K.R. MANGALAM UNIVERSITY

THE COMPLETE WORLD OF EDUCATION

SCHOOL OF BASIC AND APPLIED SCIENCES

Bachelor of Science (Hons) Mathematics

B.Sc. (Hons.) Mathematics

Programme Code: 11

2018-21

Approved in the 17th Meeting of Academic Council Held on 29 June 2018

Academic Council * K.R. Mangalam University * Member Secretary

Registrar
K.R. Mangalam University
Sohna Road, Gurugram, (Haryana)

K.R. MANGALAM UNIVERSITY
THE COMPLETE WORLD OF EDUCATION

SCHOOL OF BASIC AND APPLIED SCIENCES

Bachelor of Science (Hons) Mathematics

B.Sc. (Hons.) Mathematics

Programme Code: 11

2018-21

Approved in the 17th Meeting of Academic Council Held on 29 June 2018

Content

1.	Introduction	1
2.	About School	2
3.	Programmes offered by the School	2
3.1	B.Sc. (Hons.) Chemistry	3
3.2	B.Sc. (Hons.) Physics	3
3.3	B.Sc. (Hons.) Mathematics	4
4.	Programme Duration	4
5.	Class Timings	4
6.	Scheme of Studies and Syllabi	4-57
7.	Annexure	58

1. Introduction

The K.R. Mangalam Group has made a name for itself in the field of education. Over a period of time, the various educational entities of the group have converged into a fully functional corporate academy. Resources at KRM have been continuously upgraded to optimize opportunities for the students. Our students are groomed in a truly inter-disciplinary environment wherein they develop integrative skills through interaction with students from engineering, management, journalism and media study streams.

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. With the mushrooming of institutions of Higher Education in the National Capital Region, the university considered it very important that students take informed decisions and pursue career objectives in an institution, where the concept of education has evolved as a natural process.

K.R. Mangalam University was founded in the year 2013 by Mangalam Edu Gate, a company incorporated under Section 25 of the Companies Act, 1956.

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.

Objectives

i. To impart undergraduate, post-graduate and Doctoral education in identified areas of higher education.
ii. To undertake research programmes with industrial interface.
iii. To integrate its growth with the global needs and expectations of the major stake holders through teaching, research, exchange & collaborative programmes with foreign, Indian Universities/Institutions and MNCs.
iv. To act as a nodal center for transfer of technology to the industry.
v. To provide job oriented professional education to the pecia student community with particular focus on Haryana.

2. About School

The school imparts out both teaching and research through its various science disciplines via Mathematics, Chemistry and Physics.

School of Basic and Applied Sciences imparts students technical knowledge, enhances their skill and ability, motivating them to think creatively, helping them to act independently and take decisions accordingly in all their scientific pursuits and other endeavors. It strives to empower its students and faculty members to contribute to the development of society and Nation.

The faculty is in constant touch with various experts in the relevant field and is willing to experiment with latest ideas in teaching and research.

The School Comprises of disciplines of Chemistry, Physics and Mathematics.

VISION

School of Basic and Applied Sciences intends for continuum growth as centre of advanced learning, research and innovation by disseminating analytical and scientific knowledge in the areas of basic and applied sciences by promoting interdisciplinary research and scientific acumen.

MISSION

M1: Enable students to be scientists/ academicians /entrepreneurs by accomplishing fundamental and advanced research in diverse areas of basic and applied sciences.

M2: Build strong associations with academic organizations/industries for knowledge creation, advancement, and application of scientific fervor.

M3: Create conducive environment for lifelong learning.

M4: Empower students to be socially responsible and ethically strong individuals through value-based science education.

3. Programmes offered by the School

School offers undergraduate B.Sc. (Hons) Programmes and postgraduate M.Sc. Programmes. All these programmes are designed to impart scientific knowledge to the students and will provide theoretical as well as practical training in their respective fields.

3.1 B. Sc. (Hons.) Chemistry

This course aims to impart basic and applied knowledge in various branches in Chemistry with a view to produce good academics, researchers and professionals in the field.

Eligibility Criteria:- The student should have passed the 10+2 examination conducted by the Central Board of Secondary Education or equivalent examination from a recognized Board in Science stream with an aggregate of 50% or more.

Course Outline:- Inorganic chemistry / Organic chemistry / Physical chemistry / Analytical methods in chemical sciences / Environmental chemistry / Biochemistry / Green Chemistry.

Career Options:- Opportunities exist in chemical industry, pharmacy, education and forensics.

Programme scheme: - For Programme scheme see Annexure A.

3.2 B.Sc. (Hons.) Physics

Physics, as a stream of study, helps in understanding fundamentals and develop curiosity in understanding various physical aspects of universe. This course aims to impart basic and applied knowledge in physics with a view to produce good academicians, researchers and professionals in varied fields.

Eligibility Criteria: - The student should have passed the 10+2 examination conducted by the Central Board of Secondary Education or equivalent examination from a recognized Board in Science stream with an aggregate of 50% or more.

Course Outline: - Mathematical Physics / Mechanics / Optics / Thermal Physics / Oscillations & Waves / Electricity & Magnetism / Numerical Analysis / Digital Electronics / Microprocessor & Computer Programming / Digital Electronics / Quantum Mechanics / Atomic & Molecular Physics
/ Electronic Devices / Electromagnetic Theory / Statistical Physics / Solid State physics / Nuclear
& Particle Physics.

Career Options: - Opportunities exist in academics, research laboratories and administration besides all the opportunities applicable to any other graduate like UPSC examination's, defence services and other govt. jobs.

Programme scheme: - For Programme scheme see Annexure B.

3.3 B.Sc. (Hons.) Mathematics

Mathematics is a universal part of human culture. This course aims to impart basic and applied knowledge in Mathematics with a view to produce good Mathematicians and researchers. A degree in mathematics provides you with a broad range of skills in problem solving, logical reasoning and flexible thinking.

Eligibility Criteria: - The student should have passed the 10+2 examination conducted by the Central Board of Secondary Education or equivalent examination from a recognized Board in Science stream with an aggregate of 50% or more.

