decent<br>Work SDG<br>4.4 | Professional education(17.1-17.5)                               | Global<br>educati<br>on<br>knowle<br>dge |
| Unit<br>IV  | - | - | - | To focus on studies related to determination of acute oral toxicity (LD50) of a drug and acute skin irritation / corrosion and acute eye irritation / corrosion of a test substance which help in understanding toxicity studies |   |   | Understanding basics of toxicity studies related to acute oral toxicity acute skin irritation and acute eye irritation | - | - | - | - | Skills for<br>Decent<br>Work SDG<br>4.4 | Prof<br>essi<br>onal<br>edu<br>cati<br>on(<br>17.1<br>-<br>17.5 | Global<br>educati<br>on<br>knowle<br>dge |
| Unit<br>v   | - | - | - | To elaborate the calculation of pharmacokinetic parameters from a given  |   |   | The basic<br>knowledge<br>related<br>pharmacokinetic   | - | - | - | - | Skills for<br>Decent<br>Work SDG<br>4.4 | Prof<br>essi<br>onal<br>edu                                     | Global<br>educati<br>on<br>knowle        |

|  | data and biostatistics   |  | S |  |  | cati | dge |
|--|--------------------------|--|---|--|--|------|-----|
|  | methods in experimental  |  |   |  |  | on(  |     |
|  | pharmacology which helps |  |   |  |  | 17.1 |     |
|  | in understanding basis   |  |   |  |  | _    |     |
|  | calculation              |  |   |  |  | 17.5 |     |
|  |                          |  |   |  |  | )    |     |

| BP609P                     | Herbal Drug Technology (Practical)              | L | Т | P | C |
|----------------------------|---|---|---|---|---|
| Version 2.0                |   | 0 | 0 | 4 | 2 |
| <b>Total Contact Hours</b> | 60 Hours  |   |   |   |   |
| Pre-requisites/Exposure    | Pharmacognosy & Phytochemistry – II (Practical) |   |   |   |   |
| Co-requisites              | Pharmacognosy & Phytochemistry – I (Practical)  |   |   |   |   |
|                            | Course Objectives                               |   |   |   |   |

### **Course Objectives**

# **Upon completion of this course the student should be able to:**

- 1. Know to evaluate the quality of raw material.
- 2. Know the guidelines for quality of herbal drug.
- 3. Know about herbal cosmetics, natural sweeteners etc.
- 4. Know about modern concepts such as nutraceuticals

# **Course Outcomes (CO)**

# On completion of this course, the student will be able to:

- CO 1. Gain Practical knowledge of Preliminary phytochemical screening of crude drugs.
- CO 2. Carry out Preparation and standardization of Herbal extracts in cosmetic formulation.
- CO 3. Understand & study the monograph of various Herbal drugs.
- CO 4. Determine the content of components like Aldehyde and alcohol
- CO 5. Prepare Ayurvedic formulations

### **Programme and Course Mapping** PO1 PO2 PO3 PO4 PO5 **PO6 PO7** PO8 PO9 PO 10 PO11 **PO12** PSO 1 PSO 2 $\mathbf{CO}$ CO1 3 3 CO<sub>2</sub> 3 CO3 3 CO4 3 CO5 3 1=lightly mapped 2= moderately mapped 3=strongly mapped

| Unit | Relevance to the | local, national,<br>regional and global | developmental<br>needs |  | Relevance To the | Employability/<br>Entrepreneurship/ | Skill Development   | Relevance to the<br>Professional Ethics,<br>Gender, Human | Values,<br>Environment & | Sustainability |                              | 90   | J.   | POE/4 <sup>th</sup> IR   |
|------|------------------|---|------------------------|--|------------------|-------------------------------------|---|---|--------------------------|----------------|------------------------------|--|--|--|
|      | Re               | loc<br>reg                              | de<br>ne               |  | Re               |                                     | <b>X</b>  | 8 4 9;  | <u> </u>                 | Su             |                              | SDG  | NEP  | PC   |
| Unit | Local            | Regional                                | National               | The study of preliminary phytochemical screening of crude drugs helps students globally by providing a foundation for understanding the chemical composition of medicinal plants. This knowledge enables students to identify and isolate bioactive compounds, leading to the development of new drugs and treatments. It contributes to the field of natural medicine, supporting | Employability    | Entrepreneurship                    | The study of preliminary phytochemical screening of crude drugs helps students in skill development by enhancing their knowledge and understanding of plant-based compounds. It enables them to learn techniques for identifying and analyzing chemical constituents, fostering critical thinking, and developing laboratory skills necessary for pharmaceutical research and drug discovery. | Professional Ethics                                       | Gender                   | Human Values   | Environment & Sustainability | Rev itali ze the glob al part ners hip for sust aina ble dev | Pro fess ion al Edu cati on (17. 1-17.5) Pro mot ing | Techni cal Skills that match Industr y Needs, Entrepr eneursh ip, Employ ability |

|      |   |   | global efforts to discover novel therapeutic options and promote sustainable healthcare practices.  |  |  |  | elop<br>men<br>t<br>(Rol<br>e of<br>all<br>Sch<br>ools<br>,<br>KR<br>MU<br>)<br>(SD<br>G<br>17) | Hig<br>hj-<br>qua<br>lity<br>rese<br>arc<br>h<br>(18.<br>1-<br>18.9 |  |
|------|---|---|---|--|--|--|---|---|--|
| Unit | - | - | The study of "Evaluation of excipients of natural origin" benefits students globally by providing them with knowledge and understanding of natural excipients, which are substances used in pharmaceutical formulations. This knowledge allows students to develop safer and more effective drug formulations, promoting sustainable and eco-friendly practices in the pharmaceutical industry. Understanding natural excipients also enables students to explore new possibilities for drug delivery | The study of "Evaluation of excipients of natural origin" helps students in skill development by enhancing their understanding of natural excipients used in pharmaceutical formulations. It allows students to develop critical thinking, analytical skills, and knowledge of quality assessment methods. This knowledge equips them to evaluate, select, and formulate safer and more effective pharmaceutical products, contributing to their overall skill development in the field. |  |  |   |   | Global<br>Educat<br>ion<br>Knowl<br>edge |

| Unit | - | and develop innovative pharmaceutical products.  The study of "Monograph analysis of herbal drugs" helps students globally by providing a comprehensive understanding of the medicinal properties, chemical composition, quality control, and therapeutic applications of herbal medicines. This knowledge equips students with the necessary skills to evaluate, formulate, and recommend herbal remedies, contributing to the advancement of traditional medicine and expanding healthcare options for diverse populations worldwide.  The study of prepared and | The study of "Monograph analysis of herbal drugs" helps students in skill development by enhancing their knowledge of medicinal plants, their properties, and potential uses. It fosters skills in research, critical thinking, and data analysis, while also promoting an understanding of drug formulation and quality control. This knowledge equips students with valuable expertise in the field of herbal medicine and supports their professional growth. |  | Ens                        | 1.a Ens ure sign ific ant mo bili zati on of reso urc es fro m a vari ety of sou rces |  |
|------|---|--|--|--|----------------------------|---|--|
| IV   |   | standardized extracts helps students globally by providing a consistent and reliable basis for learning. These extracts ensure that  | standardized extracts helps<br>students in skill development by<br>providing them with consistent<br>and reliable samples for analysis<br>and experimentation. This  |  | ure<br>heal<br>thy<br>live | hno<br>logy<br>Use<br>&<br>Inte   |  |
|      |   | students have access to  | enables them to understand the   |  | and                        | grat  |  |

|  | accurate and uniform          |  | principles and techniques        |  |  | pro          | ion         |  |
|--|-------------------------------|--|----------------------------------|--|--|--------------|-------------|--|
|  | information, facilitating     |  | involved in extracting and       |  |  | mot          | <b>(23.</b> |  |
|  | easier comprehension and      |  | standardizing substances,        |  |  | e            | 1-          |  |
|  | comparability of results      |  | enhancing their scientific       |  |  | well         | 23.1        |  |
|  | across different educational  |  | knowledge and laboratory skills  |  |  | -            | 3)          |  |
|  | institutions. Additionally,   |  | in a controlled and reproducible |  |  | bein         | ,           |  |
|  | standardized extracts promote |  | manner.                          |  |  | g            |             |  |
|  | transparency and              |  |                                  |  |  | for          |             |  |
|  | reproducibility, fostering a  |  |                                  |  |  | all          |             |  |
|  | shared understanding and      |  |                                  |  |  | at           |             |  |
|  | enhancing collaboration       |  |                                  |  |  | all          |             |  |
|  | among students worldwide.     |  |                                  |  |  | ages         |             |  |
|  | _                             |  |                                  |  |  | (SD          |             |  |
|  |                               |  |                                  |  |  | G 3)         |             |  |
|  |                               |  |                                  |  |  | Ens          |             |  |
|  |                               |  |                                  |  |  | ure          |             |  |
|  |                               |  |                                  |  |  | sust         |             |  |
|  |                               |  |                                  |  |  | aina         |             |  |
|  |                               |  |                                  |  |  | ble          |             |  |
|  |                               |  |                                  |  |  | con          |             |  |
|  |                               |  |                                  |  |  | sum          |             |  |
|  |                               |  |                                  |  |  | ptio         |             |  |
|  |                               |  |                                  |  |  | n            |             |  |
|  |                               |  |                                  |  |  | and          |             |  |
|  |                               |  |                                  |  |  | pro          |             |  |
|  |                               |  |                                  |  |  | duc          |             |  |
|  |                               |  |                                  |  |  | tion         |             |  |
|  |                               |  |                                  |  |  | patt         |             |  |
|  |                               |  |                                  |  |  | erns         |             |  |
|  |                               |  |                                  |  |  | (SD          |             |  |
|  |                               |  |                                  |  |  | $\mathbf{G}$ |             |  |
|  |                               |  |                                  |  |  | 12)          |             |  |
|  |                               |  |                                  |  |  | ,            |             |  |

| ***  |                                |                                    |      | <b>m</b>   a       |
|------|--------------------------------|------------------------------------|------|--------------------|
| Unit | The study of prepared and      | Studying prepared and              | Ens  | Tec   Corpor       |
| V    | standardized extract in        | standardized extracts in cosmetic  | ure  | hnol ate           |
|      | cosmetic formulations helps    | formulations helps in skill        | sust | ogy   Allianc      |
|      | students globally by           | development by enhancing           | aina | Use es to          |
|      | providing them with a          | knowledge of ingredient            | ble  | & provid           |
|      | comprehensive understanding    | selection, formulation             | con  | Inte e Big         |
|      | of the principles and          | techniques, and quality control    | sum  | grat   Sister/     |
|      | techniques involved in         | processes. It cultivates expertise | ptio | ion <b>Big</b>     |
|      | formulating cosmetics. It      | in developing effective and safe   | n    | (23. <b>Brothe</b> |
|      | equips them with knowledge     | cosmetic products, optimizing      | and  | 1- <b>r</b>        |
|      | of selecting and preparing     | product stability and efficacy,    | pro  | 23.1 <b>Conne</b>  |
|      | standardized extracts for      | and meeting regulatory             | duc  | 3) ctions          |
|      | cosmetic products, ensuring    | requirements. This knowledge       | tion |                    |
|      | quality, safety, and efficacy. | contributes to the development     | patt |                    |
|      | This knowledge enables         | of advanced formulation skills,    | erns |                    |
|      | students to develop            | ensuring high-quality and          | (SD  |                    |
|      | innovative and effective       | standardized cosmetic              | G    |                    |
|      | cosmetic formulations,         | preparations.                      | 12)  |                    |
|      | contributing to the            |                                    |      |                    |
|      | advancement of the global      |                                    |      |                    |
|      | cosmetics industry.            |                                    |      |                    |

# **Semester-VII**

| BP 701 T                   | Instrumental Methods of Analysis (Theory) | L | Т | P | C |
|----------------------------|---|---|---|---|---|
| Version 2.0                |   | 3 | 1 | 0 | 4 |
| <b>Total Contact Hours</b> | 45 Hours                                  |   |   |   |   |
| Pre-requisites/Exposure    | Analytical Chemistry                      |   |   |   |   |

## **Co-requisites**

### **Course Objectives**

### Upon completion of this course the student should be able to:

- 1. Understand the interaction of matter with electromagnetic radiations and its applications in drug analysis
- 2. Understand the chromatographic separation and analysis of drugs.
- 3. Perform quantitative & qualitative analysis of drugs using various analytical instruments.

### **Course Outcomes (CO)**

### On completion of this course, the student will be able to:

- CO1. This subject deals with the application of instrumental methods in qualitative analysis of drugs.
- CO2. This subject deals with the application of instrumental methods in quantitative analysis of drugs.
- CO3. This subject is designed to impart a fundamental knowledge on the principles and instrumentation of spectroscopic techniques.
- CO4. This subject is designed to impart a fundamental knowledge on the principles and instrumentation of chromatographic techniques.
- CO5. This also emphasizes on theoretical knowledge on modern analytical instruments that are used for drug testing.

### **Programme and Course Mapping** CO **PO1** PO<sub>2</sub> PO<sub>3</sub> PO4 **PO5 PO6 PO7 PO8 PO9 PO 10 PO11 PO12** PSO 1 PSO 2 **CO1** 3 2 2 3 3 1 3 2 3 3 3 3 3 CO<sub>2</sub> 3 2 1 2 2 3 3 3 3 **CO3** 3 2 2 1 2 3 3 3 3 **CO4** 3 2 2 2 1 3 3 3 3 **CO5** 3 2 2 2 1=lightly mapped 3=strongly mapped 2= moderately mapped

| Unit   | Relevance to the local, national, regional and global developmental needs |          |   |          | Relevance To the Employability/ | Skill Development  |  | Relevance to the<br>Professional Ethics, | Gender, Human<br>Values, | Sustainability |                              | SDG   | NEP  | POE/4 <sup>th</sup> IR  |
|--------|---|----------|---|----------|---------------------------------|--------------------|--|--|--------------------------|----------------|------------------------------|---|--|---|
| Unit I | Local   | Regional | Charact erization of Drugs help in drug discovery | ' Global | ' Employability                 | ' Entrepreneurship | With the aid of the UV-visible spectrosc opy technique, scientists may easily ascertain the substanc | Professional Ethics                      | ' Gender                 | Human Values   | Environment & Sustainability | Skills for<br>Decent<br>Work;<br>Research-<br>related<br>skills<br>(case study,<br>seminars<br>and hands<br>on training)<br>(SDG 4.4) | Profess ional Educat ion (17.1-17.5); Promot ing Highjquality research (18.1-18.9) | Techni cal Skills that match Industr y Needs/ Hands- on Experie nce |

|         | I   |   |   |         |   |   |           |   |   |   |   |              |         |         |
|---------|-----|---|---|---------|---|---|-----------|---|---|---|---|--------------|---------|---------|
|         |     |   |   |         |   |   | e         |   |   |   |   |              |         |         |
|         |     |   |   |         |   |   | concentr  |   |   |   |   |              |         |         |
|         |     |   |   |         |   |   | ations,   |   |   |   |   |              |         |         |
|         |     |   |   |         |   |   | examine   |   |   |   |   |              |         |         |
|         |     |   |   |         |   |   | reaction  |   |   |   |   |              |         |         |
|         |     |   |   |         |   |   | rates,    |   |   |   |   |              |         |         |
|         |     |   |   |         |   |   | and       |   |   |   |   |              |         |         |
|         |     |   |   |         |   |   | derive    |   |   |   |   |              |         |         |
|         |     |   |   |         |   |   | rate      |   |   |   |   |              |         |         |
|         |     |   |   |         |   |   | equation  |   |   |   |   |              |         |         |
|         |     |   |   |         |   |   | s for     |   |   |   |   |              |         |         |
|         |     |   |   |         |   |   | reactions |   |   |   |   |              |         |         |
|         |     |   |   |         |   |   | , which   |   |   |   |   |              |         |         |
|         |     |   |   |         |   |   | can then  |   |   |   |   |              |         |         |
|         |     |   |   |         |   |   | be used   |   |   |   |   |              |         |         |
|         |     |   |   |         |   |   | to        |   |   |   |   |              |         |         |
|         |     |   |   |         |   |   |           |   |   |   |   |              |         |         |
|         |     |   |   |         |   |   | suggest a |   |   |   |   |              |         |         |
|         |     |   |   |         |   |   | mechanis  |   |   |   |   |              |         |         |
| T T.    |     |   |   |         |   |   | m.        |   |   |   |   | G1 '11 C     | D C     | TD 1 '  |
| Unit II | -   | - | - | Learnin | - | - | То        | - | - | - | - | Skills for   | Profess | Techni  |
|         |     |   |   | g of    |   |   | understa  |   |   |   |   | Decent       | ional   | cal     |
|         |     |   |   | Techni  |   |   | nd the    |   |   |   |   | Work;        | Educat  | Skills  |
|         |     |   |   | ques    |   |   | crucial   |   |   |   |   | Research-    | ion     | that    |
|         |     |   |   | help to |   |   | function  |   |   |   |   | related      | (17.1-  | match   |
|         |     |   |   | discove |   |   | that      |   |   |   |   | skills       | 17.5);  | Industr |
|         |     |   |   | r drugs |   |   | infrared  |   |   |   |   | (case study, | Promot  | У       |
|         |     |   |   |         |   |   | spectrosc |   |   |   |   | seminars     | ing     | Needs/  |
|         |     |   |   |         |   |   | opy       |   |   |   |   | and hands    | Highj-  | Hands-  |
|         |     |   |   |         |   |   | plays in  |   |   |   |   | on training) | quality | on      |
|         |     |   |   |         |   |   | the       |   |   |   |   | (SDG 4.4)    | researc | Experie |
|         |     |   |   |         |   |   | investiga |   |   |   |   |              | h       | nce     |
|         |     |   |   |         |   |   | tion of   |   |   |   |   |              | (18.1-  |         |
|         |     |   |   |         |   |   | the       |   |   |   |   |              | 18.9)   |         |
|         |     |   |   |         |   |   | structure |   |   |   |   |              | ĺ       |         |
|         |     |   |   |         |   |   | of        |   |   |   |   |              |         |         |
|         | i . | 1 | i | l       | 1 | i | 1         | 1 |   | ı |   |              | l       | 1       |

|          |   |   |   |   |   |   | organic molecule s To improve one's ability to identify distinctive absorption bands To determine a substance's composition by analysing its infrared |   |   |   |   |   |  |   |
|----------|---|---|---|---|---|---|---|---|---|---|---|---|--|---|
| Unit III | - | - | Boost<br>the<br>diagnos<br>is,<br>prognos<br>is and<br>treatme<br>nt of<br>medical<br>conditi<br>on | - | - | - | chromat ography allows for the purificati on, separatio n, and identification of a mixture's constitue  | - | - | - | - | Skills for<br>Decent<br>Work;<br>Research-<br>related<br>skills<br>(case study,<br>seminars<br>and hands<br>on training)<br>(SDG 4.4) | Profess ional Educat ion (17.1-17.5); Promot ing Highj-quality researc h | Techni cal Skills that match Industr y Needs/ Hands- on Experie nce |

|         |   |   |   |  |   |   | nt parts<br>for<br>qualitativ<br>e and<br>quantitati<br>ve<br>examinat<br>ion.  |   |   |   |   |   | (18.1-<br>18.9)  |  |
|---------|---|---|---|--|---|---|---|---|---|---|---|---|--|--|
| Unit IV |   |   |   | Help in drug designi ng                    | - |   | HPLC and GLC allows the compone nts of a mixture to be separated, identifie d, and purified for qualitative and quantitati ve examinat ion. |   |   | - |   | Skills for<br>Decent<br>Work;<br>Research-<br>related<br>skills<br>(case study,<br>seminars<br>and hands<br>on training)<br>(SDG 4.4) | Profess ional Educat ion (17.1-17.5); Promot ing Highj-quality researc h (18.1-18.9) | Techni cal Skills that match Industr y Needs; Skill Develo pment |
| Unit v  | - | - | - | Ionizab le compou nds are separat ed using | - | - | Learning of analytica l techniqu e make the   | - | - | - | - | Skills for<br>Decent<br>Work;<br>Research-<br>related<br>skills<br>(case study,   | Profess<br>ional<br>Educat<br>ion<br>(17.1-<br>17.5);<br>Promot                      | Techni cal Skills that match Industry                            |

| ion     | learner  |  | seminars     | ing     | Needs/  |
|---------|----------|--|--------------|---------|---------|
| exchan  | industry |  | and hands    | Highj-  | Hands-  |
| ge      | ready    |  | on training) | quality | on      |
| chroma  |          |  | (SDG 4.4)    | researc | Experie |
| tograph |          |  |              | h       | nce     |
| y       |          |  |              | (18.1-  |         |
| accordi |          |  |              | 18.9)   |         |
| ng to   |          |  |              |         |         |
| their   |          |  |              |         |         |
| overall |          |  |              |         |         |
| charge. |          |  |              |         |         |

| BP 702 T                   | Industrial Pharmacy-II (Theory)       | L   | Т | P | C |
|----------------------------|---------------------------------------|-----|---|---|---|
| Version 2.0                |                                       | 3   | 1 | 0 | 4 |
| <b>Total Contact Hours</b> | 45 Hours                              |     |   |   |   |
| Pre-requisites/Exposure    | Pharmaceutics                         |     |   |   |   |
| Co-requisites              |                                       |     |   |   |   |
|                            | Course Objecti                        | ves |   |   |   |
| Upon completion of this    | course the student should be able to: |     |   |   |   |

### **Upon completion of this course the student should be able to:**

- Know the process of pilot plant and scale up of pharmaceutical dosage forms
- 2. Understand the process of technology transfer from lab scale to commercial batch
- Know different Laws and Acts that regulate pharmaceutical industry
- 4. Understand the approval process and regulatory requirements for drug

### **Course Outcomes (CO)**

### On completion of this course, the student will be able to:

CO1: This course is designed to impart fundamental knowledge on pharmaceutical product development.