Course Outline: - Calculus / Vector Calculus / Business Mathematics / Differential Equations / Solid Geometry / Computer Programming / Modern Algebra / Numerical Analysis / Linear Algebra
/ Real Analysis / Complex Analysis / Probability and Statistics / Operational research / Mechanics.

Career Options: - Mathematicians work in business, finance, industry, government offices, management, education and science.

Programme scheme: - For Programme scheme see Annexure C.

4. Programme Duration

The minimum period required for the B.Sc. (Hons.) Programme offered by the University shall extend over a period of three Academic Years.

The maximum period for the completion of the B.Sc. (Hons) Programme offered by the University shall be five years.

5. Class Timings

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

6. Scheme of Studies and Syllabi

The syllabi of all courses programme offered by SBAS are given in the following pages. These are arranged as: (a) common courses (b) degree specific courses, in numeric order of the last three digits of the course code.

For each course, the first line contains; Course Code and Credits (C) of the course. This is followed by the course objectives, syllabus (Unit I to IV), Text book and reference books.

6.1 Syllabi of Common Courses in all B.Sc. (Hons.) Programme

BSEL 101 COMMUNICATION SKILLS (Credits-4)

Course Objectives:

The purpose of this course is to understand the basics of Grammar to improve written and oral communication and to speak correct form of English with proficiency in which will improve students' personality and enhance their self-confidence

UNIT I

Introduction to Communication: Meaning, Forms & Types of Communication; Process of Communication; Principles of Effective Communication/7Cs, Barriers in Communication; Literature: A Bird Came Down the Walk by Emily Dickinson

UNIT II

Essentials of Grammar: Parts of Speech: Noun, Pronoun, Adjective, Verb, Adverb, Preposition, Conjunction, Interjection; Using tenses; Articles; Types of sentences; Reported Speech; Punctuation; Literature: Stopping by Woods on A Snowy Evening by Robert Frost

UNIT III

Building Vocabulary: Word Formation (by adding suffixes and prefixes); Common Errors; Words Often Confused; One word substitution, Homonyms and Homophones; Antonyms &Synonyms, Phrasal Verbs, Idioms & Proverbs (25 each); Commonly used foreign words(15 in number); Literature: The Last Leaf by O'Henry

UNIT IV

Personality Development: Etiquette & Manners; Leadership; Inter & intra personal skills; Attitude, Self-esteem & Self-reliance; Public Speaking; Body Language: Posture, Gesture, Eye Contact, Facial Expressions; Presentation Skills/ Techniques; Literature: My Prayer to Thee by

Rabindranath Tagore;

TEXT BOOK:

1. Kumar, Sanjay and Pushplata.Communication Skills.Oxford University Press.

REFERENCE BOOKS / SITES:

1. Tickoo, M.L, Subramanian A. E. and Subramaniam P.R. Intermediate Grammar, Usage and Composition. Orient Blackswan.
2. Mitra, Barun K. Personality Development and Soft Skills. Oxford University Press.
3. "Best Poems", http://100.best-poems.net/. 20 July 2016.
4. "Classic English Short Stories" ,http://www.eastoftheweb.com/short-stories/Collections/ ClasEngl.shtml, 20 July 2016.

BSCS113 INTRODUCTION TO COMPUTERS AND PROGRAMMING (Credits-3)

Course Objectives:

The objective of the course module is to

- Introduce basics of Computers and its architecture.
- Understand the concepts of Programming using C.

UNIT-I

Introduction to Computer and Programming: Overview of Computer organization and historical perspective computer applications in various fields of science and management. Data representation: Number systems, character representation codes, binary, hex, octal codes and their inter conversions, ASCII, EBCDIC, gray code Binary arithmetic, floating-point arithmetic, signed and unsigned numbers. Concept of algorithms, flow charts, data flow diagrams etc., Concepts of the finite storage, bits bytes, kilo, mega and gigabytes; Concepts of character representation.

UNIT-II

Programming using C: Example of some simple C program. Concept of variables, program statements and function calls from the library (print for example) C data types, int, char, float etc., C expressions, arithmetic operation, relational and logic operations, C assignment statements, extension of assignment of the operations. C primitive input output using getchar and putchar, exposure to the scan and print functions, C Statements, conditional executing using if, else. Optionally switch and break statements may be mentioned.

UNIT-III

Iterations and Sub programs: Concept of loops, example of loops in C using for, while and do
-while. Optionally continue may be mentioned.
One dimensional arrays and example of iterative programs using arrays: 2-d arrays, use in matrix computations; Concept of Sub-programming, functions Example of functions; Argument passing mainly for the simple variables.

UNIT-IV

Digital: Binary representation of decimal number, Octal and Hexadecimal representation, BCD, Signed and Unsigned representation, One's and two's complement, Boolean Algebra, De- Morgan's Law, Logic Gates etc. TEXT BOOKS

1. Y. Kanetkar, Let us C, BPB Publications.

REFERENCE BOOKS:

1. Herbert Scheldt, C: The complete reference, Osbourne McGraw Hill.
2. Rajaraman, Fundamentals of Computers, Prentice Hall of India.
3. Morris Mano, Digital Design, Pearson's publications.
4. Kernighan & Ritchie, C Programming Language, the (ANSI C Version), Prentice Hall of
   India.
5. J. B. Dixit, Fundamental of Computers and Programming in C, Laxmi Publications, New
   Delhi.

BSCS131 INTRODUCTION TO COMPUTERS & IT, OFFICE AUTOMATION (Credits 4)

Course Objective: The objective of the course module is to

- Introduce basics of Computers and its architecture.
- Understand the concepts of Programming using C.

UNIT I

Introduction to Computer and Programming: Overview of Computer organization and historical perspective computer applications in various fields of science and management. Data representation: Number systems, character representation codes, Binary, hex, octal codes and their inter conversions, ASCII, EBCDIC, Gray code Binary arithmetic, Floating-point arithmetic, signed and unsigned numbers. Concept of algorithms, Flow Charts, Data Flow diagrams etc.,

Concepts of the finite storage, bits bytes, kilo, mega and gigabytes. Concepts of character representation.

UNIT II

Programming using C: Example of some simple C program. Concept of variables, program statements and function calls from the library (print for example) C data types, int, char, float etc., C expressions, arithmetic operation, relational and logic operations, C assignment statements, extension of assignment of the operations. C primitive input output using getchar and putchar, exposure to the scan and print functions, C Statements, conditional executing using if, else. Optionally switch and break statements may be mentioned.

UNIT III

Iterations and Subprograms: Concept of loops, example of loops in C using for, while and do-while. Optionally continue may be mentioned.

One dimensional arrays and example of iterative programs using arrays, 2-d arrays Use in matrix computations. Concept of Sub-programming, functions Example of functions. Argument passing mainly for the simple variables.

UNIT IV

Digital : Binary representation of decimal number, Octal and Hexadecimal representation, BCD, Signed and Unsigned representation, One's and two's complement, Boolean Algebra, De-Morgan;s Law, Logic Gates etc.

TEXT BOOKS:

1. Yashwant Kanetkar, "Let us C", BPB Publications.
2. Herbert Schildt, "C: The complete reference", Osbourne Mcgraw Hill.
3. Rajaraman, "Fundamentals of Computers", Prentice Hall of India.
4. Morris Mano, Digital Design, Pearson's publications.

REFERENCE BOOKS:

1. Kernighan & Ritchie, "C Programming Language", the (ANSI C Version), Printice Hall of India.
2. J. B. Dixit, Fundamental of Computers and Programming in C, Laxmi Publications, New Delhi.

BSCH 125 ENVIRONMENTAL STUDIES (Credits-3)

Course Objectives:

This course in environmental studies will develop the

- Basic understanding about the concept related to environment such as eco system and biodiversity.
- Understanding about pollution and its control.
- Insight about the various concerns regarding environment such as population and social issues.

UNIT-I

Introduction of Environmental Studies: Multidisciplinary nature of environmental studies; Scope and importance; Concept of sustainability and sustainable development.

Natural Resources: Renewable and Non-renewable Resources

Land resources: land use change; Land degradation, soil erosion and desertification.

Deforestation: Causes and impacts due to mining, dam building on environment, forests, biodiversity and tribal populations.

Water: Use and over-exploitation of surface and ground water, floods, droughts, conflicts over water (international & inter-state).

Energy resources: Renewable and non- renewable energy sources, use of alternate energy sources, growing energy needs, case studies.

UNIT-II

Ecosystems: Definition and Structure and function of ecosystem; Energy flow in an ecosystem: food chains, food webs and ecological succession.
Case studies of the following ecosystems:

a) Forest ecosystem
b) Grassland ecosystem
c) Desert ecosystem
d) Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries)

Biological Diversity: Levels of biological diversity; genetic, species and ecosystem diversity; Biogeographic zones of India; Biodiversity patterns and global biodiversity hot spots; India as a mega-biodiversity nation; Endangered and endemic species of India; Threats to biodiversity: Habitat loss, poaching of wildlife, man-wildlife conflicts, biological invasions; Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity; Ecosystem and biodiversity services: Ecological, economic, social, ethical, aesthetic and Informational value.

UNIT-III

Environmental Pollution: Types, causes, effects and controls; Air, water, soil and noise pollution. Nuclear hazards and human health risks; Solid waste management: Control measures of urban and industrial waste; Pollution case studies.

Environmental Policies and Practices: Climate change, global warming, ozone layer depletion,
acid rain and impacts on human communities and agriculture.

Environment Laws: Environment Protection Act; Air (Prevention & Control of Pollution) Act; Water (Prevention and control of Pollution) Act; Wildlife Protection

Act; Forest Conservation Act; Nature reserves, tribal populations and rights, and human wildlife conflicts in Indian context. International agreements: Montreal &Koyoto protocol and convention on biological diversity. Nature reserves, tribal population and rights, human wild life conflicts in Indian context.

UNIT-IV

Human Communities and the Environment: Human population growth: Impacts on environment, human health and welfare; Resettlement and rehabilitation of project affected persons; case studies; Disaster management: floods, earthquake, cyclones and landslides; Environmental movements: Chipko, Silent valley, Bishnois of Rajasthan; Environmental ethics: Role of Indian and other religions and cultures in environmental conservation; Environmental communication and public awareness, case studies (e.g., CNG vehicles in Delhi).

Field work:

Visit to an area to document environmental assets: river/ forest/ flora/fauna,
etc. Visit to a local polluted site-Urban/Rural/Industrial/Agricultural.
Study of common plants, insects, birds and basic principles of identification.
Study of simple ecosystems-pond, river, Delhi Ridge, etc.

TEXT BOOKS:

- ErachBharucha, Textbook of Environmental Studies, Universities Press (P) Ltd., Hyderabad, India
- Anubha Kaushik and C. P. Kaushik, Environmental Studies, New Age International,

New
Delhi.

REFERENCE BOOKS:

1. A.K. De, Environmental Chemistry, New Age International, New Delhi.
2. P. H. Raven, D. M. Hassenzahl & L. R. Berg, Environment, John Wiley & Sons, New Delhi.
3. J. S. Singh, S. P. Singh and S. R. Gupta, Ecology, Environmental Science and Conservation, S. Chand Publication, New Delhi.

BSCS 157 C PROGRAMMING LAB (Credits-1)

List of Experiments

1. Write a program to find the largest number out of five numbers (ternary operator)
2. Write a program to find roots of quadratic equation using functions.
3. Write a C program to check whether a given year is leap year or not.
4. Write a C program to check whether a given number is prime or not, also check whether it is divisible by a number k or not.
5. Write a C program to take marks of a student as input and print the his/her grade bases on following criteria using if —else statements

   Marks <40 Fail
   40<= Marks <59 Good
   59 <= Marks < 80 Excellent 80 <=
   Marks Outstanding
6. Perform experiment 7 using switch case statement.
7. Write a C program to concatenate two strings.
8. Write a program using arrays to find the largest and second largest number out of given 10 numbers using bubble sort.
9. Write a program to multiply two matrices
10. Write a program to reverse a string.
11. Write a program to concatenate two strings
12. Write a program to calculate the length of the string.
13. Write a program to find factorial of a number using function.