CO2: This course is designed to impart knowledge on final product translation from laboratory to market.

CO3: This subject gives understanding and idea of various technologies applied to development of dosage forms from small scale to large scale.

CO4: This subject gives understanding and idea of Indian Regulatory Requirements.

CO5: This course imparts knowledge to quality management of pharmaceutical products.

|     |     |     |     |     |         |         |     | Prog | gramme | and Cou   | ırse Map | ping |           |        |
|-----|-----|-----|-----|-----|---------|---------|-----|------|--------|-----------|----------|------|-----------|--------|
| CO  | PO1 | PO2 | PO3 | PO4 | PO5     | PO6     | PO7 | PO8  | PO9    | PO 10     | PO11     | PO12 | PSO 1     | PSO 2  |
| CO1 | 3   | •   | 3   | •   | 3       | 3       | •   | 1    | 1      | -         | 3        | 2    | 3         | 2      |
| CO2 | 3   | -   | 3   | -   | 3       | 3       |     | 1    | 1      | -         | 3        | 2    | 3         | 2      |
| CO3 | 3   | -   | 3   | -   | 3       | 3       | •   | 1    | 1      | -         | 3        | 2    | 3         | 2      |
| CO4 | 3   | •   | 3   | -   | 3       | 3       | •   | 1    | 1      | -         | 3        | 2    | 3         | 2      |
| CO5 | 3   | -   | 3   | -   | 3       | 3       | -   | 1    | 1      | -         | 3        | 2    | 3         | 2      |
|     |     |     | •   |     | 1=light | ly mapp | ed  | 2=   | moder  | ately map | ped      | 3=s  | trongly m | napped |

| Unit | evance to the li, national, ional and global elopmental ds | evance To the<br>ployability/<br>repreneurship/<br>Il Development | evance to the fessional Ethics, der, Human ues, rironment & tainability | 5 4 | E/4 <sup>th</sup> IR |
|------|--|---|---|-----|----------------------|
|      |  | Relev<br>Emple<br>Entre<br>Skill 1                                | Relev<br>Profe<br>Gend<br>Value<br>Envir<br>Susta                       |     | POE/                 |

| BP702T  |       |          |          |  |  |                  |                   |                     |        |              |                              |                 |                         |   |
|---------|-------|----------|----------|--|--|------------------|-------------------|---------------------|--------|--------------|------------------------------|-----------------|-------------------------|---|
|         | Local | Regional | National | Global   | Employability  | Entrepreneurship | Skill Development | Professional Ethics | Gender | Human Values | Environment & Sustainability |                 |                         |   |
| Unit I  | -     | -        | -        | Aiming to understand the process of pilot plant and scale up of pharmaceutical dosage for By providing valuable data studies contribute globally to the development of safe and effective pharmaceutical products. Understand the process of technology transfer from lab scale to commercial batch. | Enhancing knowledge and expertise in the characterization and analysis of drug substances, formulation development, and optimization techniques. |                  |                   | -                   | -      | -            | -                            | (SD G 3)        | (18.<br>1-<br>18.9<br>) | Global<br>Educati<br>on<br>Knowle<br>dge  |
| Unit II |       | -        | -        | Technology transfer (TT) process of conveying results stemming from scientific and   | Technology<br>transfer is<br>important to<br>ensure that the<br>company's  |                  |                   | -                   | -      | N<br>O       |                              | (SD<br>G<br>17) | (18.<br>1-<br>18.9<br>) | Dedica<br>ted<br>Career<br>Manag<br>ement |

|          |  | technological research to the market place and to wider society, along with associated skills and procedures, and is as such an intrinsic part of the technological innovation process.  | innovation becomes commercialized. This helps early- stage intellectual property to become tools for research. It can also be used as a base for new products and services for public use.   |  |  |        |           |                         | Centre   |
|----------|--|--|--|--|--|--------|-----------|-------------------------|--|
| Unit III |  | Globally Understand the approval process and regulatory requirements for drug The competent authority review the application and approve the drug for marketing only if the drug is found to be safe and effective in human being or the drug have more desirable effect as compare to the adverse effect. | Drug companies seeking to sell a drug in the United States must first test it. The company then sends CDER the evidence from these tests to prove the drug is safe and effective for its intended use. A team of CDER physicians, statisticians, chemists, pharmacologists, and other scientists reviews the |  |  | N<br>o | (SD G 17) | (18.<br>1-<br>18.9<br>) | Dedica<br>ted<br>Career<br>Manag<br>ement<br>Centre<br>s |

|         |   |   |   |  | company's data and proposed labeling. If this independent and unbiased review establishes that a drug's health benefits outweigh its known risks, the drug is approved for sale. |   |   |   |   |        |   |                 |                         |  |
|---------|---|---|---|--|--|---|---|---|---|--------|---|-----------------|-------------------------|--|
| Unit IV |   |   |   | Pharmaceutical Quality Management System (QMS) is a comprehensive collection of policies, processes, and procedures designed to ensure and maintain uniform and high quality in the production of pharmaceutical products. | A QMS supports business leadership, promotes customer focus, improves company culture and the bottom line, manages new innovations, and helps you understand any issues.         |   | - | - | - | N<br>o | - | (SD<br>G<br>17) | (18.<br>1-<br>18.9<br>) | Dedica<br>ted<br>Career<br>Manag<br>ement<br>Centre<br>s |
| Unit v  | - | - | - | Pharmaceutical regulations, or medicines regulations, have been defined as the combination of legal, administrative, and technical measures that governments take to ensure the safety,                                    | Regulatory affairs is a profession within regulated industries such as pharmaceuticals, biopharmaceutic als, medical devices,  | - | - | - | - | N<br>o | - | (SD<br>G<br>17) | (18.<br>1-<br>18.9<br>) | Dedica<br>ted<br>Career<br>Manag<br>ement<br>Centre<br>s |

| efficacy, and quality | cosmetics and    |  |  |  |  |
|-----------------------|------------------|--|--|--|--|
| of medicines, as well | consumer health, |  |  |  |  |
| as the relevance and  | natural health,  |  |  |  |  |
| accuracy of product   | and veterinary   |  |  |  |  |
| information           | products.        |  |  |  |  |

| BP 703T                          | Pharmacy Practice (Theory)                            | L T        |                     | P     | C |  |  |  |  |  |  |  |
|----------------------------------|---|------------|---------------------|-------|---|--|--|--|--|--|--|--|
| Version 2.0                      |   | 3          | 1                   | 0     | 4 |  |  |  |  |  |  |  |
| Total Contact Hours 45 Hours     |   |            |                     |       |   |  |  |  |  |  |  |  |
| Pre-requisites/Exposure          | Pharmacology  |            |                     |       |   |  |  |  |  |  |  |  |
| Co-requisites Co-requisites      |   |            |                     |       |   |  |  |  |  |  |  |  |
| Course Objectives                |   |            |                     |       |   |  |  |  |  |  |  |  |
| <b>Upon completion of this c</b> | course the student should be able to:                 |            |                     |       |   |  |  |  |  |  |  |  |
| 1. Know various drug             | distribution methods in a hospital                    |            |                     |       |   |  |  |  |  |  |  |  |
|                                  | macy stores management and inventory control          |            |                     |       |   |  |  |  |  |  |  |  |
| 3. Monitor drug therap           | py of patient through medication chart review and cli | nical rev  | iew                 |       |   |  |  |  |  |  |  |  |
| 4. Obtain medication             | history interview and counsel the patients            |            |                     |       |   |  |  |  |  |  |  |  |
| 5. Identify drug relate          | d problems  |            |                     |       |   |  |  |  |  |  |  |  |
| 6. Detect and assess a           | dverse drug reactions                                 |            |                     |       |   |  |  |  |  |  |  |  |
| 7. Interpret selected la         | boratory results (as monitoring parameters in therape | eutics) of | specific disease st | tates |   |  |  |  |  |  |  |  |
| 8. Know pharmaceutic             | 8. Know pharmaceutical care services                  |            |                     |       |   |  |  |  |  |  |  |  |
| 9. Do patient counseli           | ng in community pharmacy.                             |            |                     |       |   |  |  |  |  |  |  |  |
| 10. Appreciate the cond          | cept of rational drug therapy.                        |            |                     |       |   |  |  |  |  |  |  |  |

### Course Outcomes (CO)

# On completion of this course, the student will be able to:

CO1. The course imparts knowledge of drug distribution in hospitals.

CO2. The course imparts knowledge of drug store management in Hospitals.

CO3. The course imparts knowledge of therapeutic drug monitoring for improved patient care.

CO4. The course imparts knowledge of dispensing of drugs and responding to minor ailments by providing suitable safe medications.

CO5. The course highlights the importance of patient counseling for improved patient care in the community

|     | Programme and Course Mapping |     |     |     |        |         |     |     |         |           |       |      |            |          |  |
|-----|------------------------------|-----|-----|-----|--------|---------|-----|-----|---------|-----------|-------|------|------------|----------|--|
| CO  | PO1                          | PO2 | PO3 | PO4 | PO5    | PO6     | PO7 | PO8 | PO9     | PO 10     | PO11  | PO12 | PSO 1      | PSO 2    |  |
| CO1 | 3                            | -   | 3   | -   | 3      | 3       | -   | 2   | -       | -         | -     | 3    | 3          | 1        |  |
| CO2 | 3                            | -   | 3   | -   | 3      | 3       | -   | 2   | -       | -         | -     | 3    | 3          | 1        |  |
| CO3 | 3                            | -   | 3   | -   | 3      | 3       | -   | 2   | -       | -         | -     | 3    | 3          | 1        |  |
| CO4 | 3                            | -   | 3   | -   | 3      | 3       | -   | 2   | -       | -         | -     | 3    | 3          | 1        |  |
| CO5 | 3                            | -   | 3   | -   | 3      | 3       | -   | 2   | -       | -         | -     | 3    | 3          | 1        |  |
|     |                              |     |     |     | 1=ligh | tly map | ped |     | 2 = mod | erately m | apped |      | 3=strongly | y mapped |  |

|           | Local | Regional | National | Global   | Employability | Entrepreneurship | Skill Development   | Professional Ethics | Gender | Human Values | Environment & Sustainability |   |                                    |                          |
|-----------|-------|----------|----------|--|---------------|------------------|---|---------------------|--------|--------------|------------------------------|---|------------------------------------|--------------------------|
| Unit<br>I |       |          |          | Traine d the student s for differe nt functio n of hospita ls and staffs |               |                  | In this Unit, Classificat ion of hospital- Primary, Secondary and Tertiary hospitals, Classificat ion based on clinical and non- clinical basis using ppt and assignmen t |                     |        |              |                              | Skil ls for Dec ent Wor k (SD G 4.4) Skil ls for Dec ent Wor k (SD G 4.4) | Professional Education (17.1-17.5) | Skill<br>Develo<br>pment |

| Unit | _ | _ | In this, | This unit   | Skill   |  | Prof | Employ  |
|------|---|---|----------|-------------|---------|--|------|---------|
| II   |   |   | Studen   | based       | develop |  | essi | ability |
| 11   |   |   | ts will  | Dispensin   | ment    |  | onal | ability |
|      |   |   | learn    | g of drugs  | ment    |  | Edu  |         |
|      |   |   | about    | to          |         |  | cati |         |
|      |   |   | the      | inpatients, |         |  | on   |         |
|      |   |   | dispens  | types of    |         |  | (17. |         |
|      |   |   | ing of   | drug        |         |  | 1-   |         |
|      |   |   | drugs    | distributio |         |  | 17.5 |         |
|      |   |   | as per   | n systems,  |         |  | )    |         |
|      |   |   | the      | charging    |         |  | ,    |         |
|      |   |   | standar  | policy and  |         |  |      |         |
|      |   |   | ds       | labelling,  |         |  |      |         |
|      |   |   | harmo    | Dispensin   |         |  |      |         |
|      |   |   | nized    | g of drugs  |         |  |      |         |
|      |   |   | globall  | to          |         |  |      |         |
|      |   |   | y        | ambulator   |         |  |      |         |
|      |   |   |          | y patients, |         |  |      |         |
|      |   |   |          | and         |         |  |      |         |
|      |   |   |          | Dispensin   |         |  |      |         |
|      |   |   |          | g of        |         |  |      |         |
|      |   |   |          | controlled  |         |  |      |         |
|      |   |   |          | drugs       |         |  |      |         |
| Unit | - | - | Globall  | In this,    |         |  |      | Skill   |
| III  |   |   | y,       | students    |         |  |      | Develo  |
|      |   |   | Poisoni  | learned     |         |  |      | pment   |
|      |   |   | ng and   | and         |         |  |      |         |
|      |   |   | suicide  | trained to  |         |  |      |         |
|      |   |   | s are    | Drug and    |         |  |      |         |
|      |   |   | challen  | Poison      |         |  |      |         |
|      |   |   | ges,     | informatio  |         |  |      |         |
|      |   |   | student  | n centre,   |         |  |      |         |
|      |   |   | s are    | Sources of  |         |  |      |         |
|      |   |   | trained  | drug        |         |  |      |         |
|      |   |   | to       | informatio  |         |  |      |         |

|      |   |     | work    |              |  |  |        |
|------|---|-----|---------|--------------|--|--|--------|
|      |   |     | under   | n,           |  |  |        |
|      |   |     |         | Computeri    |  |  |        |
|      |   |     | the     | sed .        |  |  |        |
|      |   |     | drug,   | services,    |  |  |        |
|      |   |     | poison  | and          |  |  |        |
|      |   |     | and     | storage      |  |  |        |
|      |   |     | their   | and          |  |  |        |
|      |   | 5   | storage | retrieval of |  |  |        |
|      |   | ,   | ,       | informatio   |  |  |        |
|      |   |     | docum   | n            |  |  |        |
|      |   | •   | entatio |              |  |  |        |
|      |   |     | n       |              |  |  |        |
| Unit | - | - ( | Globall | <br>In this, |  |  | Skill  |
| IV   |   |     | у,      | students     |  |  | Develo |
|      |   |     | Glauco  | will learn   |  |  | pment  |
|      |   | 1   | ma,     | about the    |  |  |        |
|      |   |     | catarac | Concept of   |  |  |        |
|      |   | 1   | t and   | clinical     |  |  |        |
|      |   |     | other   | pharmacy,    |  |  |        |
|      |   | 6   | eye     | functions    |  |  |        |
|      |   |     | disorde | and          |  |  |        |
|      |   |     | rs are  | responsibil  |  |  |        |
|      |   |     | increas | ities of     |  |  |        |
|      |   |     | ing to  | clinical     |  |  |        |
|      |   |     | many    | pharmacist   |  |  |        |
|      |   |     | folds,  | , Drug       |  |  |        |
|      |   |     | thus    | therapy      |  |  |        |
|      |   |     | trained | monitorin    |  |  |        |
|      |   |     | the     | g -          |  |  |        |
|      |   |     | student | medicatio    |  |  |        |
|      |   |     | s and   | n chart      |  |  |        |
|      |   |     | make    | review,      |  |  |        |
|      |   |     | them    | clinical     |  |  |        |
|      |   |     | availab |              |  |  |        |
|      |   |     |         | review,      |  |  |        |
|      |   |     | le as   | pharmacist   |  |  |        |

|      | skilled | interventio         |          |           |
|------|---------|---------------------|----------|-----------|
|      | researc | n, Ward             |          |           |
|      | hers    | round               |          |           |
|      | ners    | participati         |          |           |
|      |         |                     |          |           |
|      |         | on,                 |          |           |
|      |         | Medicatio           |          |           |
|      |         | n history           |          |           |
|      |         | and                 |          |           |
|      |         | Pharmace            |          |           |
|      |         | utical care.        |          |           |
| Unit |         | In this             | Skil Pro | of Employ |
| V    |         | unit,               | ls ess   |           |
|      |         | students            | for one  |           |
|      |         | will learn          | Dec Ed   | u         |
|      |         | Organisati          | ent cat  | i         |
|      |         | on of drug          | Wor on   |           |
|      |         | store,              | k (17    | '.        |
|      |         | types of            | (SD 1-   |           |
|      |         | materials           | G 17.    | 5         |
|      |         | stocked             | 4.4)     |           |
|      |         | and                 |          |           |
|      |         | storage             |          |           |
|      |         | conditions,         |          |           |
|      |         | Purchase            |          |           |
|      |         | and                 |          |           |
|      |         | inventory           |          |           |
|      |         | control:            |          |           |
|      |         | principles,         |          |           |
|      |         | purchase            |          |           |
|      |         | procedure,          |          |           |
|      |         | purchase            |          |           |
|      |         | order,              |          |           |
|      |         |                     |          |           |
|      |         | procureme<br>nt and |          |           |
|      |         |                     |          |           |
|      |         | stocking,           |          |           |

|  |  |  | Economic    |  |  |  |
|--|--|--|-------------|--|--|--|
|  |  |  | order       |  |  |  |
|  |  |  |             |  |  |  |
|  |  |  | quantity,   |  |  |  |
|  |  |  | Reorder     |  |  |  |
|  |  |  | quantity    |  |  |  |
|  |  |  | level, and  |  |  |  |
|  |  |  | Methods     |  |  |  |
|  |  |  | used for    |  |  |  |
|  |  |  | the         |  |  |  |
|  |  |  | analysis of |  |  |  |
|  |  |  | the drug    |  |  |  |
|  |  |  | expenditur  |  |  |  |
|  |  |  | e           |  |  |  |

| BP 704 T                   | Novel Drug Delivery System (Theory) | L | Т | P | C |
|----------------------------|-------------------------------------|---|---|---|---|
| Version 2.0                |                                     | 3 | 1 | 0 | 4 |
| <b>Total Contact Hours</b> | 45 Hours                            |   |   |   |   |
| Pre-requisites/Exposure    | Pharmaceutics                       |   |   |   |   |
| Co-requisites              |                                     |   |   |   |   |
|                            | ~ ~ ~                               |   |   |   |   |