Note: - Any 10 experiments will be performed.

BSEL 171 COMMUNICATION SKILLS LAB (Credits-1)

Course Objectives:

The Communication Skills Lab focuses on communication activities in functional and situational contexts. It encourages students to speak with fluency and accuracy as well as

to enhance the four language skills of reading, writing, listening and speaking through real life and professional situations.

In each practical class student should spend

- 5 to 10 minutes on effective browsing of online News paper
- 5 to 10 minutes on English Language software activities

Each student must actively complete the following ten activities in practical classes, and the Lab Record with the teacher's signature and the internal marks should be submitted to the External Expert during Viva.

Activity 1: Self - introduction: Informal introduction & formal introduction; A detailed write up on formal 'Self Introduction'; Formal Introduction of oneself in front of the group.

Activity 2 : News Reading: Introduction to 'online News papers'; Browsing and selecting the preferred News paper; Browsing through the News Headlines; Selecting interested News items; Comprehending the content, writing down the essence and reading the News in front of the Group. Discuss 5 to 8 new words or terms, 4 to 5 important personalities of that day's news etc.

Activity 3: a. JAM: Introduction to 'Just A Minute speech' and the 'Extempore speech'; Preparation of speech on given topic(different topic for each student); delivery of the speech; Feed back(on content, time management, body language etc. highlighting the positive aspects first.)

b. Listening Comprehension: Listen to online / downloaded oration by renowned Orators; write down the content in a precise form and give an oral presentation of that write up following all the etiquettes of public speaking.

Activity 4: a. Turn Coat: Speaking for and against by the same person with time specification; assign topics from the immediate surroundings; write down the contenteitherfrom the Net or from personal knowledge; prepare well and deliver; feedback & suggestions for improvement.

b. News Discussions: Selecting News of the day, Discussing among the group, prepare the news content and prepare the group opinion about the issue and present it in front of the class by the group involving each member; select 5 new words & new usages from the selected news item

Activity 5: Conversation ability: Characteristics of effective conversation; Listening to a few sample conversations; preparing conversation based on the given situation; enacting the situation through effective delivery of the script; feedback & suggestions for improvement.

Activity 6: Role Play: Characteristics of Role Play; assigning roles; developing the content to
deliver; enacting the role with effective delivery; feedback & suggestions for improvement.

Activity 7: Public Speaking: Characteristics of effective Public speaking; possible barriers; watching demo online; topic assignment, information gathering & recording; delivery in front of the class; feedback & suggestions for improvement.(Different topic for each student)

Activity 8: Group Discussion: Importance and characteristics; Dos & Don'ts in GD; Demo display; assign topic for the group, Preparation & performance; feedback & suggestions for improvement.

Activity 9: Debate: Difference between Group Discussion & Debating; Watching demo of Debating; Topic for the group of 2 or 4; preparation and performance; feedback & suggestions for improvement.

Activity 10: Interview: Importance & purpose of Job Interview; Interview etiquettes; Watch demo interview; Appear for formal mock interview; feedback & suggestions for improvement.

TEXT BOOK:

1. Kumar, Sanjay and Pushplata.CommunicationSkills.Oxford University Press.

REFERENCE BOOKS:

1. Mitra, Barun K. Personality Development and Soft Skills. Oxford University Press.
2. Raman Meenakshi& Sharma, Sangeetha. Technical Communication Principles and Practices, 2nd Ed. Oxford University Press, New Dehi, 2011.

BSMA 131 DATA PRESENTATION FOR SCIENCES (Credits-1)

Using Excel, create documents that highlight:

1) Scaling in size. Rounding numbers.
2) Graphing simple data. Bar graphs (2D and 3D). Pie Charts.
3) Absolute and Relative references. Effects on data visualizations when references aren't properly used.
4) Using Functions. SUM, AVERAGE, MEDIAN, SQRT, and other simple one variable functions.
5) Using Conditional statements. IF, AND, OR.
6) Creating Scatterplots. Showing correlation and regression for two variables, and higher number of variables.
7) Using Filters. Pivot tables. Freezing panes.
8) Linking sheets using VLOOKUP and HLOOKUP.

Using PowerPoint, create presentations that highlight:

9) Standard format, font, transitions (illustrating negatives of too many variations). Using Presenter view in Powerpoint. Multiple notes to be displayed.
10) Embedding a functioning Excel sheet into a PowerPoint slide.
11) Embedding your own videos, videos from the internet (such as from YouTube), and embedding GIFs.
12) Mathematics Formulae in PowerPoint.
13) Creating personalized templates.
14) Animations and creating animated GIFS using PowerPoint.

BSEL217 Personality Development and Communication Skills (Credits 3)

Course Objective: The objective of this course is to:

- Include intensive reading, writing, and some listening practices.
- Understanding long sentences, understanding main idea and also the gist and details of a reading text.

UNIT I

Remedial Grammar: Errors of Accidence and syntax with reference to parts of speech; Confusion of adjectives and adverbs; Agreement of subject and verb; Simple, Complex and Compound Sentences; Question tags and short responses; Sentence Errors

UNIT II

Vocabulary and Usage: One word substitution; Indianism; Redundant words; Jumbled Sentences; Idiomatic Expressions

UNIT III

Reading Skills: Speed Reading: Skimming and Scanning; Reading at various speeds (slow, fast, very fast); Reading different kinds of text for different purposes (e.g. for relaxation, for information, for discussion at a later stage, etc.); Reading between the lines; Overcoming common obstacles; Comprehension of unseen passages

UNIT IV

Selected Short Stories and Poems

1. *The Chimney Sweeper* by William Blake
2. *Mending Wall* by Robert Frost
3. *Of Death* by Francis Bacon
4. *The Diamond Necklace* by Guy De Maupassant
5. *The Grief* by Anton Chekhov

TEXT BOOK:

Kumar, Sanjay and Pushplata; *Communication Skills*; Oxford University Press.

REFERENCES:

1. Sinha, *K.K; Business Communication*; Galgotia Publishers.
2. Tickoo, A. E. Subramanian and P.R. Subramaniam; *Intermediate Grammar*; Usage and Composition, Orient Blackswan.

6.2 Syllabi of Common Courses in B.Sc. (Hons.) Chemistry and Mathematics

BSPH120 PHYSICS-I (Credits-4)

Course Objectives:

The objective of the course module is to

- Introduce basics of particle dynamics
- Understand the concepts of wave optics

UNIT-I

Mathematical Physics: Scalar and vector products, polar and axial vectors, triple and quadruple products. Scalar and vector fields, differentiation of a vector, gradient, divergence, curl and operations and their meaning, idea of line, surface and volume integrals, Gauss and Stokes 'theorem.

UNIT-II

Classical Mechanics: Particle dynamics: Newton's laws of motion, conservation of linear momentum, centre of mass, conservative forces, work energy theorem, particle collision.

Oscillations: Linearity and superposition principle, free oscillation with one and two degrees of freedom, simple pendulum, combination of two simple harmonic motions.

UNIT-III

Wave Optics: Interference, division of amplitudes, Young's double split, Fresnel's biprism, interference in thin films and wedged shaped films, Newton's Rings, Michelson's interferometer.

UNIT-IV

Diffraction: Fresnel &Fraunhofer diffraction: Diffraction at a single slit and N slits, resolving power of a telescope, resolving and dispersive power of a plane diffraction grating.

Polarization: Polarization by reflection and refraction, Brewster's law, double refraction, nicol prism, quarter and half-wave plates, Production and analysis of circularly and elliptically polarized light.

TEXT BOOK:

1. M. N. Avadhanulu & P. G. Kshirsagar, A Text Book of Engg. physics, S. Chand.

REFERENCE BOOKS:

1. H. K. Dass & R. Verma, Higher Mathematical Physics, S. Chand.
2. D. S. Mathur, Mechanics, S. Chand.
3. M. R. Spiegel, Vector Analysis Schaum's Outline Series. McGraw-Hill Book Co. Singapore.
4. Beiser, Concepts of Modern Physics McGraw-Hill Education, New Delhi.
5. R. Resnick, D. Halliday& K.S. Krane, Physics Vol. I and II, John Wiley & Sons, New York, USA.
6. R. A. Serway& J. W. Jewett, Physics for Scientists and Engineers, Boston, USA.
7. S. L. Gupta, Engg. Physics, DhanpatRai Publications, Delhi.

BSPH 158 PHYSICS —I LAB (Credits-1)

List of Experiments

1. To plot a graph between the distance of the knife edge from the centre of gravity and the time period of the bar pendulum. From the graph, find the acceleration due to gravity, the radius of gyration and the moment of inertia of the bar about an axis.
2. To determine the moment of inertia of a flywheel about its own axis of motion.
3. To determine the value of acceleration due to gravity using Kater's pendulum.
4. To determine the frequency of A.C. mains with sonometer using non-magnetic wire.
5. To determine the frequency of electrically maintained turning fork by Melde's method.
6. To determine the wavelength of sodium light using Newton's ring apparatus.
7. To determine the wavelength of prominent lines of mercury by plane diffraction grating.
8. To determine the refractive index of the material of the prism for the given colors (wavelengths) of mercury light with the help of spectrometer.
9. To determine the specific rotation of cane sugar solution with the help of half shade polarimeter.
10. To determine the wavelength of He-Ne LASER using transmission diffraction grating. (Note: A candidate has to perform at least eight experiments in the lab. Any suitable
experiment may be added.)

TEXT BOOK:

1. C. L. Arora, B. Sc. Practical Physics, S Chand and Co. Ltd., New Delhi.

6.3 Syllabi of Common Courses in B.Sc. (Hons.) Physics and Mathematics

BSCH 120 CHEMISTRY-I (Credits-4)

Course Objective: Study of the topics included in this course will enable the students to

- Appreciate the developments in the field of chemical bonding.
- Learn structure and shapes of various mononuclear and heteronuclear molecules.
- Understand basic concepts involved in organic reactions.
- Appreciate the concept of geometric and optical isomerism.

UNIT I

Covalent Bonding: Qualitative approach to Valence Bond Theory and its Limitations. Hybridization, Equivalent and Non-equivalent Hybrid Orbitals, Bent's Rule and Applications.

Weak Chemical Forces: Van-der-Waals Forces, Hydrogen Bonding. Effects of Chemical Forces on M.P., B.P., and Solubility. Energetics of Dissolution Process. Molecular Orbital Theory: Symmetry and Overlap. Molecular Orbital Diagrams of diatomic and simple polyatomic systems (O_2, CO, NO and their ions; HCl BeF , CH , CO) (Idea of Sp^3 Mixing and Orbital Interaction to be given).

2 4 2

UNIT II

Reaction Mechanism in Organic Chemistry: Electronic Displacements in Organic Molecules. Aromaticity. Reactivity of Organic Molecules. Heterolytic and Hemolytic Fission. Nucleophiles, Electrophiles, Acids and Bases and their Relative Strengths (including Carbon Acids). Addition, Elimination and Substitution Reactions (including Electrophilic, Nucleophilic and Aromatic Types). Arynes and Carbenes as Reaction Intermediates.

UNIT III

Stereochemistry of organic compounds: Bonding in Organic Molecules and its effects on Shape Chirality and RS Nomenclature as applied to Chiral Centers. Treatment of Chirality upto three chiral centers. Conformation of Acyclic and Cyclic Systems, Conformational Analysis of Di- substituted Cyclohexanes. Geometrical Isomerism and E-2 Nomenclature.