# **Upon completion of this course the student should be able to:**

- 1. To understand various approaches for development of novel drug delivery systems.
- 2. To understand the criteria for selection of drugs and polymers for the development of Novel drug delivery systems, their formulation and evaluation

#### **Course Outcomes (CO)**

# On completion of this course, the student will be able to:

CO1: This subject is designed to impart basic knowledge on the area of various conventional drug delivery systems.

| CO2: | The co   | urse im  | parts k | nowled | lge on s | sustaine | ed relea | se drug  | delive | ery systen       | ns.   |   |                  |   |     |                        |
|------|--|--|---------|--------|----------|----------|----------|----------|--------|------------------|---|---|------------------|---|-----|------------------------|
| CO3: | The co   | urse im  | parts k | nowled | lge on t | argeted  | l drug d | lelivery | systen | ns.              |   |   |                  |   |     |                        |
| CO4: | CO4: The course imparts knowledge on organ specific drug delivery systems. |  |         |        |          |          |          |          |        |                  |   |   |                  |   |     |                        |
| CO5: | CO5: The course imparts knowledge on newer drug delivery systems           |  |         |        |          |          |          |          |        |                  |   |   |                  |   |     |                        |
|      | Programme and Course Mapping   |  |         |        |          |          |          |          |        |                  |   |   |                  |   |     |                        |
| CO   | CO PO1 PO2 PO3 PO4 PO5 PO6 PO7 PO8 PO9 PO 10 PO11 PO12 PSO 1 PSO 2         |  |         |        |          |          |          |          |        |                  |   |   |                  |   |     |                        |
| CO1  | 01 3 2 3 - 3 3 - 2 - 2 3 3 1   |  |         |        |          |          |          |          |        |                  |   |   |                  |   |     |                        |
| CO2  | 02 3 2 3 - 3 3 - 2 - 2 3 3 1   |  |         |        |          |          |          |          |        |                  |   |   |                  |   |     |                        |
| CO3  |  |  |         |        |          |          |          |          |        |                  |   |   |                  |   |     |                        |
| CO4  | 3  | 2  | 3       | -      | 3        | 3        | -        | 2        | -      | -                | 2   | 3 | 3                | 1   |     |                        |
| CO5  | 3  | 2  | 3       | -      | 3        | 3        | -        | 2        | -      | -                | 2   | 3 | 3                | 1   |     |                        |
|      |  |  | I       | I      | 1=lig    | htly ma  | apped    | l        | 2= m   | oderately        | mapped  |   | 3=stroi          | ngly mapped   |     |                        |
| Unit | Relevance to the   | local, national,<br>regional and global<br>develonmental | needs   |        |          |          |          |          |        | Relevance To the | Employablity/<br>Entrepreneurship/<br>Skill Development |   | Relevance to the | Professional Ethics,<br>Gender, Human<br>Values,<br>Environment &<br>Sustainability | NEP | POE/4 <sup>th</sup> IR |

| BP704<br>T |   |  |  |  |  |   |  |  |        |              |                              |   |  |   |
|------------|---|--|--|--|--|---|--|--|--------|--------------|------------------------------|---|--|---|
|            | Jocal   | Regional   | National   | Global   | Employability  | Entrepreneurship  | Skill Development  | Professional Ethics  | Gender | Human Values | Environment & Sustainability |   |  |   |
| Unit I     | This course is intended to provide fundamental information on different conventional drug delivery systems/contr olled drug delivery systems with local relevance and | This course is intended to provide fundamental information on different conventional drug delivery systems/controlle d drug delivery systems with regional relevance and developmental | This course is intended to provide fundamental information on different conventional drug delivery systems/contr olled drug delivery systems with national relevance and | This course is intended to provide fundame ntal informati on on different conventi onal drug delivery systems/ | Their pharm aceuti cal indust ry/res earch depart ment (natio nal/int ernati onal) has a | This course knowl edge gives you the ability to build a pharm aceutical | This course is design ed to teach basic inform ation on variou s conventiona | This course is designed to teach o n various conventional drug delivery systems/controlle d drug | -      | H            | <u>日</u>                     | Ens ure heal thy live s and pro mot e well - bein g for | Insti<br>tuti<br>onal<br>Rest<br>ruct<br>urin<br>g<br>and<br>Con<br>soli<br>dati<br>on<br>(10. | Corpor<br>ate/Co<br>mpany<br>Trips/P<br>rojects |
|            | development<br>al<br>requirements.<br>They can  | requirements. They can create novel dosage forms.  | developmenta l requirements. They can  | controlle<br>d drug<br>delivery<br>systems   | wide<br>choice<br>of<br>career   | medic<br>ation<br>devel<br>oping  | l drug<br>delive<br>ry<br>syste  | delivery<br>systems<br>with<br>local   |        |              |                              | all<br>at<br>all  | 10.1 4)  |   |
|            | create novel dosage forms.  |  | create novel dosage forms.   | with<br>global<br>relevanc   | opport<br>unitie<br>s.   | firm<br>on a<br>nation  | ms/co<br>ntrolle<br>d drug   | relevanc<br>e and<br>develop   |        |              |                              | ages<br>(SD<br>G 3)                                     |  |   |

|         |                    |                                  |                         | e and develop mental requirem ents. They can create novel dosage forms. |                | al and<br>world<br>wide<br>scale. | delive ry syste ms with local releva nce and develo pment needs. They have the ability to develo p unique | ment needs. They have the ability to develop unique dosage formulat ions. |   |   |   |          |            |         |
|---------|--------------------|----------------------------------|-------------------------|---|----------------|-----------------------------------|---|---|---|---|---|----------|------------|---------|
|         |                    |                                  |                         |   |                |                                   | e<br>formul   |   |   |   |   |          |            |         |
|         |                    |                                  |                         |   |                |                                   | ations.   |   |   |   |   |          |            |         |
| Unit II | This course is     | This course is                   | This course is          | This  | Their          | This                              | This  | This  | - | - | - | Ens      | Insti      | Corpor  |
|         | intended to        | intended to                      | intended to             | course is   | pharm          | course                            | course  | course is   |   |   |   | ure      | tuti       | ate/Co  |
|         | provide            | provide                          | provide                 | intended  | aceuti         | knowl                             | is  | designed  |   |   |   | heal     | onal       | mpany   |
|         | fundamental        | fundamental                      | fundamental             | to  | cal            | edge<br>·                         | design  | to  |   |   |   | thy      | Rest       | Trips/P |
|         | information        | information on                   | information             | provide   | indust         | gives                             | ed to   | teach o   |   |   |   | live     | ruct       | rojects |
|         | on different       | different                        | on different            | fundame   | ry/res         | you                               | teach   | n   |   |   |   | S1       | urin       |         |
|         | Mucosal            | Mucosal Drug                     | Mucosal Drug            | ntal  | earch          | the                               | basic   | various   |   |   |   | and      | g          |         |
|         | Drug               | Delivery system /Microcapsulatio | Delivery                | informati   | depart         | ability<br>to                     | inform<br>ation   | conventi<br>onal  |   |   |   | pro      | and<br>Con |         |
|         | Delivery<br>system | n/implantable                    | system<br>/Microcapsula | on on different   | ment<br>(natio | to<br>build                       | on  | drug  |   |   |   | mot<br>e | soli       |         |
|         | /Microcapsul       | drug delivery                    | tion/implantab          | Mucosal   | nal/int        | a                                 | variou  | delivery  |   |   |   | well     | dati       |         |
|         | / wiiciocapsul     | arug derivery                    | 1011/1111prantau        | mucosai   | mai/mit        | u                                 | variou  | ach ver y   |   |   |   | WCII     | uati       |         |

| ation/implant able drug delivery system with local relevance and development al requirements. They can create novel dosage forms. | system with regional relevance and developmental requirements. They can create novel dosage forms. | le drug delivery system with national relevance and developmenta l requirements. They can create novel dosage forms. | Drug Delivery system /Microca psulation /implanta ble drug delivery system with global relevanc e and develop mental requirem ents. They can create novel dosage forms. | ernational) has a wide choice of career opport unitie s. | pharm aceuti cal medic ation devel oping firm on a nation al and world wide scale. | s conventional drug delivery systems/controlled drug delivery systems with local relevance and development needs. They | systems/ controlle d drug delivery systems with local relevanc e and develop ment needs. They have the ability to develop unique dosage formulat ions. |  | bein g for all at all ages (SD G 3) | on<br>(10.<br>1-<br>10.1<br>4) |  |
|---|--|--|---|--|--|--|--|--|-------------------------------------|--------------------------------|--|
| _   |  |  | e and   |  | wide   | syste  | They   |  |                                     |                                |  |
|   |  |  | requirem  |  |  | local  | develop  |  |                                     |                                |  |
|   |  |  | They can create   |  |  | nce<br>and   | dosage<br>formulat   |  |                                     |                                |  |
|   |  |  | dosage  |  |  | pment  | ions.  |  |                                     |                                |  |
|   |  |  |   |  |  | have   |  |  |                                     |                                |  |
|   |  |  |   |  |  | the ability to   |  |  |                                     |                                |  |
|   |  |  |   |  |  | develo p   |  |  |                                     |                                |  |
|   |  |  |   |  |  | unique<br>dosag<br>e   |  |  |                                     |                                |  |
|   |  |  |   |  |  | formul ations.   |  |  |                                     |                                |  |

| Unit III | This course is | This course is  | This course is | This      | Their   | This    | This    | This       | _ | _ | _ | Ens  | Insti | Corpor  |
|----------|----------------|-----------------|----------------|-----------|---------|---------|---------|------------|---|---|---|------|-------|---------|
|          | intended to    | intended to     | intended to    | course is | pharm   | course  | course  | course is  |   |   |   | ure  | tuti  | ate/Co  |
|          | provide        | provide         | provide        | intended  | aceuti  | knowl   | is      | designed   |   |   |   | heal | onal  | mpany   |
|          | fundamental    | fundamental     | fundamental    | to        | cal     | edge    | design  | to         |   |   |   | thy  | Rest  | Trips/P |
|          | information    | information on  | information    | provide   | indust  | gives   | ed to   | teach o    |   |   |   | live | ruct  | rojects |
|          | on different   | different       | on different   | fundame   | ry/res  | you     | teach   | n          |   |   |   | S    | urin  | 5       |
|          | Transdermal    | Transdermal     | Transdermal    | ntal      | earch   | the     | basic   | various    |   |   |   | and  | g     |         |
|          | Drug           | Drug Delivery   | Drug Delivery  | informati | depart  | ability | inform  | conventi   |   |   |   | pro  | and   |         |
|          | Delivery       | Systems /       | Systems /      | on on     | ment    | to      | ation   | onal       |   |   |   | mot  | Con   |         |
|          | Systems /      | Gastroretentive | Gastroretentiv | different | (natio  | build   | on      | drug       |   |   |   | e    | soli  |         |
|          | Gastroretenti  | drug delivery   | e drug         | Transder  | nal/int | a       | variou  | delivery   |   |   |   | well | dati  |         |
|          | ve drug        | systems/        | delivery       | mal Drug  | ernati  | pharm   | s       | systems/   |   |   |   | _    | on    |         |
|          | delivery       | Nasopulmonary   | systems/       | Delivery  | onal)   | aceuti  | conve   | controlle  |   |   |   | bein | (10.  |         |
|          | systems/       | drug delivery   | Nasopulmona    | Systems   | has a   | cal     | ntiona  | d drug     |   |   |   | g    | Ì-    |         |
|          | Nasopulmona    | system with     | ry drug        | /         | wide    | medic   | 1 drug  | delivery   |   |   |   | for  | 10.1  |         |
|          | ry drug        | regional        | delivery       | Gastroret | choice  | ation   | delive  | systems    |   |   |   | all  | 4)    |         |
|          | delivery       | relevance and   | system with    | entive    | of      | devel   | ry      | with       |   |   |   | at   |       |         |
|          | system with    | developmental   | national       | drug      | career  | oping   | syste   | local      |   |   |   | all  |       |         |
|          | local          | requirements.   | relevance and  | delivery  | opport  | firm    | ms/co   | relevanc   |   |   |   | ages |       |         |
|          | relevance and  | They can create | developmenta   | systems/  | unitie  | on a    | ntrolle | e and      |   |   |   | (SD  |       |         |
|          | development    | novel dosage    | 1              | Nasopul   | s.      | nation  | d drug  | develop    |   |   |   | G 3) |       |         |
|          | al             | forms.          | requirements.  | monary    |         | al and  | delive  | ment       |   |   |   |      |       |         |
|          | requirements.  |                 | They can       | drug      |         | world   | ry      | needs.     |   |   |   |      |       |         |
|          | They can       |                 | create novel   | delivery  |         | wide    | syste   | They       |   |   |   |      |       |         |
|          | create novel   |                 | dosage forms.  | system    |         | scale.  | ms      | have the   |   |   |   |      |       |         |
|          | dosage         |                 |                | with      |         |         | with    | ability to |   |   |   |      |       |         |
|          | forms.         |                 |                | global    |         |         | local   | develop    |   |   |   |      |       |         |
|          |                |                 |                | relevanc  |         |         | releva  | unique     |   |   |   |      |       |         |
|          |                |                 |                | e and     |         |         | nce     | dosage     |   |   |   |      |       |         |
|          |                |                 |                | develop   |         |         | and     | formulat   |   |   |   |      |       |         |
|          |                |                 |                | mental    |         |         | develo  | ions.      |   |   |   |      |       |         |
|          |                |                 |                | requirem  |         |         | pment   |            |   |   |   |      |       |         |
|          |                |                 |                | ents.     |         |         | needs.  |            |   |   |   |      |       |         |
|          |                |                 |                | They can  |         |         | They    |            |   |   |   |      |       |         |
|          |                |                 |                | create    |         |         | have    |            |   |   |   |      |       |         |

|         |                |                 |                | novel     |         |         | the     |           |   |   |   |      |       |         |
|---------|----------------|-----------------|----------------|-----------|---------|---------|---------|-----------|---|---|---|------|-------|---------|
|         |                |                 |                | dosage    |         |         | ability |           |   |   |   |      |       |         |
|         |                |                 |                | forms.    |         |         | to      |           |   |   |   |      |       |         |
|         |                |                 |                |           |         |         | develo  |           |   |   |   |      |       |         |
|         |                |                 |                |           |         |         | p       |           |   |   |   |      |       |         |
|         |                |                 |                |           |         |         | unique  |           |   |   |   |      |       |         |
|         |                |                 |                |           |         |         | dosag   |           |   |   |   |      |       |         |
|         |                |                 |                |           |         |         | e       |           |   |   |   |      |       |         |
|         |                |                 |                |           |         |         | formul  |           |   |   |   |      |       |         |
|         |                |                 |                |           |         |         | ations. |           |   |   |   |      |       |         |
| Unit IV | This course is | This course is  | This course is | This      | Their   | This    | This    | This      | - | - | - | Ens  | Insti | Corpor  |
|         | intended to    | intended to     | intended to    | course is | pharm   | course  | course  | course is |   |   |   | ure  | tuti  | ate/Co  |
|         | provide        | provide         | provide        | intended  | aceuti  | knowl   | is      | designed  |   |   |   | heal | onal  | mpany   |
|         | fundamental    | fundamental     | fundamental    | to        | cal     | edge    | design  | to        |   |   |   | thy  | Rest  | Trips/P |
|         | information    | information on  | information    | provide   | indust  | gives   | ed to   | teach o   |   |   |   | live | ruct  | rojects |
|         | on different   | different       | on different   | fundame   | ry/res  | you     | teach   | n         |   |   |   | S    | urin  |         |
|         | Targeted       | Targeted drug   | Targeted drug  | ntal      | earch   | the     | basic   | various   |   |   |   | and  | g     |         |
|         | drug Delivery  | Delivery with   | Delivery with  | informati | depart  | ability | inform  | conventi  |   |   |   | pro  | and   |         |
|         | with local     | regional        | national       | on on     | ment    | to      | ation   | onal      |   |   |   | mot  | Con   |         |
|         | relevance and  | relevance and   | relevance and  | different | (natio  | build   | on      | drug      |   |   |   | e    | soli  |         |
|         | development    | developmental   | developmenta   | Targeted  | nal/int | a       | variou  | delivery  |   |   |   | well | dati  |         |
|         | al             | requirements.   | 1              | drug      | ernati  | pharm   | S       | systems/  |   |   |   | -    | on    |         |
|         | requirements.  | They can create | requirements.  | Delivery  | onal)   | aceuti  | conve   | controlle |   |   |   | bein | (10.  |         |
|         | They can       | novel dosage    | They can       | with      | has a   | cal     | ntiona  | d drug    |   |   |   | g    | 1-    |         |
|         | create novel   | forms.          | create novel   | global    | wide    | medic   | 1 drug  | delivery  |   |   |   | for  | 10.1  |         |
|         | dosage         |                 | dosage forms.  | relevanc  | choice  | ation   | delive  | systems   |   |   |   | all  | 4)    |         |
|         | forms.         |                 |                | e and     | of      | devel   | ry      | with      |   |   |   | at   |       |         |
|         |                |                 |                | develop   | career  | oping   | syste   | local     |   |   |   | all  |       |         |
|         |                |                 |                | mental    | opport  | firm    | ms/co   | relevanc  |   |   |   | ages |       |         |
|         |                |                 |                | requirem  | unitie  | on a    | ntrolle | e and     |   |   |   | (SD  |       |         |
|         |                |                 |                | ents.     | S.      | nation  | d drug  | develop   |   |   |   | G 3) |       |         |
|         |                |                 |                | They can  |         | al and  | delive  | ment      |   |   |   |      |       |         |
|         |                |                 |                | create    |         | world   | ry      | needs.    |   |   |   |      |       |         |
|         |                |                 |                | novel     |         | wide    | syste   | They      |   |   |   |      |       |         |
|         |                |                 |                | dosage    |         | scale.  | ms      | have the  |   |   |   |      |       |         |