UNIT IV

Water Technology: Introduction and characteristics of water; Hardness and its determination (EDTA method only); Alkalinity and its determination; Boiler feed water; Boiler problems - scale, sludge, priming & foaming, their causes & prevention; Caustic embrittlement& corrosion -Causes & prevention; Removal of silica & dissolved gases; Water softening processes : Lime - soda process, Ion exchange method, carbonate & phosphate conditioning, colloidal conditioning & calgon treatment; Water for domestic use.

TEXT BOOKS:

1. Sunita Ratan, A textbook of Engineering Chemistry, S. Chand and Co. Ltd., New Delhi.

REFERENCE BOOKS:

1. A. Bahl and B. S. Bahl, Advanced Organic Chemistry, S. Chand and Co. Ltd., New Delhi.
2. W. U. Malik, R. D. Madan, G. D. Tuli, Selected Topics in Inorganic Chemistry, S. Chand and Co. Pvt. Ltd., New Delhi.
3. J. D. Lee, Concise Inorganic Chemistry, ELBS with Chapman and Hall Ltd, London.

BSCH 154 CHEMISTRY LAB-I (Credits-1)

List of Experiments

1. Preparation of Urea-formaldehyde and phenol formaldehyde resins.
2. Determination of saponification number of oil.
3. Preparation of Aspirin, Urea-Oxalate, m-dinitrobanzene, and Oxalic acid.
4. Determination of melting and boiling points of unknown compounds.
5. Nitration of one of the following compounds: Nitrobanzene, Chlorobanzene, Bromobanzene.
6. Separation of Cations and Anions by Paper Chromatography
7. Preparation of Tetrammine copper (II) Sulfate.
8. Preparation of ALuminium Potassium sulphate (Potash alum) or Chrome alum.
9. Determination of the amount of Oxalic acid and Sulphuric acid in a given sample

using N/10 NaOH and N/10 $KMnO_4$ solution.

10. Conductometric Titration of a solution of HCl or CH_3COOH with NaOH by a direct reading
    Conductometer.
11. Determination of strength of given solution of $AgNO_3$ by using N/20 NaCl solution and
    K2CrO4 as an indicator (Mohr's Method).
12. To find out the strength of strong or weak acid conductometrically.

    (Note: A candidate has to perform at least eight experiments in the lab. Any suitable experiment may be added.)

REFERENCE BOOKS:

1. O. P Pandey, D. N Bajpai and S. Giri, Practical chemistry, S. Chand & Company Pvt. Ltd., New Delhi.
2. F. G. Mann and P. C. Saunders, Practical organic chemistry, Green and Co. Ltd. New Delhi.
3. A. I. Vogel, Text-Book of Practical Organic Chemistry, Prentice Hall, New Jersey.
4. A. I. Vogel, Qualitative Inorganic Analysis, Prentice Hall, New Jersey.

6.4 Syllabi of Courses specific to B.Sc. (Hons.) Mathematics

BSMA 137 ALGEBRA (Credits-4)

Course Objectives:

The objective of the course module is to

- Introduce basic concepts of matrices.
- Nature of roots by inspection of change of sign of equations.

UNIT- I

Symmetric; Skew-symmetric; Hermitian and skew Hermitian matrices; Elementary Operations on matrices; Rank of a matrices; Inverse of a matrix; Linear dependence and independence of rows and columns of matrices; Row rank and column rank of a matrix; Eigenvalues, eigenvectors and the characteristic equation of a matrix; Minimal polynomial of a matrix; Cayley Hamilton theorem and its use in finding the inverse of a matrix.

UNIT -II

Applications of matrices to a system of linear (both homogeneous and non–homogeneous) equations; Theorems on consistency of a system of linear equations; unitary and Orthogonal Matrices; Bilinear and Quadratic forms

UNIT- III

Relations between the roots and coefficients of general polynomial equation in one variable; Solutions of polynomial equations having conditions on roots; Common roots and multiple roots; Transformation of equations

UNIT-IV

Nature of the roots of an equation; Descarte's rule of signs; Solutions of cubic equations (Cardon's method); Biquadratic equations and theirsolutions

TEXT BOOK:

1. C. Prasad, Text Book on Algebra and Theory of Equations. Pothishala Private Ltd., Allahabad.

REFERENCE BOOKS:

1. T. Andreescu and DorinAndrica, Complex Numbers from A to Z, Birkhauser.
2. E.J. Barbeau, Polynomials, Springer Verlag.
3. David C. Lay, Linear Algebra and its Applications, Pearson Education.
4. H.S. Hall and S.R. Knight, Higher Algebra, H.M. Publications, New Delhi.
5. Shanti Narayan, A TEXT BOOK of Matrices, S. Chand, New Delhi.

BSMA 133 CALCULUS (Credits-4)

Course Objectives:

Study of the topics of the course will enable the students to

- Build knowledge about the basics of geometry and its applications.
- Tracing of a curve.

UNIT- I

Definition of the limit of a function; Basic properties of limits; Continuous functions and classification of discontinuities; Differentiability; Successive differentiation; Leibnitz theorem; Maclaurin and Taylor series expansions.

UNIT- II

Asymptotes in Cartesian coordinates; intersection of curve and its asymptotes; asymptotes in polar coordinates; Curvature, radius of curvature for Cartesian curves, parametric curves, polar curves; Newton's method; Radius of curvature for pedal curves; Tangential polar equations. Centre of curvature. Circle of curvature. Chord of curvature; evolutes; Tests for concavity and convexity; Points of inflexion; Multiple points; Cusps, nodes & conjugate points; Type of cusps.

UNIT - III

Tracing of curves in Cartesian, parametric and polar co-ordinates; Reduction formulae; Rectification; intrinsic equations of curve.

UNIT-IV

Quardrature (area) Sectorial area; Area bounded by closed curves. Volumes and surfaces of solids of revolution.

TEXT BOOKS:

1. Shanti Narayan, Differential Calculus, S. Chand & Co., New Delhi.
2. Shanti Narayan, Integral Calculus, S. Chand & Co., New Delhi.