|        |                |                  |                | forms.    |         |         | with    | ability to |   |   |   |      |       |         |
|--------|----------------|------------------|----------------|-----------|---------|---------|---------|------------|---|---|---|------|-------|---------|
|        |                |                  |                |           |         |         | local   | develop    |   |   |   |      |       |         |
|        |                |                  |                |           |         |         | releva  | unique     |   |   |   |      |       |         |
|        |                |                  |                |           |         |         | nce     | dosage     |   |   |   |      |       |         |
|        |                |                  |                |           |         |         | and     | formulat   |   |   |   |      |       |         |
|        |                |                  |                |           |         |         | develo  | ions.      |   |   |   |      |       |         |
|        |                |                  |                |           |         |         | pment   | 101101     |   |   |   |      |       |         |
|        |                |                  |                |           |         |         | needs.  |            |   |   |   |      |       |         |
|        |                |                  |                |           |         |         | They    |            |   |   |   |      |       |         |
|        |                |                  |                |           |         |         | have    |            |   |   |   |      |       |         |
|        |                |                  |                |           |         |         | the     |            |   |   |   |      |       |         |
|        |                |                  |                |           |         |         | ability |            |   |   |   |      |       |         |
|        |                |                  |                |           |         |         | to      |            |   |   |   |      |       |         |
|        |                |                  |                |           |         |         | develo  |            |   |   |   |      |       |         |
|        |                |                  |                |           |         |         | p       |            |   |   |   |      |       |         |
|        |                |                  |                |           |         |         | unique  |            |   |   |   |      |       |         |
|        |                |                  |                |           |         |         | dosag   |            |   |   |   |      |       |         |
|        |                |                  |                |           |         |         | e       |            |   |   |   |      |       |         |
|        |                |                  |                |           |         |         | formul  |            |   |   |   |      |       |         |
|        |                |                  |                |           |         |         | ations. |            |   |   |   |      |       |         |
| Unit v | This course is | This course is   | This course is | This      | Their   | This    | This    | This       | - | - | - | Ens  | Insti | Corpor  |
|        | intended to    | intended to      | intended to    | course is | pharm   | course  | course  | course is  |   |   |   | ure  | tuti  | ate/Co  |
|        | provide        | provide          | provide        | intended  | aceuti  | knowl   | is      | designed   |   |   |   | heal | onal  | mpany   |
|        | fundamental    | fundamental      | fundamental    | to        | cal     | edge    | design  | to         |   |   |   | thy  | Rest  | Trips/P |
|        | information    | information on   | information    | provide   | indust  | gives   | ed to   | teach o    |   |   |   | live | ruct  | rojects |
|        | on different   | different Ocular | on different   | fundame   | ry/res  | you     | teach   | n          |   |   |   | S    | urin  |         |
|        | Ocular Drug    | Drug Delivery    | Ocular Drug    | ntal      | earch   | the     | basic   | various    |   |   |   | and  | g     |         |
|        | Delivery       | Systems with     | Delivery       | informati | depart  | ability | inform  | conventi   |   |   |   | pro  | and   |         |
|        | Systems with   | regional         | Systems with   | on on     | ment    | to      | ation   | onal       |   |   |   | mot  | Con   |         |
|        | local          | relevance and    | national       | different | (natio  | build   | on      | drug       |   |   |   | e    | soli  |         |
|        | relevance and  | developmental    | relevance and  | Ocular    | nal/int | a       | variou  | delivery   |   |   |   | well | dati  |         |
|        | development    | requirements.    | developmenta   | Drug      | ernati  | pharm   | S       | systems/   |   |   |   | -    | on    |         |
|        | al .           | They can create  | 1              | Delivery  | onal)   | aceuti  | conve   | controlle  |   |   |   | bein | (10.  |         |
|        | requirements.  | novel dosage     | requirements.  | Systems   | has a   | cal     | ntiona  | d drug     |   |   |   | g    | 1-    |         |
|        | They can       | forms.           | They can       | with      | wide    | medic   | 1 drug  | delivery   |   |   |   | for  | 10.1  |         |

|              |               |          |        |        | 1 11    |            |  | 11   | 45 |  |
|--------------|---------------|----------|--------|--------|---------|------------|--|------|----|--|
| create novel | create novel  | global   | choice | ation  | delive  | systems    |  | all  | 4) |  |
| dosage       | dosage forms. | relevanc | of     | devel  | ry      | with       |  | at   |    |  |
| forms.       |               | e and    | career | oping  | syste   | local      |  | all  |    |  |
|              |               | develop  | opport | firm   | ms/co   | relevanc   |  | ages |    |  |
|              |               | mental   | unitie | on a   | ntrolle | e and      |  | (SD  |    |  |
|              |               | requirem | S.     | nation | d drug  | develop    |  | G 3) |    |  |
|              |               | ents.    |        | al and | delive  | ment       |  | ŕ    |    |  |
|              |               | They can |        | world  | ry      | needs.     |  |      |    |  |
|              |               | create   |        | wide   | syste   | They       |  |      |    |  |
|              |               | novel    |        | scale. | ms      | have the   |  |      |    |  |
|              |               | dosage   |        |        | with    | ability to |  |      |    |  |
|              |               | forms.   |        |        | local   | develop    |  |      |    |  |
|              |               | TOTHIS.  |        |        | releva  | unique     |  |      |    |  |
|              |               |          |        |        | nce     | dosage     |  |      |    |  |
|              |               |          |        |        | and     | formulat   |  |      |    |  |
|              |               |          |        |        | develo  | ions.      |  |      |    |  |
|              |               |          |        |        |         | ions.      |  |      |    |  |
|              |               |          |        |        | pment   |            |  |      |    |  |
|              |               |          |        |        | needs.  |            |  |      |    |  |
|              |               |          |        |        | They    |            |  |      |    |  |
|              |               |          |        |        | have    |            |  |      |    |  |
|              |               |          |        |        | the     |            |  |      |    |  |
|              |               |          |        |        | ability |            |  |      |    |  |
|              |               |          |        |        | to      |            |  |      |    |  |
|              |               |          |        |        | develo  |            |  |      |    |  |
|              |               |          |        |        | p       |            |  |      |    |  |
|              |               |          |        |        | unique  |            |  |      |    |  |
|              |               |          |        |        | dosag   |            |  |      |    |  |
|              |               |          |        |        | e       |            |  |      |    |  |
|              |               |          |        |        | formul  |            |  |      |    |  |
|              |               |          |        |        | ations. |            |  |      |    |  |

| BP 705 P                   | Instrumental Methods of Analysis (Practical) | L    | T | P | C |
|----------------------------|--|------|---|---|---|
| Version 2.0                |  | 0    | 0 | 4 | 2 |
| <b>Total Contact Hours</b> | 60 Hours                                     |      |   |   |   |
| Pre-requisites/Exposure    | Analytical Chemistry-I Practical             |      |   |   |   |
| Co-requisites              |  |      |   |   |   |
|                            | Course Object                                | ives |   |   |   |

## **Upon completion of this course the student should be able to:**

- 1. Quantitative & Qualitative Analysis of drugs using various analytical instruments.
- 2. Demonstration of HPLC instrument
- 3. Separations of sugars and amino acids by chromatography.

#### **Course Outcomes (CO)**

- CO1. This subject deals with the practical knowledge of application of instrumental methods in qualitative analysis of drugs.
- CO2. This subject deals with the practical knowledge of application of instrumental methods in quantitative analysis of drugs.
- CO3. This subject is designed to impart a practical knowledge on the principles and instrumentation of spectroscopic techniques.
- CO4. This subject is designed to impart a practical knowledge on the principles and instrumentation of chromatographic techniques.
- CO5. This also emphasizes on practical knowledge on modern analytical instruments that are used for drug testing.

|     |     |     |     |     |     |     |     | Prog | gramm | e and Co | urse Ma | pping |       |       |
|-----|-----|-----|-----|-----|-----|-----|-----|------|-------|----------|---------|-------|-------|-------|
| CO  | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8  | PO9   | PO 10    | PO11    | PO12  | PSO 1 | PSO 2 |
| CO1 | 3   | -   | 2   | -   | 3   | 3   | -   | 1    | ı     | •        | 3       | 2     | 3     | 2     |
| CO2 | 3   | -   | 2   | -   | 3   | 3   | -   | 1    | -     | -        | 3       | 2     | 3     | 2     |
| CO3 | 3   | -   | 2   | -   | 3   | 3   | -   | 1    | -     | -        | 3       | 2     | 3     | 2     |
| CO4 | 3   | -   | 2   | -   | 3   | 3   | -   | 1    | -     | -        | 3       | 2     | 3     | 2     |

| CO5 | 3 | - | 2 | - | 3       | 3      | -   | 1  | -      | -          | 3    | 2  | 3        | 2      |
|-----|---|---|---|---|---------|--------|-----|----|--------|------------|------|----|----------|--------|
|     |   |   |   |   | 1=light | ly map | ped | 2= | = mode | rately maj | pped | 3= | strongly | napped |

| Unit   | Relevance to the local, national, regional and global developmental needs |          |  |        | Relevance To the Employability/                     | Skill Development |                   | Relevance to the<br>Professional Ethics, | Gender, Human<br>Values, | Sustainability |                              | SDG  | NEP  | POE/4 <sup>th</sup> IR                               |
|--------|---|----------|--|--------|---|-------------------|-------------------|--|--------------------------|----------------|------------------------------|--|--|--|
|        | Local   | Regional | National   | Global | Employability                                       | Entrepreneurship  | Skill Development | Professional Ethics                      | Gender                   | Human Values   | Environment & Sustainability |  |  |  |
| Unit I | -   | -        | Charact<br>erizatio<br>n of<br>Drugs<br>help in<br>drug<br>discove<br>ry | -      | Know ledge of UV spectr oscop y increa se the emplo | -                 | -                 | -  | -                        | -              | -                            | Skills for<br>Decent<br>Work;<br>Research-<br>related<br>skills<br>(SDG 4.4) | Profess<br>ional<br>Educat<br>ion<br>(17.1-<br>17.5);<br>Promot<br>ing<br>Highj- | Techni cal Skills that match Industr y Needs/ Hands- |

|         |   |  |  | yabilit y of the learne r in analyt ical sector like QA depart ment of Pharm aceuti cal comp anies |  |   |   |   |   | quality<br>researc<br>h<br>(18.1-<br>18.9)   | on<br>Experie<br>nce  |
|---------|---|--|--|--|--|---|---|---|---|--|---|
| Unit II | - |  | Learnin g of Techni ques help to discove r drugs | Know ledge of Infra red and colori metry spectr oscop y increa se the emplo yabilit y of           |  | - | - | - | Skills for<br>Decent<br>Work;<br>Research-<br>related<br>skills | Profess ional Educat ion (17.1-17.5); Promot ing Highj-quality researc h (18.1-18.9) | Techni cal Skills that match Industr y Needs/ Handson Experie nce |

| Unit III | _ | - | Boost   | - | the learne r in analyt ical sector like QA depart ment of Pharm aceuti cal comp anies          | _ | - | - | _ | _ | Skills for                                      | Profess   | Techni   |
|----------|---|---|---|---|--|---|---|---|---|---|---|---|--|
|          |   |   | the diagnos is, prognos is and treatme nt of medical conditi on |   | ledge of HPLC and GLC increa se the emplo yabilit y of the learne r in analyt ical sector like |   |   |   |   |   | Decent Work; Research- related skills (SDG 4.4) | ional Educat ion (17.1- 17.5); Promot ing Highj- quality researc h (18.1- 18.9) | cal Skills that match Industr y Needs/ Hands- on Experie nce |

|         |  |   |                         | QA<br>depart<br>ment<br>in<br>metho<br>d<br>devel<br>opme<br>nt and<br>valida<br>tion                                       |   |   |   |   |   |   |  |  |  |
|---------|--|---|-------------------------|---|---|---|---|---|---|---|--|--|--|
| Unit IV |  | - | Help in drug estmati on | Know ledge of HPLC increa se the emplo yabilit y of the learne r in analyt ical sector like QA depart ment in metho d devel | - | - | - | - | - | - | Skills for<br>Decent<br>Work;<br>Research-<br>related<br>skills<br>(SDG 4.4) | Profess ional Educat ion (17.1-17.5); Promot ing Highj-quality researc h (18.1-18.9) | Techni cal Skills that match Industr y Needs; Skill Develo pment |

|        |                                   |  | opme<br>nt and<br>valida<br>tion   |   |   |  |  |  |  |
|--------|-----------------------------------|--|--|---|---|--|--|--|--|
| Unit v | d<br>d<br>ry<br>d<br>n<br>b<br>ii | Help in I- Ilrug Iliscove Ty & Ilevelop Inhibiti Ing Tenzyme | Know ledge of GLC increa se the emplo yabilit y of the learne r in analyt ical sector like QA depart ment in metho d devel opme nt and valida tion | - | - |  | Skills for<br>Decent<br>Work;<br>Research-<br>related<br>skills<br>(SDG 4.4) | Profess ional Educat ion (17.1-17.5); Promot ing Highj-quality researc h (18.1-18.9) | Technical Skills that match Industr y Needs/ Hands- on Experie nce |

# **Semester-VIII**

| BP801T                     | Biostatisitcs and Research Methodology (Theory) | L | Т | P | C |
|----------------------------|---|---|---|---|---|
| Version 2.0                |   | 3 | 1 | 0 | 4 |
| <b>Total Contact Hours</b> | 45 Hours  |   |   |   |   |
| Pre-requisites/Exposure    |   |   |   |   |   |
| Co-requisites              | Any analytical Software                         |   |   |   |   |
|                            | Course Objectives                               |   |   |   |   |

#### **Upon completion of this course the student should be able to:**

- 1. Know the operation of M.S. Excel, SPSS, R and MINITAB ®, DoE (Design of Experiment)
- 2. Know the various statistical techniques to solve statistical problems.
- 3. Appreciate statistical techniques in solving the problems.

#### **Course Outcomes (CO)**

- CO1.To establish a formulation helping to predict one variable in terms of the other that is, correlation and linear regression.
- CO2. To understand of Parametric and Non-Parametric models for developing relevant inferences on associated parameters
- CO3. To know advanced level topics in statistical inference on testing of statistical hypotheses for both randomized and non-randomized tests
- CO4. To use appropriate experimental designs to analyze the experimental data

|    |     |     |     |     |     |     |            | Progra | ımme aı | nd Course | Марріі | ıg          |       |       |
|----|-----|-----|-----|-----|-----|-----|------------|--------|---------|-----------|--------|-------------|-------|-------|
| CO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | <b>PO7</b> | PO8    | PO9     | PO 10     | PO11   | <b>PO12</b> | PSO 1 | PSO 2 |

| <b>CO1</b> | 2 |   |   | 2 | 2        |          |    |      |          |           |   | 2      | 2        |     |
|------------|---|---|---|---|----------|----------|----|------|----------|-----------|---|--------|----------|-----|
| CO2        |   |   | 2 |   |          |          | 2  |      | 2        |           | 2 |        |          |     |
| CO3        | 2 |   |   | 2 | 2        |          |    |      |          |           |   | 2      | 2        |     |
| CO4        |   | 2 | 2 |   |          |          | 2  |      |          |           |   |        |          |     |
|            |   |   |   |   | 1=lightl | ly mappe | ed | 2= n | noderate | ly mapped |   | 3=stro | ngly map | ped |

| n<br>i      |   | evance to | Ŋ | the local,                                    | national,                               | egionai and                 | bal  | developmenta                   | needs                     |            | Relevance To    |   | <b>Employability</b>                                  | Rutropropolir  |  | snip/ Skill                                | Development                              | Professional    | Ethics,             | Gender, | Human | Values. |    | Environment |                             | <b>C</b>   | ۵   | POE/4 <sup>th</sup> IR |
|-------------|---|-----------|---|---|---|-----------------------------|--|--------------------------------|---------------------------|------------|-----------------|---|---|--|--|--|--|-----------------|---------------------|---------|-------|---------|----|-------------|-----------------------------|--|---|------------------------|
| Ĺ           |   | Rel       |   | the   | nat                                     | ිනි ;                       | global   | dev                            | l ne                      |            | Rel             | the   | Em  | H_   |  | Surj                                       | Dev                                      | $\mathbf{Pr}_0$ | Eth                 | Ge      | Hu    | Val     | į. | En          | 8                           | SDG  | NEP   | PO                     |
|             |   |           |   |   |   |                             | Global   |                                |                           | Епрюзаонну | cincepreneusinp |   |   | Skill Development  | 4  |  |  |                 | Professional Ethics |         |       | Qenaei  |    |             | Environment & Bustannaonney |  |   |                        |
| n<br>i<br>t | _ | -         | - | sta<br>the<br>add<br>pol<br>res<br>org<br>evi | tisti<br>ir aj<br>ires<br>licyi<br>earc | cal opli sing mal cher zati | coricating glassers, and the constant c | ion<br>ob<br>s,<br>and<br>s ca | al needs,<br>l<br>an make |            | 1               | dev<br>soli<br>stat<br>tech<br>app<br>skil<br>and | elop<br>d fo<br>istic<br>nniq<br>lica<br>ls an<br>can | y Uni-<br>omen<br>ounda-<br>cal co-<br>ues,<br>tions<br>re tra-<br>ues ben<br>uals | t protein tion concernation of the concernatio | rov<br>on in<br>ept<br>d th<br>hes<br>fera | rides a<br>n<br>s,<br>heir<br>se<br>able | -               |                     |         |       |         | -  | -           |                             | SDG 9: Industry, Innovation, and Infrastructure:  The use of statistical techniques and concepts in pharmaceutical | Promoting High-quality research (18.1-18.9) By incorporating Unit 1 into the NEP, educational institutions can promote high-quality research by equipping students with robust research |                        |

|               | targeted interventions, and monitor progress towards achieving global goals such as poverty reduction, improved healthcare, and sustainable development.  Additionally, these concepts can contribute to improving data literacy and fostering critical thinking skills, enabling individuals to better understand and interpret information in an increasingly data-driven world. | professional domains, enabling them to analyze data effectively, make informed decisions, and contribute to evidence-based practices.   |   |   | research and development supports innovation in the industry. Understanding measures of central tendency, dispersion, and correlation helps identify patterns, trends, and relationships in pharmaceutical data, leading to improved drug development processes, quality control, and innovation in healthcare. | methodologies, advanced data analysis techniques, and interdisciplinary problem-solving skills. This, in turn, fosters a research culture, promotes collaboration between academia and industry, and contributes to the achievement of SDG 18 by driving research excellence and innovation. |                           |
|---------------|--|---|---|---|---|--|---------------------------|
| U n i t I I I | By applying these concepts in research, decision-making, and policy formulation, Unit II contributes to addressing global needs by enabling accurate predictions, quantifying uncertainty, making  | <br>Overall, Unit II in skill development enhances individuals' statistical literacy, data analysis skills, and critical thinking abilities. These skills are transferable and valuable in a wide range of professional | - | - | <br>SDG 3: Good Health and Wellbeing: Biostatistics plays a crucial role in studying health- related outcomes, evaluating interventions, and  | Promoting High-quality research (18.1-18.9) By incorporating Unit II into the NEP, educational institutions can promote high-quality research by equipping students with robust research   | Sk ill E m be dd ed Co ur |

|       | valid inferences, and      |   | domains, including        |               |       |       | monitoring public  | methodologies,           | se  |
|-------|----------------------------|---|---------------------------|---------------|-------|-------|--------------------|--------------------------|-----|
|       | facilitating effective     |   | research, healthcare,     |               |       |       | health indicators. | advanced data analysis   | S   |
|       | comparisons. These         |   | finance, marketing, and   |               |       |       | Research           | techniques, and          | De  |
|       | statistical tools are      |   | policy analysis. Mastery  |               |       |       | methodology helps  | interdisciplinary        | ve  |
|       | essential in fields such   |   | of these concepts         |               |       |       | in designing       | problem-solving skills.  | lo  |
|       | as public health,          |   | enables individuals to    |               |       |       | studies to assess  | This, in turn, fosters a | p   |
|       | medicine, social           |   | make evidence-based       |               |       |       | health             | research culture,        | m   |
|       | sciences, and              |   | decisions, conduct        |               |       |       | interventions,     | promotes collaboration   | en  |
|       | environmental studies,     |   | rigorous analyses, and    |               |       |       | understand disease | between academia and     | t   |
|       | helping tackle complex     |   | contribute to informed    |               |       |       | patterns, and      | industry, and            |     |
|       | global challenges and      |   | decision-making           |               |       |       | improve            | contributes to the       |     |
|       | improving the well-        |   | processes.                |               |       |       | healthcare         | achievement of SDG 18    |     |
|       | being of populations       |   |                           |               |       |       | delivery.          | by driving research      |     |
|       | worldwide.                 |   |                           |               |       |       |                    | excellence and           |     |
|       |                            |   |                           |               |       |       |                    | innovation.              |     |
|       | By studying and            |   | Unit III in skill         | Maintaining   |       |       |                    | Promoting High-quality   | Sk  |
|       | applying the concepts      |   | development enhances      | the           |       |       |                    | research (18.1-18.9)     | ill |
|       | covered in Unit III,       |   | individuals' research     | uniqueness    |       |       |                    | By incorporating Unit    | E   |
| U     | individuals can            |   | skills, data analysis and | and novelity  |       |       |                    | III into the NEP,        | m   |
| n     | contribute to addressing   |   | visualization abilities,  | in research   |       |       |                    | educational institutions | be  |
| i     | global needs through       |   | critical thinking, and    | is of         |       |       |                    | can promote high-        | dd  |
| t     | rigorous research, valid   |   | understanding of          | importance    |       |       |                    | quality research by      | ed  |
| - - - | data analysis, effective - | - | methodological            | and ensures   | -   - | -   - | -                  | equipping students with  | Co  |
|       | data presentation, and     |   | considerations. These     | ethical       |       |       |                    | robust research          | ur  |
|       | the development of         |   | skills are transferable   | professionali |       |       |                    | methodologies,           | se  |
|       | ethical and well-          |   | and valuable in various   | sm as it      |       |       |                    | advanced data analysis   | s   |
|       | designed clinical trials.  |   | professional domains,     | doesn't       |       |       |                    | techniques, and          | De  |
|       | These skills are           |   | including research,       | favour the    |       |       |                    | interdisciplinary        | ve  |
|       | essential in fields such   |   | healthcare, academia,     | manipulatio   |       |       |                    | problem-solving skills.  | lo  |
|       | as healthcare, public      |   | and policy analysis.      | n and false   |       |       |                    | This, in turn, fosters a | p   |

|                      | health, social sciences, and environmental studies, helping tackle global challenges and improve the well-being of individuals and communities worldwide.  | Mastery of these concepts equips individuals to conduct rigorous research, effectively analyze and present data, and contribute to evidence-based decision-making processes.   | represantatio<br>n of data. |  | research culture, promotes collaboration between academia and industry, and contributes to the achievement of SDG 18 by driving research excellence and innovation.   | m<br>en<br>t                                     |
|----------------------|--|--|-----------------------------|--|---|--|
| U<br>n<br>i<br>t<br> | By studying and applying the concepts covered in Unit IV, individuals gain skills in experimental design, regression modeling, and statistical analysis using popular software tools. These skills are applicable across various industries and research fields, addressing global needs by enabling more efficient processes, reliable predictions, and evidence-based decision-making. The practical knowledge | Overall, Unit IV contributes to skill development by equipping individuals with the necessary tools and knowledge to design experiments, analyze data, and make evidence-based decisions. These skills have broad applicability across industries and research fields, enabling individuals to address global needs by improving processes, making accurate predictions, and contributing to | -                           | <br>SDG 9: Industry, Innovation, and Infrastructure: Non-parametric tests and research methodology play a vital role in promoting innovation and improving infrastructure. By conducting research studies and analyzing data using non-parametric tests, industries can identify trends, patterns, and | Promoting High-quality research (18.1-18.9) By incorporating Unit IV into the NEP, educational institutions can promote high-quality research by equipping students with robust research methodologies, advanced data analysis techniques, and interdisciplinary problem-solving skills. This, in turn, fosters a research culture, promotes collaboration between academia and industry, and | Sk ill E m be dd ed Co ur se s De ve lo p m en t |

|                  | gained through this unit equips individuals to tackle complex challenges and contribute to advancements in fields such as manufacturing, healthcare, and environmental sustainability.   | advancements in various domains.  | relationships, leading to innovation in product development, process optimization, and infrastructure planning.   | contributes to the achievement of SDG 18 by driving research excellence and innovation.   |  |
|------------------|--|---|---|---|--|
| U<br>n<br>i<br>t | By studying and applying the concepts covered in Unit V, individuals gain skills in designing experiments, analyzing complex systems, and optimizing processes. These skills are valuable in addressing global needs by improving efficiency, reducing waste, enhancing product quality, optimizing resource utilization, and finding optimal solutions to complex problems in diverse fields such as manufacturing, | Overall, Unit V in skill development equips individuals with valuable skills in experimental design, analysis, and optimization. These skills are transferable and applicable across various industries and research fields, allowing individuals to address complex problems, optimize processes, and make data-driven decisions. Mastery of these concepts contributes to skill development by fostering critical | SDG 12: Responsible Consumption and Production:  The application of experimental design techniques promotes responsible consumption and production. By using factorial design and response surface methodology, industries can optimize resource utilization, reduce waste, and | Promoting High-quality research (18.1-18.9) By incorporating Unit V into the NEP, educational institutions can promote high-quality research by equipping students with robust research methodologies, advanced data analysis techniques, and interdisciplinary problem-solving skills. This, in turn, fosters a research culture, promotes collaboration between academia and industry, and contributes to the | Sk ill E m be dd ed Co ur se s De ve lo p m en t |

| healthcare, agriculture, and environmental sustainability. | thinking, problem- solving, and efficiency in experimental design and analysis. | improve the quality and efficiency of production processes, aligning with the principles of sustainable consumption and production. |
|--|---|---|
|--|---|---|

| BP 802 T                   | Social and Preventive Pharmacy (Theory) | L | T | P | C |  |  |  |  |  |  |
|----------------------------|---|---|---|---|---|--|--|--|--|--|--|
| Version 2.0                |   | 3 | 1 | 0 | 4 |  |  |  |  |  |  |
| <b>Total Contact Hours</b> | 45 Hours                                |   |   |   |   |  |  |  |  |  |  |
| Pre-requisites/Exposure    | Pharmacology                            |   |   |   |   |  |  |  |  |  |  |
| Co-requisites              | o-requisites Remedial Biology           |   |   |   |   |  |  |  |  |  |  |
|                            | Course Objectives                       |   |   |   |   |  |  |  |  |  |  |

## Upon completion of this course the student should be able to:

- 1. Acquire high consciousness/realization of current issues related to health and pharmaceutical problems within the country and worldwide.
- 2. Have a critical way of thinking based on current healthcare development.
- 3. Evaluate alternative ways of solving problems related to health and pharmaceutical issues

# **Course Outcomes (CO)**

# On completion of this course, the student will be able to:

CO1. The purpose of this course is to introduce to students number of health issues and their challenges.

CO2. Give information regarding Public health, preventive medicine, social medicine and community medicine their historical background. Giving information about the significance of food and its various components.

CO3. Tounderstand the various principles for the prevention and control of various diseases.

CO4.In this course introduced various National health programs like HIV, AIDS, TB, IDSP, NLCP, NMHP etc. and its objectives, functioning and their outcome

CO5. The roles of the pharmacist in the Community services in rural, urban and school health awareness program.

|     | Programme and Course Mapping                            |  |  |  |  |  |  |  |  |  |  |  |  |       |
|-----|---|--|--|--|--|--|--|--|--|--|--|--|--|-------|
| СО  | 10  |  |  |  |  |  |  |  |  |  |  |  |  | PSO 2 |
| CO1 | CO1 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2               |  |  |  |  |  |  |  |  |  |  |  |  |       |
| CO2 | CO2 2 2 2 2 2 2 1 1 1 2 1 2 1 2 1 2 1 2 1               |  |  |  |  |  |  |  |  |  |  |  |  |       |
| CO3 | CO3 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2               |  |  |  |  |  |  |  |  |  |  |  |  |       |
| CO4 | CO4 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2               |  |  |  |  |  |  |  |  |  |  |  |  |       |
| CO5 | CO5 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2               |  |  |  |  |  |  |  |  |  |  |  |  |       |
|     | 1=lightly mapped 2= moderately mapped 3=strongly mapped |  |  |  |  |  |  |  |  |  |  |  |  |       |

| vance to the national, national, opmental                 | vance To loyability/ epreneursh xill lopment          | vance to the ssional s. Gender, an Values, ronment & unability |     | /4 <sup>th</sup> IR |
|---|---|--|-----|---------------------|
| Releva<br>local, 1<br>region<br>global<br>develo<br>needs | Releva<br>the<br>Emplo<br>Entrey<br>ip/ Ski<br>Develo | Releva<br>Profes<br>Ethics<br>Huma<br>Enviro<br>Sustaii        | SDG | NEP<br>POE/4        |

|            | Local | Regional | National   | Global   | Employability | Entrepreneurship | Skill Development  | Professional Ethics | Gender | Human Values   | Environment &<br>Sustainability |  |   |
|------------|-------|----------|--|--|---------------|------------------|--|---------------------|--------|--|---------------------------------|--|---|
| Unit       | -     | -        | Provides basic understanding of public health, epidemiology, preventive care, and other social health-related ideas. | Become well<br>aware of<br>current<br>difficulties<br>with<br>pharmaceutical<br>s and health<br>worldwide.               |               |                  | Promote the functions played by health professionals in public health initiatives.         |                     |        | Improve public health by providing services that contribute to the prevention, treatment and management of the disease.  |                                 | Ensure healt hy lives and promote well being for all at all ages (SD G3) | <br>Global<br>educatio<br>n policy,<br>Skill<br>develop<br>ment |
| Unit<br>II | -1    |          |  | Impart the knowledge on prevention and control of diseases along with their preventive and curative medicines available. |               |                  | Develops the knowledge, skills, abilities, to use medicines in society in a scientific way |                     |        | Encouraging patients to have healthy lives, advice on stress management and mental health, and they recommend seeking the appropriate medical help when necessary. |                                 | Ensu<br>re<br>healt<br>hy<br>lives<br>and<br>pro<br>mote<br>well         | <br>Global<br>educatio<br>n policy,<br>Skill<br>develop<br>ment |

| Unit       | <br> | Imparts knowledge  | <br> | <br>Brings the potential  | <br> | Provides patient care   | <br>bein g for all at all ages (SD G3) Ensu                              | <br>Global  |
|------------|------|--|------|---|------|---|--|---|
| III        |      | about the aims, operations, and results of national health programmes to achieve the objective of Health for all |      | to solve new global health concerns like managing acute and chronic illnesses and health literacy |      | services that optimize the use of medication and promotes health, wellness, and disease prevention        | re healt hy lives and pro mote well - bein g for all at all ages (SD G3) | educatio<br>n policy,<br>Skill<br>develop<br>ment               |
| Unit<br>IV | <br> | Create awareness of<br>National health<br>intervention<br>programmes<br>available in India                       | <br> | <br>Develop a critical perspective based on recent advancements in healthcare.                    | <br> | Helps in equity,<br>dignity, informed<br>decision-making,<br>health and well-being,<br>and social justice | <br>Ensu re healt hy lives and pro mote well - bein                      | <br>Global<br>educatio<br>n policy,<br>Skill<br>develop<br>ment |

| ages   (SD |
|------------|
|------------|

| BP 803 ET   | Pharmaceutical Marketing Management (Theory) | L | Т | P | C |
|-------------|--|---|---|---|---|
| Version 2.0 |  | 3 | 1 | 0 | 4 |

| <b>Total Contact Hours</b> | 45 Hours                 |
|----------------------------|--------------------------|
| Pre-requisites/Exposure    | Pharmaceutical Marketing |
| Co-requisites              | Marketing                |

#### Upon completion of this course the student should be able to:

- 1. Understanding the marketing concepts and techniques and their applications in the pharmaceutical industry.
- 2. Explain the role of Industry competitive analysis, marketing mix and promotion strategy
- 3. To learn about price strategy, marketing distribution channel, sales distribution concepts in pharma marketing management
- 4. To learn and understand the principle and function of DPCO and NPPA authority for pharmaceutical product

# **Course Outcomes (CO)**

- CO1. In this topic is devoted the general questions of market concepts, including pharmaceutical, also understand the choice of physician and retail pharmacist.
- CO2. To learn and understand the product line and product mix decisions, product life cycle stage, product portfolio analysis; product positioning, marketing mix and promotion mix strategy in companies.
- CO3. To learn and understand the principle and function of DPCO and NPPA authority for better understanding essential commodities act.
- CO4. The knowledge of theoretical based marketing pricing, prices classification, demand, supply and prices and establishment of the price for the goals.

|     |     |     |     |     |        |         |     | Prog | gramm   | e and Cor | ırse Ma | pping |                 |       |
|-----|-----|-----|-----|-----|--------|---------|-----|------|---------|-----------|---------|-------|-----------------|-------|
| CO  | PO1 | PO2 | PO3 | PO4 | PO5    | PO6     | PO7 | PO8  | PO9     | PO 10     | PO11    | PO12  | PSO 1           | PSO 2 |
| CO1 | 2   | 2   |     |     | 2      | 2       |     |      |         |           |         |       |                 | 2     |
| CO2 | 2   | 1   | 2   |     |        | 1       | 2   |      | 2       |           | 2       |       |                 |       |
| CO3 | 2   | 2   |     |     | 2      | 2       |     |      |         |           |         |       | 2               |       |
| CO4 |     | 2   | 2   |     |        |         | 2   |      |         |           |         |       |                 |       |
|     |     |     |     |     | 1=ligh | tly map | ped | 2=   | = moder | ately mar | ned     | 3=    | strongly mapped |       |

| BP 804 ET                  | Pharmaceutical Regulatory Science (Theory) | L | T | P | C |  |
|----------------------------|--|---|---|---|---|--|
| Version 2.0                |  | 3 | 1 | 0 | 4 |  |
| <b>Total Contact Hours</b> | 45 Hours                                   |   |   |   |   |  |

| <b>Total Contact Hours</b> | 45 Hours            |  | • |  |
|----------------------------|---------------------|--|---|--|
| Pre-requisites/Exposure    | Pharmaceutics       |  |   |  |
| Co-requisites              | Regulatory Sciences |  |   |  |

#### Upon completion of this course the student should be able to:

- 1. Know about the process of drug discovery and development
- 2. Know the regulatory authorities and agencies governing the manufacture and sale of pharmaceuticals
- 3. Know the regulatory approval process and their registration in Indian and International markets

#### **Course Outcomes (CO)**

## On completion of this course, the student will be able to:

CO1. This course is designed to impart the fundamental knowledge on the Origin, development, scope, objectives and nature of Pharmaceutical legislation in India.

CO2.A study of regulatory aspects that affect drug product design, manufacture and distribution in India with special emphasis on the following Acts / Laws (with latest amendments)

CO3.Need Product development stage documentation, factory procedures – Standard operating procedures (SOPs) and standard test Procedures (STPs).

CO4. Regulatory requirements for approval of new drugs, and drug products in regulated markets of India & other countries like US, EU, Japan, Australia, UK etc.

CO5.It prepares the students to learn in detail on the regulatory requirements, documentation requirements, and registration procedures for marketing the drug products

|     |     |     |           |       |     | Prog | ramm  | e and ( | Course | Map      | ping |           |        |       |
|-----|-----|-----|-----------|-------|-----|------|-------|---------|--------|----------|------|-----------|--------|-------|
| СО  | PO1 | PO2 | PO3       | PO4   | PO5 | PO6  | PO7   | PO8     | PO9    | PO<br>10 | PO11 | PO12      | PSO 1  | PSO 2 |
| CO1 | 2   | 2   |           | 1     | 2   | 2    |       | 2       |        | 2        |      |           | 2      | 2     |
| CO2 | 2   | 1   | 2         |       |     | 1    | 2     |         | 2      |          | 2    |           |        |       |
| CO3 | 2   | 2   |           | 2     | 2   | 2    |       |         |        | 2        |      |           | 2      |       |
| CO4 |     |     | 2         | 2     |     | 2    | 2     | 2       |        |          |      | 2         |        |       |
| CO5 |     | 2   | 2         |       | 2   | 2    | 2     |         |        |          | 2    |           |        | 2     |
|     |     |     | 1=lightly | mappe | ed  | 2=   | moder | ately n | napped |          | 3=s  | trongly n | napped |       |

| BP805ET                    | Pharmacovigilance (Theory) | L | Т | P | С |
|----------------------------|----------------------------|---|---|---|---|
| Version 2.0                |                            | 3 | 1 | 0 | 4 |
| <b>Total Contact Hours</b> | 45 Hours                   |   |   |   |   |
| Pre-requisites/Exposure    | Toxicology study           |   |   |   |   |
| Co-requisites              | ADR                        |   |   |   |   |

# **Course Objectives**

# **Upon completion of this course the student should be able to:**

- 1 Why drug safety monitoring is important?
- 2. History and development of pharmacovigilance

- 3. National and international scenario of pharmacovigilance
- 4. Dictionaries, coding and terminologies used in pharmacovigilance
- 5. Detection of new adverse drug reactions and their assessment problems