REFERENCE BOOKS:

1. Murray R. Spiegel, Theory and Problems of Advanced Calculus, Schaun'sOutline series. Schaum Publishing Co., New York.
2. N. Piskunov, Differential and integral Calculus, Peace Publishers, Moscow.
3. Gorakh Prasad, Differential Calculus, Pothishasla Pvt. Ltd., Allahabad.
4. Gorakh Prasad, Integral Calculus, Pothishala Pvt. Ltd., Allahabad.

BSMA 135 VECTOR CALCULUS (Credits-4)

Course Objectives:

Study of the topics of the course will enable the students to

- Build knowledge about vectors and scalars.
- Physical significance of gradient, divergence and curl.

UNIT - I

Scalar and vector product of three vectors; Product of four vectors; Reciprocal vectors, Vector differentiation; Scalar Valued point functions, vector valued point functions, derivative along a curve, directional derivatives.

UNIT- II

Gradient of a scalar point function: geometrical interpretation of grad, character of gradient as a point function; Divergence and curl of vector point function; characters of Div f and Curl f as point function, examples; Gradient, divergence and curl of sums and product and their related vector identities; Laplacian operator.

UNIT- III

Orthogonal curvilinear coordinates: Conditions for orthogonality fundamental triad of mutually orthogonal unit vectors; Gradient, Divergence, Curl and Laplacian operators in terms of orthogonal curvilinear coordinates; cylindrical co-ordinates and Spherical coordinates.

UNIT-IV

Vector integration: Line integral, Surface integral, Volume integral; Theorems of Gauss,Green&Stokesandproblemsbasedonthesetheorems.

TEXT BOOK:

1. Shanti Narayna, A Text Book of Vector Calculus. S. Chand & Co., New Delhi

REFERENCE BOOKS:

1. Murrary R. Spiegal, Theory and Problems of Advanced Calculus, Schaum Publishing Company, New York.
2. Murrary R. Spiegal , Vector Analysis, Schaum Publishing Company, New York.
3. N. Saran and S.N. Nigam, Introduction to Vector Analysis, Pothishala Pvt. Ltd., Allahabad.

BSMC 119 MATHEMATICAL FINANCE (Credits-4)

Course Objectives:

Study of the topics of the course will enable the students to

- Provide active and practical use of mathematics, which includes interrelated financial topics.
- Provide an experience of formulating finance problems into computational problems.
- Provide an illustration of the role of optimization in computational finance such as single and multi-period mean-variance portfolio management.

UNIT- I

Nature, process and scope of financial assets investment decisions. Structure of Indian Securities market-An overview; Comparison, arbitrage and risk aversion, Interest (simple and compound).

UNIT -II

Time value of money, Inflation, net present value, internal rate of return, comparison of NPV and IRR Bonds, bond prices and yields, Macaulay and modified duration, term structure of interest rate, explanations of term structure, immunization, convexity, putable and callable bonds.

UNIT- III

Asset return, portfolio return (brief introduction to expectation, variance, covariance and correlation), Random returns, Portfolio mean return and variance, diversification.

UNIT- IV

Capital Asset Pricing Model (CAPM), betas of stocks and Portfolios security market line, Capital market line, Financial Derivatives:An introduction.

TEXT BOOKS:

1. John C. Hull, Options, Futures and Other Derivatives, Prentice-Hall, India.
2. Z. Bodie, A. Kane, Marcus, Mohanty, Investments, McGraw Hill Education (India) Private Limited.
3. S. Ross, An Elementary Introduction to Mathematical Finance, Cambridge University Press, USA.

REFERENCE BOOKS:

1. David G. Luenberger, Investment Science, Oxford University Press, Delhi.
2. Fischer Donald E. and Ronald J. Jordan, Security Analysis and Portfolio Management, Prentice Hall of India.
3. Frank K. Reilly, and Keith C. Brown, Investment Analysis and Portfolio Management, Thomson.
4. S. Roman, Introduction to the Mathematics of Finance (Springer, New York).

BSMA 132 MODERN ALGEBRA (Credits-4)

Course Objectives:

The objective of the course module is to

- Introduce basic concepts of algebraic structures.
- Concepts of cyclic groups and its application in Number Theory.

UNIT- I

Definition of a group with example and simple properties of groups, Subgroups and Subgroups criteria, Generation of groups, cyclic groups, Cosets, Left and right cosets, Index of a sub-group, Coset decomposition, Largrage's theorem and its consequences, Normal subgroups, Quotient Groups.

UNIT-II

Homomorphisms, isomophisms, automorphisms and inner automorphisms of a group. Automorphisms of cyclic groups, Permutations groups. Even and odd permutations, Alternating groups, Cayley's theorem, Center of a group and derived group of a group.

UNIT-III

Introduction to rings, subrings, integral domains and fields, Characteristics of a ring. Ring homomorphisms, ideals (principle, prime and Maximal) and Quotient rings, Field of quotients of an integral domain.

UNIT - IV

Euclidean rings, Polynomial rings, Polynomials over the rational field, The Eisentein's criterion, Polynomial rings, over commutative rings, Unique factorization domain, R unique factorization domain implies so is R[X1, X2. Xn].

TEXT BOOK:

1. N. Herstein, Topics in Algebra, Wiley Eastern Ltd. New Delhi.
2. A. R. Vashishta, Modern Algebra, Krishna prakashan, New Delhi.

REFERENCE BOOKS:

1. S. Singh, Modern Algebra, Vikas Publishing House, India.
2. Joseph A. Gallian, Contemporary Abstract Algebra, Narosa Publishing House, New Delhi.

BSMA 134 ORDINARY DIFFERENTIAL EQUATIONS (Credits-4)

Course Objectives:

Study of the topics of the course will enable the students to

- Solve Ordinary Differential Equations.
- Some applications of Ordinary Differential Equations.

UNIT- I

Geometrical meaning of a differential equation; exact differential equations, integrating factors; First order higher degree equations solvable for x,y,p Lagrange's equations, Clairaut's equations; Equationreducible to Clairaut's form; Singular solutions.