# **Course Outcomes (CO)**

- CO1.International standards for classification of diseases and drugs
- CO 2. Adverse drug reaction reporting systems and communication in pharmacovigilance
- CO 3. Methods to generate safety data during pre-clinical, clinical and post approval phases of drugs' life cycle
- CO 4. Drug safety evaluation in paediatrics, geriatrics, pregnancy and lactation
- CO 5. Pharmacovigilance Program of India (PvPI) requirement for ADR reporting in India

|     |     |     |     |     |       |        |       | I   | Prograi | mme a    | nd Cou  | rse Map | ping  |              |
|-----|-----|-----|-----|-----|-------|--------|-------|-----|---------|----------|---------|---------|-------|--------------|
| СО  | PO1 | PO2 | PO3 | PO4 | PO5   | PO6    | PO7   | PO8 | PO9     | PO<br>10 | PO11    | PO12    | PSO 1 | PSO 2        |
| CO1 | 2   | 2   |     | 1   | 2     | 2      |       | 2   |         | 2        |         |         | 2     | 2            |
| CO2 | 2   | 1   | 2   |     |       | 1      | 2     |     | 2       |          | 2       |         |       |              |
| CO3 | 2   | 2   |     | 2   | 2     | 2      |       |     |         | 2        |         |         | 2     |              |
| CO4 | 2   | 2   |     | 2   | 2     | 2      |       |     |         | 2        |         |         | 2     |              |
| CO5 | 2   | 3   | 2   | 2   | 2     | 2      | 1     |     |         | 2        |         |         | 2     |              |
|     |     |     |     |     | 1=lig | htly m | apped |     | 2= m    | oderat   | ely map | ped     | 3=str | ongly mapped |

| Unit | Relevance to the local, national, regional and global developmental | needs    |          |  | Relevance To the<br>Employability/<br>Entrepreneurship/<br>Skill Development   |                  |                   | Relevance to the Professional Ethics, Gender, Human Values, Environment & Sustainability |        |              |                              | SDG       | NEP                      | POE/4 <sup>th</sup> IR   |
|------|---|----------|----------|--|--|------------------|-------------------|--|--------|--------------|------------------------------|-----------|--------------------------|--|
| Unit | Local   | Regional | National | Students will be able to understand importance safety monitoring globally and also international terminologies used in this process. | By acquiring knowledge and experience in pharmacovigila nce, individuals can position themselves for a wide range of rewarding career opportunities within the healthcare and pharmaceutical | Entrepreneurship | Skill Development | Professional Ethics  | Gender | Human Values | Environment & Sustainability | SD<br>G 3 | (11.<br>1-<br>11.1<br>3) | Technical<br>Skills that<br>match<br>Industry<br>Needs/<br>Employabi<br>lity |

|             |   |   |  | sectors.   |  |  |           |                         |  |
|-------------|---|---|--|--|--|--|-----------|-------------------------|--|
|             |   |   |  |  |  |  |           |                         |  |
| Unit        | - | ha<br>un<br>In<br>st<br>cl<br>di<br>di<br>di<br>es<br>pl<br>ce<br>to<br>co<br>di<br>m<br>re<br>pr<br>pr | ave Inderstanding of International Itandards for Itandards | By acquiring proficiency in drug dictionaries, coding systems, and the establishment of pharmacovigila nce programs, individuals can enhance their employability in the field of pharmacovigila nce. |  |  | SD<br>G 3 | (17.<br>1-<br>17.5<br>) | Technical<br>Skills that<br>match<br>Industry<br>Needs/Co<br>ding            |
| Unit<br>III | - | ga<br>ki<br>sk<br>pl<br>ce<br>w<br>co   | tudents will cain necessary nowledge and kills, charmacovigilan e education which will ontribute to the everall safety nd effectiveness  | Education and expertise in vaccine safety surveillance, pharmacovigila nce methods, and communication can significantly  |  |  | SD<br>G3  | (17.<br>1-<br>17.5<br>) | Technical<br>Skills that<br>match<br>Industry<br>Needs/<br>Employabi<br>lity |

|            |   |   | of vaccines,<br>thereby<br>protecting public<br>health on a<br>global scale.  | enhance<br>employability in<br>the field  |   |       |                         |   |
|------------|---|---|---|---|---|-------|-------------------------|---|
| Unit<br>IV | - | -   | . Students will expertise methods to generate safety data during pre clinical, clinical and post approval phases of drugs' life cycle & ICH guidelines for ICSR, PSUR, expedited reporting, pharmacovigilan ce planning | Education in safety data generation and ICH guidelines for pharmacovigila nce enhances employability by ensuring regulatory compliance.             | Students will understand ethical considerations related to patient confidentiality, data protection, and the responsible use of information | SDG 3 | (17.<br>1-<br>17.5<br>) | Technical<br>Skills that<br>match<br>Industry<br>Needs/<br>Project    |
| Unit<br>v  |   | Students will have understandi ng CDSCO guidelines and pharmacovi gilance at the national level in India. | Students will understand and will develop skills for Drug safety evaluation in special population, pharmacogenomi cs of ADRs, & and the CIOMS guidelines and forms.   | By possessing expertise in pharmacogeno mics, drug safety evaluation in special populations, CIOMS guidelines, CDSCO regulations, and understanding |   | SDG3  | (17.<br>1-<br>17.5<br>) | Technical<br>Skills that<br>match<br>Industry<br>Needs/<br>Internship |

|  |  | the differences |  |  |  |  | ٦ |
|--|--|-----------------|--|--|--|--|---|
|  |  |                 |  |  |  |  |   |
|  |  | in Indian and   |  |  |  |  |   |
|  |  | global          |  |  |  |  |   |
|  |  | pharmacovigila  |  |  |  |  |   |
|  |  | nce             |  |  |  |  |   |
|  |  | requirements,   |  |  |  |  |   |
|  |  | individuals can |  |  |  |  |   |
|  |  | enhance their   |  |  |  |  |   |
|  |  | employability   |  |  |  |  |   |
|  |  | prospects in    |  |  |  |  |   |
|  |  | various sectors |  |  |  |  |   |
|  |  | related to      |  |  |  |  |   |
|  |  | pharmacovigila  |  |  |  |  |   |
|  |  | nce             |  |  |  |  |   |

| BP 806 ET                  | Quality Control And Standardization Of Herbals (Theory)                    | L | T | P | C |
|----------------------------|--|---|---|---|---|
| Version 2.0                |  | 3 | 1 | 0 | 4 |
| <b>Total Contact Hours</b> | 45 Hours   |   |   | I |   |
| Pre-requisites/Exposure    | Herbal Drug Technology   |   |   |   |   |
| Co-requisites              | Pharmacognosy & Phytochemistry   |   |   |   |   |
|                            | Course Objectives  |   |   |   |   |
|                            | ourse the student should be able to: s for quality control of herbal drugs |   |   |   |   |

- 2. Know Quality assurance in herbal drug industry
- 3. Know the regulatory approval process and their registration in Indian and international markets
- 4. Appreciate EU and ICH guidelines for quality control of herbal drugs

#### **Course Outcomes (CO)**

### On completion of this course, the student will be able to:

CO1.In this subject the student learns about the various methods and guidelines for evaluation and standardization of herbs and herbal drugs like Moisture Content, Ash Values, Determination of Extractive Value, Swelling Index, Hemolytic Activity etc.

CO2. The subject also provides an opportunity for the student to learn the quality assurance of crude drugs in herbal industry and follow the following guide line cGMP, GAP and GLP in traditional system of medicines.

CO3. Knowledge about the Quality control of following guideline like EU and ICH guidelines.

CO4. Knowledge about the stability testing of herbal medicines and application of various chromatographic techniques for evaluation of crude drugs.

CO5. Regulatory requirement for development of herbal medicine as per WHO guide lines.

|     | Programme and Course Mapping |     |         |         |     |     |        |         |       |          |      |         |          |       |  |
|-----|------------------------------|-----|---------|---------|-----|-----|--------|---------|-------|----------|------|---------|----------|-------|--|
| СО  | PO1                          | PO2 | PO3     | PO4     | PO5 | PO6 | PO7    | PO8     | PO9   | PO<br>10 | PO11 | PO12    | PSO<br>1 | PSO 2 |  |
| CO1 | 2                            | 2   |         | 1       | 2   | 2   |        | 2       |       | 2        |      |         | 2        | 2     |  |
| CO2 | 2                            | 1   | 2       |         |     | 1   | 2      |         | 2     |          | 2    |         |          | 2     |  |
| CO3 | 2                            | 2   |         | 2       | 2   | 2   |        |         |       | 2        |      |         | 2        |       |  |
| CO4 | 2                            | 1   | 2       |         |     | 1   | 2      |         | 2     |          | 2    |         | 1        |       |  |
| CO5 | 2                            | 1   | 2       |         |     | 1   | 2      |         | 2     |          | 2    |         | 2        | 2     |  |
|     |                              |     | 1=light | tly map | ped | 2   | 2= mod | erately | mappe | ed       | 3=   | strongl | y mapp   | ed    |  |

| Unit            | Relevance to the | local, national, | developmental | needs   | Relevance To the | Entrepreneurship/<br>Strill Dovelonment |  | Relevance to the    | Professional Ethics, | Values,      | Environment &<br>Sustainability | SDG  | NEP  | POE/4 <sup>th</sup> IR  |
|-----------------|------------------|------------------|---------------|---|------------------|---|--|---------------------|----------------------|--------------|---------------------------------|--|--|---|
| BP8<br>06E<br>T | Local            | Regional         | National      | The study of "Herbs as a raw material"  | Employability    | Entrepreneurship                        | Skill Development  The study of "Herbs as a raw  | Professional Ethics | Gender               | Human Values | Environment & Sustainability    | Rev  | Prof   | Techni  |
| I               |                  |                  |               | provides students with knowledge about the medicinal properties and applications of herbs, enabling them to contribute to the development of natural remedies. Understanding "Biodynamic agriculture" promotes sustainable farming practices, benefiting the environment and human health. Exploring the "Indian system of medicine" offers students insights into traditional healing methods, |                  |   | material" helps students develop skills in identifying, cultivating, and processing medicinal plants, enhancing their knowledge of herbal remedies. "Biodynamic agriculture" provides students with skills in sustainable farming practices, organic cultivation, and holistic approaches to agriculture. The study of "Indian system of |                     |                      |              |                                 | itali ze the glob al part ners hip for sust aina | essi<br>onal<br>Edu<br>cati<br>on<br>(17.<br>1-<br>17.5<br>)<br>Pro<br>mot | cal Skills that match Industr y Needs, Entrepr eneursh ip, Employ |

|      |  |   | expanding their understanding of healthcare practices worldwide. Overall, these studies equip students with diverse perspectives and skills for global health and sustainability.   | medicine" equips students with knowledge of traditional healing methods, Ayurvedic principles, and herbal formulations, enhancing their understanding of holistic healthcare practices.  |  | ble dev elop men t (Rol e of all Sch ools , KR MU ) (SD G 17) | ing<br>Hig<br>hj-<br>qual<br>ity<br>rese<br>arch<br>(18.<br>1-<br>18.9 | ability                                       |
|------|--|---|---|--|--|---|--|---|
| Unit |  | - | The study of nutraceuticals, herbs in food, and herbs-drugs can greatly benefit students globally by providing them with a comprehensive understanding of natural health and wellness. This knowledge equips students with insights into the potential therapeutic properties of certain foods and herbs, enabling them to make informed dietary choices and explore alternative approaches to healthcare. Such understanding can enhance personal well-being and support their future professional endeavors in fields related to nutrition and holistic medicine. | Studying "Nutraceuticals" and "Herbs-Food & Herbs-Drugs" can help students in skill development by enhancing their understanding of natural remedies and their effects on health. It cultivates knowledge in the fields of nutrition, pharmacology, and herbal medicine, fostering critical thinking, research skills, and the ability to assess the safety and efficacy of these products. This knowledge equips students with valuable expertise in the growing field of alternative medicine. |  |   |  | Global<br>Educati<br>on<br>Knowle<br>dge<br>, |

| Unit |   |   | The study of herbal cosmetics, herbal   | The study of herbal cosmetics,    |       | 1.a      |
|------|---|---|---|-----------------------------------|-------|----------|
| III  | - | _ |   |                                   |       | Ens      |
| 1111 |   |   | excipients, and herbal formulations     | herbal excipients, and herbal     |       |          |
|      |   |   | can benefit students globally by        | formulation helps students        |       | ure<br>· |
|      |   |   | providing them with a comprehensive     | develop skills in natural product |       | sign     |
|      |   |   | understanding of natural ingredients    | development, formulation          |       | ifica    |
|      |   |   | and their applications in the beauty    | design, and understanding of      |       | nt       |
|      |   |   | and pharmaceutical industries. This     | herbal ingredients. It enhances   |       | mob      |
|      |   |   | knowledge equips students with the      | their knowledge of plant-based    |       | iliza    |
|      |   |   | skills to develop and manufacture       | remedies, extraction techniques,  |       | tion     |
|      |   |   | effective, safe, and sustainable herbal | and quality control. These skills |       | of       |
|      |   |   | products, meeting the growing demand    | enable students to excel in the   |       | reso     |
|      |   |   | for natural alternatives worldwide.     | field of cosmetic science,        |       | urce     |
|      |   |   |   | pharmaceuticals, and herbal       |       | S        |
|      |   |   |   | product development,              |       | fro      |
|      |   |   |   | contributing to the growing       |       | m a      |
|      |   |   |   | demand for natural and            |       | vari     |
|      |   |   |   | sustainable beauty and            |       | ety      |
|      |   |   |   | healthcare solutions.             |       | of       |
|      |   |   |   |                                   |       | sour     |
|      |   |   |   |                                   |       | ces      |
|      |   |   |   |                                   |       |          |
|      |   |   |   |                                   |       |          |
| Unit | - | - | The study of "Evaluation of Drug"       | Studying the evaluation of        | Ens   | Tec      |
| IV   |   |   | helps students globally understand the  | drugs, patenting and regulatory   | ure   | hnol     |
|      |   |   | process of testing and analysing the    | requirements of natural products, | heal  | ogy      |
|      |   |   | effectiveness and safety of drugs,      | and regulatory issues helps       | thy   | Use      |
|      |   |   | ensuring their quality and efficacy.    | students develop essential skills | live  | &        |
|      |   |   | "Patenting and Regulatory               | in the pharmaceutical and         | S     | Inte     |
|      |   |   | requirements of natural products"       | biotechnology fields. These       | and   | grat     |
|      |   |   | educates students on legal aspects and  | subjects provide knowledge        | pro   | ion      |
|      |   |   | protection of natural products.         | about the process of evaluating   | mot   | (23.     |
|      |   |   | "Regulatory Issues" provides insight    | drug efficacy and safety,         | e     | 1-       |
|      |   |   | into the complex regulations            | protecting intellectual property  | well  | 23.1     |
|      |   |   | governing pharmaceuticals, preparing    | rights, and navigating regulatory | -     | 3)       |
|      |   |   | students for careers in the global      | frameworks. Such skills are       | bein  |          |
|      |   |   | Students for Careers III the ground     | Hameworks. Such skills are        | DEIII |          |

|      | healthcare industry.  | development, and compliance within the healthcare industry.  | g<br>for<br>all<br>at<br>all   |  |
|------|---|--|--|--|
|      |   |  | ages (SD G 3) Ens ure sust   |  |
|      |   |  | aina ble cons ump tion   |  |
|      |   |  | and prod ucti on patt  |  |
|      |   |  | erns<br>(SD<br>G   |  |
| Unit | The study of "Schedule T - Good Manufacturing Practice of Indian systems of medicine" can help students globally by providing them with insights into the manufacturing practices and quality standards followed in the Indian systems of medicine. This knowledge can be | Good Manufacturing Practice of Indian systems of medicine" helps students in skill development by providing them with a comprehensive understanding of the manufacturing practices and | Ens Tec ure hnol sust ogy aina Use ble & cons Inte ump grat tion ion | Corpor ate Allianc es to provide Big Sister/ Big |
|      | beneficial for students pursuing  | quality standards specific to  | and (23.   | Brother  |

| careers in pharmaceuticals, healthcare, or research, allowing them to understand and incorporate best practices from Indian medicine into their own work. | Indian systems of medicine. This knowledge equips them with the necessary skills to ensure the safety, efficacy, and quality of herbal medicines and traditional remedies, thereby enhancing their competence in the field. | prod 1- Connec tions on 3) patt erns (SD G |
|---|---|--|
|   | their competence in the field.  | 12)  |

| BP 807 ET  | Computer aided drug design (Theory)                      | L           | T           | P             | C          |  |  |  |  |  |  |
|--|--|-------------|-------------|---------------|------------|--|--|--|--|--|--|
| Version 2.0  |  | 3           | 1           | 0             | 4          |  |  |  |  |  |  |
| <b>Total Contact Hours</b>                                 | 45 Hours   |             |             |               |            |  |  |  |  |  |  |
| Pre-requisites/Exposure                                    | Computer application                                     |             |             |               |            |  |  |  |  |  |  |
| Co-requisites  | Medicinal Chemistry                                      |             |             |               |            |  |  |  |  |  |  |
|  | Course Objectives  |             |             |               |            |  |  |  |  |  |  |
| <b>Upon completion of this c</b>                           | ourse the student should be able to:                     |             |             |               |            |  |  |  |  |  |  |
| 1. Design and discovery of                                 | of lead molecules  |             |             |               |            |  |  |  |  |  |  |
| 2. The role of drug design                                 | n in drug discovery process                              |             |             |               |            |  |  |  |  |  |  |
| 3. The concept of QSAR                                     | and docking  |             |             |               |            |  |  |  |  |  |  |
| 4. Various strategies to de                                | evelop new drug like molecules.   The design of new drug | molecules u | sing molecu | ılar modeling | g software |  |  |  |  |  |  |
| Course Outcomes (CO)                                       |  |             |             |               |            |  |  |  |  |  |  |
| On completion of this course, the student will be able to: |  |             |             |               |            |  |  |  |  |  |  |
| •  | provide knowledge on history of computers in pharmaceut  | . 1 1       |             |               |            |  |  |  |  |  |  |

- CO2. The course gives fundamental learning of basic computer skills required in pharmaceutical research and drug development.
- CO 3. This course is designed to impart knowledge on the principles of informatics as applicable to the drug development process.
- CO 4. The subject aims at imparting knowledge on computational modeling, and computer aided biopharmaceutical characterization.
- CO 5. The subject offers to develop an understanding of drug-product performance in

|        |   |     |     |     |     | Progr | amme | and C | ourse I | Mapp     | ing  |      |          |       |
|--------|---|-----|-----|-----|-----|-------|------|-------|---------|----------|------|------|----------|-------|
| СО     | PO1   | PO2 | PO3 | PO4 | PO5 | PO6   | PO7  | PO8   | PO9     | PO<br>10 | PO11 | PO12 | PSO<br>1 | PSO 2 |
| CO1    | 2   | 2   |     | 1   | 2   | 2     |      | 2     |         | 2        |      |      | 2        | 2     |
| CO2    | 2   | 1   | 2   |     |     | 1     | 2    |       | 2       |          | 2    |      |          | 2     |
| CO3    | 2   | 2   |     | 2   | 2   | 2     |      |       |         | 2        |      |      | 2        |       |
| CO4    | 2   | 1   | 2   |     |     | 1     | 2    |       | 2       |          | 2    |      | 1        |       |
| CO5    | CO5 2 1 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2               |     |     |     |     |       |      |       |         |          |      |      |          |       |
| 1=ligh | I=lightly mapped 2= moderately mapped 3=strongly mapped |     |     |     |     |       |      |       |         |          |      |      |          |       |

| Unit | Relevance to the local, national, regional and global developmental needs | Relevance To the Employability/ Entrepreneurship/ Skill Development | Relevance to the Professional Ethics, Gender, Human Values, Environment & Sustainability | SDG | NEP | POE/4 <sup>th</sup> IR |
|------|---|---|--|-----|-----|------------------------|
|------|---|---|--|-----|-----|------------------------|

|            | Local | Regional | National   | Global                                  | Employability | Entrepreneurship | Skill Development   | Professional Ethics | Gender | Human Values | Environment & Sustainability |  |  |   |
|------------|-------|----------|--|---|---------------|------------------|---|---------------------|--------|--------------|------------------------------|--|--|---|
| Unit       |       | -        | Drug<br>discovery<br>boost the<br>economy<br>of<br>country |   | 1             | -                | Activities on online available computational soft wares like autodock |                     | 1      |              |                              | Skills for<br>Decent<br>Work;<br>Research-<br>related<br>skills<br>(case<br>study,<br>seminars<br>and<br>hands on<br>training)<br>(SDG<br>4.4) | Professional<br>Education<br>(17.1-17.5);<br>Promoting<br>Highj-<br>quality<br>research<br>(18.1-18.9) | Technical Skills that match Industry Needs/ Hands-on Experience |
| Unit<br>II | -     | -        | -  | Learning of Techniques help to discover | -             | -                | Activities on online available computational soft wares               | -                   | -      | -            | -                            | Skills for<br>Decent<br>Work;<br>Research-   | Professional<br>Education<br>(17.1-17.5);<br>Promoting   | Technical Skills that match Industry                            |

|            |   |   |  | drugs   |   |   | like<br>schrodinger,<br>discovery<br>studio  |   |   |   |   | related skills (case study, seminars and hands on training) (SDG 4.4)  | Highj-<br>quality<br>research<br>(18.1-18.9)   | Needs/<br>Hands-on<br>Experience                                |
|------------|---|---|--|---|---|---|--|---|---|---|---|--|--|---|
| Unit       |   |   | -  | Target identification and validation help in drug discovery | - | - | on online<br>available<br>computational<br>soft wares<br>like<br>schrodinger,<br>discovery<br>studio | - | - | - | - | Skills for<br>Decent<br>Work;<br>Research-<br>related<br>skills<br>(case<br>study,<br>seminars<br>and<br>hands on<br>training)<br>(SDG<br>4.4) | Professional<br>Education<br>(17.1-17.5);<br>Promoting<br>Highj-<br>quality<br>research<br>(18.1-18.9) | Technical Skills that match Industry Needs/ Hands-on Experience |
| Unit<br>IV | - | - | Molecular docking fastens the drug discovery for the | -   | - | - | on online<br>available<br>computational<br>soft wares<br>like<br>schrodinger,<br>discovery           | - | - | - | - | Skills for<br>Decent<br>Work;<br>Research-<br>related<br>skills  | Professional<br>Education<br>(17.1-17.5);<br>Promoting<br>Highj-<br>quality                            | Technical Skills that match Industry Needs; Skill Development   |

| Unit<br>v | - | - | benefit of the country | Help in drug discovery & development by inhibiting enzymes |  | - | on online available computational soft wares like QSAR toolbox |  |  | - | - | (case study, seminars and hands on training) (SDG 4.4) Skills for Decent Work; Research-related skills (case study, seminars and hands on training) (SDG 4.4) | research (18.1-18.9)  Professional Education (17.1-17.5); Promoting Highj-quality research (18.1-18.9) | Technical Skills that match Industry Needs/ Hands-on Experience |
|-----------|---|---|------------------------|--|--|---|--|--|--|---|---|---|--|---|
|-----------|---|---|------------------------|--|--|---|--|--|--|---|---|---|--|---|

| BP 808 ET   | Cell and molecular biology (Theory) | L | Т | P | C |
|-------------|-------------------------------------|---|---|---|---|
| Version 2.0 |                                     | 3 | 1 | 0 | 4 |

| <b>Total Contact Hours</b> | 45 Hours |
|----------------------------|----------|
|                            |          |
|                            |          |
| Co-requisites              |          |
|                            |          |

#### **Course Objectives**

## Upon completion of this course the student should be able to:

- 1. Explain the receptor signal transduction processes.
- 2. Explain the molecular pathways affected by drugs.
- 3. Appreciate the applicability of molecular pharmacology and biomarkers in drug discovery process.
- 4. Demonstrate molecular biology techniques as applicable for pharmacology

#### **Course Outcomes (CO)**

## On completion of this course, the student will be able to:

- CO1. The subject imparts a fundamental knowledge on the structure and functions of cellular components and help to understand the interaction of these components with drugs.
- CO2. The subject also designed to impart knowledge about the various cell death pathways.
- CO3. It helps in detail understaning of molecular biology techniques like western blotting and PCR
- CO4. The students will be able to undesrstand about the cell culture techniques.
- CO5. This information will further help the student to apply the knowledge in drug discovery process.

|     | Programme and Course Mapping |     |     |     |     |     |     |     |     |    |      |      |     |       |
|-----|------------------------------|-----|-----|-----|-----|-----|-----|-----|-----|----|------|------|-----|-------|
| CO  | PO1                          | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO | PO11 | PO12 | PSO | PSO 2 |
|     |                              |     |     |     |     |     |     |     |     | 10 |      |      | 1   |       |
|     |                              |     |     |     |     |     |     |     |     |    |      |      |     |       |
| CO1 | 2                            | 2   |     | 1   | 2   | 2   |     | 2   |     | 2  |      |      | 2   | 2     |
| CO2 | 2                            | 1   | 2   |     |     | 1   | 2   |     | 2   |    | 2    |      |     | 3     |

| CO3 | 2 | 2 |         | 2                   |     | 2 |        |         |       | 2 |    |           | 2    |    |
|-----|---|---|---------|---------------------|-----|---|--------|---------|-------|---|----|-----------|------|----|
| CO4 |   | 1 |         |                     | 2   | 1 | 2      |         | 2     |   | 2  |           | 1    |    |
| CO5 | 2 | 1 | 2       |                     |     | 1 | 2      |         | 2     |   | 2  |           | 2    | 3  |
|     |   |   | 1=light | ly map <sub>l</sub> | ped | 4 | 2= mod | erately | mappe | d | 3= | strongly= | mapp | ed |

| Uni | Releva | ance to the | local, nat | ional, regional and | Releva      | ance To the Emplo  | oyability/  | Relevance to |         |      | SDG | NE | POE/4 <sup>th</sup> IR |
|-----|--------|-------------|------------|---------------------|-------------|--------------------|-------------|--------------|---------|------|-----|----|------------------------|
| t   | global | developm    | ental need | ds                  | Entrepre    | neurship/ Skill De | evelopment  |              | the     |      |     | P  |                        |
|     |        |             |            |                     |             |                    |             | Pro          | fession | nal  |     |    |                        |
|     |        |             |            |                     |             | I                  | Ethics,     |              |         |      |     |    |                        |
|     |        |             |            |                     |             |                    |             |              | ender,  |      |     |    |                        |
|     |        |             |            |                     |             |                    |             |              | Human   |      |     |    |                        |
|     |        |             |            |                     |             |                    |             |              | /alues, |      |     |    |                        |
|     |        |             |            |                     |             |                    |             |              | vironm  |      |     |    |                        |
|     |        |             |            |                     |             |                    |             |              | t &     |      |     |    |                        |
|     |        |             |            |                     |             |                    |             | Sus          | tainabi | ilit |     |    |                        |
|     |        |             |            |                     |             |                    |             |              | у       |      |     |    |                        |
|     | Loca   | Region      | Nation     | Global              | Employabili | Entrepreneursh     | Skill       |              | Ĭ       |      |     |    |                        |
|     | 1      | al          | al         |                     | ty          | ip                 | Development |              |         |      |     |    |                        |
|     |        |             |            |                     | -5          | -F                 |             |              |         |      |     |    |                        |
|     |        |             |            |                     |             |                    |             |              |         |      |     |    |                        |
|     |        |             |            |                     |             |                    |             |              |         |      |     |    |                        |
|     |        |             |            |                     |             |                    |             |              |         |      |     |    |                        |
|     |        |             |            |                     |             |                    |             |              |         |      |     |    |                        |
|     |        |             |            |                     |             |                    |             |              |         |      |     |    |                        |
|     |        |             |            |                     |             |                    |             |              |         |      |     |    |                        |
|     |        |             |            |                     |             |                    |             |              |         |      |     |    |                        |
|     |        |             |            |                     |             |                    |             |              |         |      |     |    |                        |
|     |        |             |            |                     |             |                    |             |              |         |      |     |    |                        |

| Uni  |  | Student will able   |  | Pharmacology    |  | (SD  | (9.1 | Global      |
|------|--|---------------------|--|-----------------|--|------|------|-------------|
| t I  |  | to know general     |  | as a discipline |  | G    | _    | Education   |
|      |  | pharmacology is     |  | has             |  | 4.4) | 9.3) | Knowledge,  |
|      |  | crucial for         |  | significantly   |  |      |      | Skill       |
|      |  | ensuring the        |  | contributed to  |  |      |      | Developmen  |
|      |  | safe, effective,    |  | skill           |  |      |      | t,          |
|      |  | and rational use    |  | development     |  |      |      | Employabili |
|      |  | of drugs            |  | in various      |  |      |      | ty          |
|      |  | globally. It        |  | aspects of      |  |      |      |             |
|      |  | informs drug        |  | drug therapy.   |  |      |      |             |
|      |  | regulation,         |  | It has          |  |      |      |             |
|      |  | promotes            |  | provided the    |  |      |      |             |
|      |  | rational drug use,  |  | knowledge,      |  |      |      |             |
|      |  | contributes to      |  | education, and  |  |      |      |             |
|      |  | pharmacovigilan     |  | training        |  |      |      |             |
|      |  | ce efforts,         |  | necessary for   |  |      |      |             |
|      |  | supports global     |  | healthcare      |  |      |      |             |
|      |  | health initiatives, |  | professionals   |  |      |      |             |
|      |  | informs             |  | to understand   |  |      |      |             |
|      |  | pharmacoecono       |  | drug actions,   |  |      |      |             |
|      |  | mic evaluations,    |  | make            |  |      |      |             |
|      |  | and fosters         |  | informed        |  |      |      |             |
|      |  | international       |  | therapeutic     |  |      |      |             |
|      |  | collaborations      |  | decisions,      |  |      |      |             |
|      |  | and research in     |  | ensure drug     |  |      |      |             |
|      |  | pharmacology.       |  | safety, and     |  |      |      |             |
| Uni  |  | The global          |  | contribute to   |  | (SD  | (9.1 | Global      |
| t II |  | impact of drugs     |  | patient care.   |  | G    | -    | Education   |
|      |  | targeting the       |  | Skill           |  | 4.4) | 9.3) | Knowledge,  |
|      |  | peripheral          |  | development     |  |      |      | Skill       |

|       | nervous system    | in              |  |      |      | Developmen  |
|-------|-------------------|-----------------|--|------|------|-------------|
|       | is vast, with     | pharmacology    |  |      |      | t,          |
|       | applications in   | continues       |  |      |      | Employabili |
|       | treating          | through         |  |      |      | ty          |
|       | autonomic         | lifelong        |  |      |      |             |
|       | disorders,        | learning and    |  |      |      |             |
|       | anesthesia,       | interdisciplina |  |      |      |             |
|       | neuromuscular     | ry              |  |      |      |             |
|       | disorders and     | collaboration,  |  |      |      |             |
|       | research,         | enabling        |  |      |      |             |
|       | allowing          | professionals   |  |      |      |             |
|       | healthcare        | to adapt to     |  |      |      |             |
|       | professionals to  | new             |  |      |      |             |
|       | optimize patient  | developments    |  |      |      |             |
|       | outcomes by       | and improve     |  |      |      |             |
|       | leveraging their  | patient         |  |      |      |             |
|       | pharmacological   | outcomes.       |  |      |      |             |
|       | properties.       |                 |  |      |      |             |
| Uni   | The               |                 |  | (SD  | (9.1 | Global      |
| t III | pharmacology of   |                 |  | G    | -    | Education   |
|       | drugs acting on   |                 |  | 4.4) | 9.3) | Knowledge,  |
|       | the central       |                 |  |      |      | Skill       |
|       | nervous system    |                 |  |      |      | Developmen  |
|       | has profound      |                 |  |      |      | t,          |
|       | various global    |                 |  |      |      | Employabili |
|       | applications such |                 |  |      |      | ty          |
|       | as neurological   |                 |  |      |      |             |
|       | and psychiatric   |                 |  |      |      |             |
|       | disorders, pain   |                 |  |      |      |             |
|       | management        |                 |  |      |      |             |

|      | sleep disorders, substance abuse, neuro-protection |
|------|--|
| Uni  | Cardiovascular (SD (9.1 Global                     |
| t IV | drugs have G - Education                           |
|      | extensive global 4.4) 9.3) Knowledge,              |
|      | applications and Skill                             |
|      | are utilized in the Developmen                     |
|      | management of t,                                   |
|      | hypertension, Employabili                          |
|      | ischemic heart ty                                  |
|      | disease, heart                                     |
|      | failure,   |
|      | arrhythmias,                                       |
|      | thromboembolic                                     |
|      | diseases,  |
|      | dyslipidemia,                                      |
|      | pulmonary  |
|      | hypertension,                                      |
|      | valvular heart                                     |
|      | disease, and                                       |
|      | secondary  |
|      | prevention   |
|      | strategies. They                                   |
|      | play a critical                                    |
|      | role in improving                                  |
|      | cardiovascular                                     |
|      | health, reducing                                   |

|     |  | morbidity and    |  |  |  |      |      |             |
|-----|--|------------------|--|--|--|------|------|-------------|
|     |  | mortality rates  |  |  |  |      |      |             |
|     |  | associated with  |  |  |  |      |      |             |
|     |  | cardiovascular   |  |  |  |      |      |             |
|     |  | conditions       |  |  |  |      |      |             |
| Uni |  | Autacoids used   |  |  |  | (SD  | (9.1 | Global      |
| t v |  | to address       |  |  |  | Ğ    | _    | Education   |
|     |  | inflammatory     |  |  |  | 4.4) | 9.3) | Knowledge,  |
|     |  | disorders,       |  |  |  |      | ,    | Skill       |
|     |  | manage pain,     |  |  |  |      |      | Developmen  |
|     |  | treat            |  |  |  |      |      | t,          |
|     |  | cardiovascular   |  |  |  |      |      | Employabili |
|     |  | disorders,       |  |  |  |      |      | ty          |
|     |  | alleviate        |  |  |  |      |      |             |
|     |  | gastrointestinal |  |  |  |      |      |             |
|     |  | and respiratory  |  |  |  |      |      |             |
|     |  | conditions,      |  |  |  |      |      |             |
|     |  | control allergic |  |  |  |      |      |             |
|     |  | and immune       |  |  |  |      |      |             |
|     |  | responses,       |  |  |  |      |      |             |
|     |  | address          |  |  |  |      |      |             |
|     |  | reproductive     |  |  |  |      |      |             |
|     |  | health issues,   |  |  |  |      |      |             |
|     |  | and manage       |  |  |  |      |      |             |
|     |  | renal disorders  |  |  |  |      |      |             |

| L T P |
|-------|
|-------|

| BP 809 ET                 |                | Cos         | metic sci  | ence (T    | neory)   |          |             |           |           |          |   |   |
|---------------------------|----------------|-------------|------------|------------|----------|----------|-------------|-----------|-----------|----------|---|---|
| Version 2.0               |                |             |            |            |          |          |             |           | 3         | 1        | 0 | 4 |
| Total Contact Hours       | 45 Hours       |             |            |            |          |          |             |           |           |          |   | 1 |
| Herbal Drug Technology    |                |             |            |            |          |          |             |           |           |          |   |   |
| Co-requisites             |                |             |            |            |          |          |             |           |           |          |   |   |
|                           |                |             |            | Cou        | rse Ob   | jective  | S           |           |           |          |   |   |
| Upon completion of this   | course the st  | udent sho   | ould be al | ole to:    |          |          |             |           |           |          |   |   |
| 1. Key ingredients used   | n cosmetics    | and cosme   | eceuticals |            |          |          |             |           |           |          |   |   |
| 2. Key building blocks f  | or various for | mulations   | S.         |            |          |          |             |           |           |          |   |   |
| 3. Current technologies   | in the market  |             |            |            |          |          |             |           |           |          |   |   |
| 4. Various key ingredier  | ts and basic s | science to  | develop c  | osmetic    | s and co | osmece   | uticals     | S         |           |          |   |   |
| 5. Scientific knowledge   | to develop co  | osmetics a  | and cosme  | ceutical   | s with o | desired  | Safety      | , stabili | ty, and e | fficacy. |   |   |
|                           |                |             |            | Course     | Outco    | omes (C  | <b>CO</b> ) |           |           |          |   |   |
| On completion of this co  | ırse, the stud | lent will   | be able to | ) <b>:</b> |          |          |             |           |           |          |   |   |
| CO1: To make the student  | know about     | the variou  | s cosmeti  | cs produ   | cts, the | ir princ | ciples      | & formu   | ılation.  |          |   |   |
| CO2 T 1 1 1 1 1           | 1 . 1.1        | c .:        |            | . 11       |          |          | ,•          | 1         |           | . 1      |   |   |
| CO2:To make the student   | understand th  | ie functioi | ning of na | turai nei  | bs usin  | g in co  | smetic      | es and co | smeceu    | ticais   |   |   |
| CO3: To enable the studer | it with the kn | owledge o   | of cosmeti | cs as per  | Indian   | and E    | U regu      | ılations. |           |          |   |   |
| CO4: To make the student  | know about     | Principles  | of Cosmo   | etic Eval  | uation.  |          |             |           |           |          |   |   |
| Programme and Course      | Mapping        |             |            |            |          |          |             |           |           |          |   |   |
|                           |                |             |            |            |          |          |             |           |           |          |   |   |

| CO1 | 2   | 2 |   | 1 | 2 | 2 |   | 2 |   | 2 |   |  | 2 | 2 |
|-----|---|---|---|---|---|---|---|---|---|---|---|--|---|---|
| CO2 | 2   | 1 | 2 |   |   | 1 | 2 |   | 2 |   | 2 |  |   | 3 |
| CO3 | 2   | 2 |   | 2 |   | 2 |   |   |   | 2 |   |  | 2 |   |
| CO4 |   | 1 |   |   | 2 | 1 | 2 |   | 2 |   | 2 |  | 1 |   |
|     | 1=lightly mapped 2= moderately mapped 3=strongly mapped |   |   |   |   |   |   |   |   |   |   |  |   |   |

| Unit | regio   | vance<br>onal ai<br>lopme | nd glo     |                                    | Eı            | Em<br>ntrepr     | vance To the<br>ployability/<br>eneurship/ Skill<br>evelopment | Prof<br>Go<br>Valu  | essior<br>ender,<br>es, En | ce to t<br>nal Eth<br>Huma<br>viron<br>inabili | nics,<br>an<br>ment          | SDG  | NEP                                  | POE/4 <sup>th</sup> IR                                |
|------|---------|---------------------------|------------|------------------------------------|---------------|------------------|--|---------------------|----------------------------|--|------------------------------|--|--------------------------------------|---|
| Unit | . Local | ' Regional                | ' National | Ulopal Individual know             | Employability | Entrepreneurship | Skill Development wow well about                               | Professional Ethics | Gender                     | Human Values                                   | Environment & Sustainability | Revitalize the global                            | Professional<br>Education            | Technical Skills that match                           |
| 1    |         |                           |            | Regulation/ provisions for import, |               |                  | nation & international Regulations for                         |                     |                            |  |                              | partnership<br>for<br>sustainable<br>development | (17.1-17.5) Promoting Highj- quality | Industry Needs,<br>Entrepreneurship,<br>Employability |

| Unit        | - | - | manufacture and sale of different cosmetics product know different health related issues, their preventive requirement & their improvement. | import, export, manufacture & sales of cosmoceuticals  scientific knowledge, of different body conditions and their preventive requirement ts. |  | (Role of all<br>Schools,<br>KRMU)<br>(SDG 17)                                  | research<br>(18.1-18.9)                                | Global Education<br>Knowledge   |
|-------------|---|---|---|--|--|--|--|---|
| Unit<br>III | - | - | Individual may know different ingredients used in cosmetic formulation and their properties cosmetics and their requirements                | Scientific Knowledge about ingredients, their properties and use in cosmeceuticals.  |  | 1.a Ensure significant mobilization of resources from a variety of sources     |  |   |
| Unit<br>IV  | - | - | Proper & best utilization of natural resources in formulating different cosmeceutical   | Increase in skill of an individual and personals.  |  | Ensure healthy lives and promote well-being for all at all ages (SDG 3) Ensure | Technology<br>Use &<br>Integration<br>(23.1-<br>23.13) | Focus on<br>Employability<br>Skills<br>(Local/Regional<br>and Global) |

|      |  | products   |  |  |  | sustainable<br>consumption<br>and<br>production<br>patterns<br>(SDG 12)           |  |   |
|------|--|--|--|--|--|---|--|---|
| Unit |  | Proper & best utilization of natural resources in cosmeceutical. | Better utilization of different Natural resources in health and beauty care. |  |  | Ensure<br>sustainable<br>consumption<br>and<br>production<br>patterns<br>(SDG 12) | Technology Use & Integration (23.1- 23.13) | Corporate Alliances to provide Big Sister/Big Brother Connections |

| BP 810 ET                        | Experimental Pharmacology (Theory)                            | L | Т | P | C |  |  |  |  |  |  |  |  |
|----------------------------------|---|---|---|---|---|--|--|--|--|--|--|--|--|
| Version 2.0                      |   | 3 | 1 | 0 | 4 |  |  |  |  |  |  |  |  |
| <b>Total Contact Hours</b>       | 45 Hours  |   |   |   |   |  |  |  |  |  |  |  |  |
| Pre-requisites/Exposure          | Pharmacology and Toxicology                                   |   |   |   |   |  |  |  |  |  |  |  |  |
| Co-requisites                    | HAP-I   |   |   |   |   |  |  |  |  |  |  |  |  |
|                                  | Course Objectives   |   |   |   |   |  |  |  |  |  |  |  |  |
| <b>Upon completion of this c</b> | Upon completion of this course the student should be able to: |   |   |   |   |  |  |  |  |  |  |  |  |
| 1. Appreciate the applicat       | tions of various commonly used laboratory animals.            |   |   |   |   |  |  |  |  |  |  |  |  |

- 2. Appreciate and demonstrate the various screening methods used in preclinical research
- 3. Appreciate and demonstrate the importance of biostatistics and research methodology
- 4. Design and execute a research hypothesis independently

## Course Outcomes (CO)

#### On completion of this course, the student will be able to:

CO1. This subject is designed to impart fundamental knowledge about the pharmacological experiments, animal's handlings and about different animals used in the experimental pharmacology.

CO2.It imparts the practical knowledge on molecular biology techniques

CO3. It helps the students to learn about different roots a drug administration and methods of blood withdrawal

CO4. The subject also designed to impart knowledge about the regulatory bodies governing experiments on animals like CPCSEA.

|        | Programme and Course Mapping |      |            |         |     |     |        |        |        |          |      |      |          |       |
|--------|------------------------------|------|------------|---------|-----|-----|--------|--------|--------|----------|------|------|----------|-------|
| CO     | PO1                          | PO2  | PO3        | PO4     | PO5 | PO6 | PO7    | PO8    | PO9    | PO<br>10 | PO11 | PO12 | PSO<br>1 | PSO 2 |
| CO1    | 2                            | 2    |            | 1       | 2   | 2   |        | 2      |        | 2        |      |      | 2        | 2     |
| CO2    | 2                            | 1    | 2          |         |     | 1   | 2      |        | 2      |          | 2    |      |          | 2     |
| CO3    | 2                            | 2    |            | 2       | 2   | 2   |        |        |        | 2        |      |      | 2        |       |
| CO4    | 2                            | 1    | 2          |         |     | 1   | 2      |        | 2      |          | 2    |      | 1        |       |
| 1=ligh | tly ma                       | pped | 2= moderat | ely map | ped |     | 3=stro | ngly m | napped | •        | •    | •    |          |       |

| Unit | Relevance to the local, national, regional and global developmental needs | Relevance To the<br>Employability/<br>Entrepreneurship/<br>Skill<br>Development | Relevance to the Professional Ethics, Gender, Human Values, Environment & Sustainability | SDG | NEP | POE/4 <sup>th</sup> IR |  |
|------|---|---|--|-----|-----|------------------------|--|
|------|---|---|--|-----|-----|------------------------|--|

|            | Local | Regional | National | Global  | Employability | Entrepreneurship | Skill Development   | Professional Ethics | Gender | Human Values | Environment & Sustainability |  |   |             |
|------------|-------|----------|----------|---|---------------|------------------|---|---------------------|--------|--------------|------------------------------|--|---|-------------|
| Unit<br>I  |       |          |          | This unit covers the practical approaches of animal experimentation in labs Skill development |               |                  | Hands on training of different techniques, s that students can learn the in vivo, ex vivo and in vitro techniques |                     |        |              |                              | Skills for<br>Decent Work<br>(SDG 4.4) |   | Soft Skills |
| Unit<br>II |       | -        | -        | Different instruments are used n measurement of BP, Skill development                         |               |                  | Hands on<br>training of<br>different<br>techniques  |                     |        |              |                              | -                                      | - | Soft Skills |

| Unit<br>III | - | - | - | Hands on training of different techniques  | Hands on training of different techniques |  |  | Skills<br>Decent<br>(SDG 4.4  | for<br>Work<br>)               | Effective<br>Governance &<br>Leadership<br>(19.1- 19.5) | Skill<br>Development |
|-------------|---|---|---|--|---|--|--|---|--------------------------------|---|----------------------|
| Unit<br>IV  | - | - | - | Skill development  |   |  |  | -   |                                | -   | Skill<br>Development |
| Unit<br>v   |   |   |   | Designing of In silico studies helps the students to get the training on lead optimization Skill development | Hands on training of different techniques |  |  | Revitalize<br>global<br>partnersh<br>sustainab<br>developm<br>(Role of<br>Schools,<br>KRMU)<br>(SDG 17) | ip for<br>le<br>nent<br>of all | Transforming the Regulatory System (20.1-20.15)         | Soft Skills          |

| BP 811 ET                  | Advanced Instrumentation Techniques (Theory) | L | Т | P | C |  |
|----------------------------|--|---|---|---|---|--|
| Version 2.0                |  | 3 | 1 | 0 | 4 |  |
| <b>Total Contact Hours</b> | 45 Hours                                     |   |   |   | I |  |
| Pre-requisites/Exposure    | Pharmaceutical Analysis                      |   |   |   |   |  |
| Co-requisites              |  |   |   |   |   |  |
|                            | Course Objectives                            |   |   |   |   |  |

## Upon completion of this course the student should be able to:

- 1. Appreciate the applications of various commonly used laboratory animals.
- 2. understand the advanced instruments used and its applications in drug analysis
- 3. Understand the chromatographic separation and analysis of drugs.
- 4. Understand the calibration of various analytical instruments
- 5. Know analysis of drugs using various analytical instruments.

#### **Course Outcomes (CO)**

#### On completion of this course, the student will be able to:

CO1: Theory and practical knowledge of UV spectrophotometer and IR spectrophotometer.

CO2: The analysis of various drugs in single and combination dosage forms by various spectroscopic and chromatographic techniques.

CO3: Understanding NMR and Mass spectroscopy.

CO4: Theoretical and practical skills of the instruments.

|     | Programme and Course Mapping  |   |         |        |     |   |         |         |       |   |    |         |        |    |
|-----|---|---|---------|--------|-----|---|---------|---------|-------|---|----|---------|--------|----|
| СО  | CO   PO1   PO2   PO3   PO4   PO5   PO6   PO7   PO8   PO9   PO   PO11   PO12   PSO 2 1   PSO 2 |   |         |        |     |   |         |         |       |   |    |         |        |    |
| CO1 | CO1 2 2 1 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2   |   |         |        |     |   |         |         |       |   |    |         |        |    |
| CO2 | 2   | 1 | 2       |        |     | 1 | 2       |         | 2     |   | 2  |         |        | 2  |
| CO3 | 2   | 2 |         | 2      | 2   | 2 |         |         |       | 2 |    |         | 2      |    |
| CO4 | 2   | 1 | 2       |        |     | 1 | 2       |         | 2     |   | 2  |         | 1      |    |
|     |   |   | 1=light | ly map | ped | 2 | 2 = mod | erately | mappe | d | 3= | strongl | y mapp | ed |

| Ţ   | Jnit | Relevance to the | local, national,<br>regional and | global   | needs   | Relevance To the | Employability/<br>Entrepreneurship/ | Skill Development                    |               | Relevance to the    | Protessional<br>Ethics, Gender, | Human Values, Environment & Sustainability   |                                | SDG   | NEP                                       | POE/4 <sup>th</sup> IR |
|-----|------|------------------|----------------------------------|----------|---|------------------|-------------------------------------|--------------------------------------|---------------|---------------------|---------------------------------|--|--------------------------------|---|---|------------------------|
| UII | Jnit | ' Local          | ' Regional                       | National | identification, characterization and quantification of drugs using UV-Visible spectroscopy, IR, Spectroflourimetr y and Flame emission spectroscopy and Atomic absorption | Employability    | . Entrepreneurship                  | Theoretical practical of instruments | skills<br>the | Professional Ethics | ' Gender                        | Right Conduct, Truth Contains values like accuracy, fairness, honesty, justice, quest for knowledge, determination | ' Environment & Sustainability | Skills<br>for<br>Decen<br>t<br>Work<br>(SDG<br>4.4) | Professiona<br>1 Education<br>(17.1-17.5) | Skill<br>Development   |

|             |   |   |   | spectroscopy  |   |   |  |   |   |   |   |   |   |                      |
|-------------|---|---|---|---|---|---|--|---|---|---|---|---|---|----------------------|
| Unit<br>II  |   | - | - | Identification, characterization and quantification of drug using NMR Spectroscopy.             | - | - | The analysis of various drugs in single and combination dosage form, Theoretical and practical skills of the instruments | 1 | - | Right<br>Conduct and<br>Truth                       | - | Skills<br>for<br>Decen<br>t<br>Work<br>(SDG<br>4.4) | Professiona<br>1 Education<br>(17.1-17.5) | Skill<br>Development |
| Unit<br>III |   | - | - | Identification, characterization and quantification of drug using Mass Spectroscopy.            | - | - | Theoretical and practical skills of the instruments  | - | - | Right Conduct and Truth                             | - | Skills<br>for<br>Decen<br>t<br>Work<br>(SDG<br>4.4) | Professiona<br>1 Education<br>(17.1-17.5) | Skill<br>Development |
| Unit<br>IV  |   | - | - | Quantitative and<br>Qualitative<br>analysis of Drugs<br>using<br>Chromatographic<br>techniques. | - | - | The analysis of various drugs in single and combination dosage form using Chromatographi c techniques.                   | - | - | Right Conduct, accuracy, fairness, honesty, justice | - | Skills<br>for<br>Decen<br>t<br>Work<br>(SDG<br>4.4) | Professiona<br>1 Education<br>(17.1-17.5) | Employabilit<br>y    |
| Unit<br>v   | - | - | - | Use of Electrophoresis in   |   | - | Quantitative analysis of   | - | - | Right<br>Conduct and                                | - | Skills<br>for                                       | Professiona<br>1 Education                | Skill<br>Development |

|      | separation and    | Drugs            | Truth | Decen  | (17.1-17.5)   |              |
|------|-------------------|------------------|-------|--------|---------------|--------------|
|      | Quantitative      | 21485            |       | t      | (17.11.17.10) | Employabilit |
|      | analysis of Drugs |                  |       | Work   |               | y            |
|      |                   |                  |       | (SDG   |               |              |
|      |                   |                  |       | 4.4)   |               |              |
| Unit | Immunological     | Develop skills   |       | Skills | Professiona   | Skill        |
| -VI  | assays in         | for diagnosis of |       | for    | 1 Education   | Development  |
|      | diagnosis of      | diseases,        |       | Decen  | (17.1-17.5)   |              |
|      | diseases,         | therapeutic drug |       | t      |               |              |
|      | therapeutic drug  | monitoring,      |       | Work   |               |              |
|      | monitoring,       | clinical         |       | (SDG   |               |              |
|      | clinical          | pharmacokinetic  |       | 4.4)   |               |              |
|      | pharmacokinetic   | and              |       |        |               |              |
|      | and               | bioequivalence   |       |        |               |              |
|      | bioequivalence    | studies in drug  |       |        |               |              |
|      | studies in drug   | discovery and    |       |        |               |              |
|      | discovery and     | pharmaceutical   |       |        |               |              |
|      | pharmaceutical    | industries       |       |        |               |              |
|      | industries.       |                  |       |        |               |              |

| BP 812 ET                  | Dietary supplements and Neutraceuticals (Theory) | L | Т | P | C |
|----------------------------|--|---|---|---|---|
| Version 2.0                |  | 3 | 1 | 0 | 4 |
| <b>Total Contact Hours</b> | 45 Hours   | I | L |   |   |
| Pre-requisites/Exposure    | Herbal Drug Technology                           |   |   |   |   |

| Co-requisites |  |
|---------------|--|
|               |  |

# **Course Objectives**

Upon completion of this course the student should be able to:

1. Understand the need of supplements by the different group of people to maintain Healthy life.

## **Course Outcomes (CO)**

On completion of this course, the student will be able to:

- 1. Understand the need of nutrients by the different group of people to maintain Healthy life.
- 2. Understand the outcome of deficiencies in dietary supplements.
- 3. Appreciate the components in dietary supplements and the application.
- 4. Appreciate the regulatory and commercial aspects of dietary supplements including health claims

|        | Programme and Course Mapping                            |     |     |     |     |   |   |     |   |   |      |      |          |       |
|--------|---|-----|-----|-----|-----|---|---|-----|---|---|------|------|----------|-------|
| СО     | PO1   | PO2 | PO3 | PO4 | PO5 |   |   | PO8 |   |   | PO11 | PO12 | PSO<br>1 | PSO 2 |
| CO1    | 2   | 2   |     | 1   | 2   | 2 |   | 2   |   | 2 |      |      | 2        | 2     |
| CO2    | 2   | 1   | 2   |     |     | 1 | 2 |     | 2 |   | 2    |      |          | 2     |
| CO3    | 2   | 2   |     | 2   | 2   | 2 |   |     |   | 2 |      |      | 2        |       |
| CO4    | 2   | 1   | 2   |     |     | 1 | 2 |     | 2 |   | 2    |      | 1        |       |
| 1=ligh | 1=lightly mapped 2= moderately mapped 3=strongly mapped |     |     |     |     |   |   |     |   |   |      |      |          |       |

| Unit | Relevance to the local, national, regional and global developmental | needs    |          |   | Relevance To the Employability/ | Entrepreneurship/<br>Skill Development | Ι  | Relevance to the Professional Ethics, Gender, Human | values,<br>Environment & | Sustainability                      |                              | SDG   | NEP                                | POE/4 <sup>th</sup> IR  |
|------|---|----------|----------|---|---------------------------------|--|--|---|--------------------------|-------------------------------------|------------------------------|---|------------------------------------|---|
| Unit | Local   | Regional | National | Unders tand the need of nutrien ts by the differe nt group of people to maintai | Employability                   | Entrepreneurship                       | Skills related to Appreciate the componen ts in dietary supplemen ts and the application | Professional Ethics                                 | Gender                   | B et e r Q a lit y of he rb al D ru | Environment & Sustainability | Skil<br>ls<br>for<br>Dec<br>ent<br>Wor<br>k<br>(SD<br>G<br>4.4) | Professional Education (17.1-17.5) | Global<br>Educati<br>on<br>Knowle<br>dge<br>Techni<br>cal<br>Skills<br>that<br>match<br>Industr<br>y<br>Needs,<br>Skill |

|             |   |   |   | n<br>Health<br>y life  |  |  | gs                                  |   |                                    | Develo<br>pment   |
|-------------|---|---|---|--|--|--|-------------------------------------|---|------------------------------------|---|
| Unit        |   |   |   | regulat ory and comme rcial aspects of dietary supple ments includi ng health claims |  |  | B et te r yi el d                   | Skil<br>ls<br>for<br>Dec<br>ent<br>Wor<br>k<br>(SD<br>G<br>4.4) | Professional Education (17.1-17.5) | Global Educati on Knowle dge Techni cal Skills that match Industr y Needs, Skill Develo pment |
| Unit<br>III | - | - | - | -  |  |  | E n vi ro n m en t co ns er vi ti o | Skil<br>ls<br>for<br>Dec<br>ent<br>Wor<br>k<br>(SD<br>G<br>4.4) | Professional Education (17.1-17.5) | Global Educati on Knowle dge Techni cal Skills that match Industr y Needs, Skill              |

|            |   |   |   |  |  |  | n        |            |              | Develo<br>pment   |
|------------|---|---|---|--|--|--|----------|------------|--------------|-------------------|
|            |   |   |   |  |  |  |          |            |              |                   |
| Unit<br>IV | - | - | - |  |  |  | Tr<br>ad | Skil<br>ls | Prof<br>essi | Global<br>Educati |
|            |   |   |   |  |  |  | iti      | for        | onal         | on                |
|            |   |   |   |  |  |  | О        | Dec        | Edu          | Knowle            |
|            |   |   |   |  |  |  | na       | ent        | cati         | dge<br>Techni     |
|            |   |   |   |  |  |  | l<br>k   | Wor        | on<br>(17.   | cal               |
|            |   |   |   |  |  |  | n        | k<br>(SD   | 1-           | Skills            |
|            |   |   |   |  |  |  | 0        | G          | 17.5         | that              |
|            |   |   |   |  |  |  | W        | 4.4)       | )            | match             |
|            |   |   |   |  |  |  | le       |            |              | Industr           |
|            |   |   |   |  |  |  | d        |            |              | y                 |
|            |   |   |   |  |  |  | ge       |            |              | Needs,            |
|            |   |   |   |  |  |  |          |            |              | Skill             |
|            |   |   |   |  |  |  |          |            |              | Develo pment      |
| Unit       |   |   |   |  |  |  | N        | Skil       | Prof         | Global            |
| V          |   |   |   |  |  |  | e        | ls         | essi         | Educati           |
|            |   |   |   |  |  |  | w        | for        | onal         | on                |
|            |   |   |   |  |  |  | er       | Dec        | Edu          | Knowle            |
|            |   |   |   |  |  |  | dr       | ent        | cati         | dge               |
|            |   |   |   |  |  |  | u        | Wor        | on           | Techni            |
|            |   |   |   |  |  |  | gs<br>fr | k          | (17.         | cal               |
|            |   |   |   |  |  |  | o l      | (SD<br>G   | 1-<br>17.5   | Skills<br>that    |
|            |   |   |   |  |  |  | m        | 4.4)       | )            | match             |
|            |   |   |   |  |  |  | na       | /          | '            | Industr           |
|            |   |   |   |  |  |  | tu       |            |              | y                 |
|            |   |   |   |  |  |  | ra       |            |              | Needs,            |

|  |  |  |  |  | 1  |  | Skill           |
|--|--|--|--|--|----|--|-----------------|
|  |  |  |  |  | re |  | Skill<br>Develo |
|  |  |  |  |  | so |  | pment           |
|  |  |  |  |  | ur |  |                 |
|  |  |  |  |  | ce |  |                 |
|  |  |  |  |  | S  |  |                 |

| BP 813 PW                  | Project work | L | Т | P  | С |
|----------------------------|--------------|---|---|----|---|
| Version 2.0                |              | 0 | 0 | 12 | 6 |
| <b>Total Contact Hours</b> | 45 Hours     |   |   |    |   |
| Herbal Drug Technology     |              |   |   |    |   |
| Co-requisites              |              |   |   |    |   |