UNIT -II

Orthogonal trajectories in Cartesian coordinates and polar coordinates, Self orthogonal family of curves, Linear differential equations with constant coefficients, Homogeneous linear ordinary differential equations, Equations reducible to homogeneous.

UNIT- III

Linear differential equations of second order: Reduction to normal form; Transformation of the equation by changing the dependent variables and the independent variables; Solution by operators of non-homogeneous linear differential equations; Reduction of order of a differential equation; Method of variations of parameters; Method of undetermined coefficients.

UNIT- IV

Ordinary simultaneous differential equations, Solution of simultaneous differential equations involving operators x(d/dx) or t(d/dt) etc. Simultaneous equation of the formdx/P=dy/Q=dz/R.Totaldifferentialequations.Conditionfor Pdx + Qdy +Rdz= 0 to be exact. General method of solving Pdx + Qdy + Rdz = 0 by taking one variable con- stant; Method of auxiliary equations

TEXT BOOK:

1. M.D. Raisinghania, Ordinary And Partial Differential Equations, S. Chand & Co., New Delhi.

REFERENCE BOOKS:

1. D. A. Murray, Introductory Course in Differential Equations, Orient Longaman (India).
2. A. R. Forsyth, A Treatise on Differential Equations, Machmillan and Co. Ltd.London.
3. E. A. Codington, Introduction to Differential Equations, McGraw Hills, New York.
4. S. L. Ross, Differential Equations, John Wiley & Sons.
5. B. Rai& D.P. Chaudhary, Ordinary Differential Equations, Narosa Publishing House Pvt. Ltd.

BSMA 136 SOLID GEOMETERY (Credits-4)

Course Objectives:

Study of the topics of the course will enable the students to

- Understand the basic concepts of three dimensional geometry.
- Developing critical thinking skills as they relate to logical reasoning and argument.

UNIT -I

General equation of second degree: Tracing of conics, Tangent at any point to the conic, chord of contact, pole of line to the conic, director circle of conic; System of conics; Confocal conics; Polar equation of a conic, tangent and normal to the conic.

UNIT -II

Sphere: Plane section of a sphere; Sphere through a given circle; Intersection of two spheres, radical plane of two spheres; Co-axel system of spheres Cones; Right circular cone, enveloping cone and reciprocal cone. Cylinder: Right circular cylinder and enveloping cylinder.

UNIT- III

Central Conicoids: Equation of tangent plane; Director sphere; Normal to the conicoids; Polar plane of a point; Enveloping cone of a conicoid; Enveloping cylinder of a conicoid.

UNIT-IV

UParaboloids: Circular section; Plane sections of conicoids; generating lines; confocalconicoid.Reductionofseconddegreeequations

TEXT BOOK:

1. Shanti Narayan, Analytical Solid Geometry, S.Chand, New Delhi.

REFERENCE BOOKS:

1. R. J. T. Bill, Elementary Treatise on Coordinate Geometry of Three Dimensions, MacMillan India Ltd.
2. P. K. Jain and Khalil Ahmad: A Textbook of Analytical Geometry of Three Dimensions, Wiley Eastern Ltd.

Semester - III

BSMA217 REAL ANALYSIS (Credits 4)

Course Objective: The objective of the course module is to

- Provide a brief knowledge of Real Analysis.
- The students will learn about the boundedness, sequence and series.

UNIT I

Review of Algebraic and Order Properties of R, ε-neighborhood of a point in R, Idea ofcountable sets, uncountable sets and uncountability of R. Bounded above sets, Bounded belowsets, Bounded Sets, Unbounded sets, Suprema and Infima, The Completeness Property of R, The Archimedean Property, Density of Rational (and Irrational) numbers in R, Intervals. Limit points of a set, Isolated points, Illustrations of Bolzano-Weierstrass theorem for sets.

UNIT II

Sequences, Bounded sequence, Convergent sequence, Limit of a sequence. Limit Theorems, Monotone Sequences, Monotone Convergence Theorem. Subsequences, Divergence Criteria, Monotone Subsequence Theorem (statement only), Bolzano Weierstrass Theorem for Sequences. Cauchy sequence, Cauchy's Convergence Criterion.

UNIT III

Infinite series, convergence and divergence of infinite series, Cauchy Criterion, Tests for convergence: Comparison test, Limit Comparison test, Ratio Test, Cauchy's nth root test, Integral test, Alternating series, Leibniz test, Absolute and Conditional convergence.

UNIT IV

Calculus of a single variable - continuity; attainment of supremum and infimum of a continuous function on a closed bounded interval, uniform continuity. Differentiability of functions. Rolle's theorem and mean value theorem. Higher derivatives, maxima and minima. Taylor's theorem - various forms of remainder, infinite Taylor expansions.

TEXT BOOK:

S.C. Malik and Savita Arora*; Mathematical Analysis;* New Age Science.

REFERENCE BOOKS:

1. R.G. Bartle and D. R. Sherbert; *Introduction to Real Analysis*; John Wiley and Sons Pvt. Ltd.
2. Gerald G. Bilodeau, Paul R. Thie, G.E. Keough; *An Introduction to Analysis*; Jones& Bartlett.
3. Brian S. Thomson, Andrew. M. Bruckner and Judith B. Bruckner; *Elementary Real Analysis*, Prentice Hall.

BSMA219 Partial Differential Equations (Credits 4)

Course Objective: The objective of the course module is to

- Provide a brief knowledge of Partial Differential Equations.
- The students will learn about the linear partial differential equations and calculus of variation.

UNIT I

Partial differential equations: Formation, order and degree, Linear and Non-Linear Partial differential equations of the first order: Complete solution, singular solution, General solution, Solution of Lagrange's linear equations, Charpit's general method of solution. Compatible systems of first order equations, Jacobi's method.

UNIT II

Linear partial differential equations of second and higher orders, Linear and non-linear homogenous and non-homogenous equations with constant co-efficient, Partial differential equation with variable co-efficients reducible to equations with constant coefficients, their complimentary functions and particular Integrals, Equations reducible to linear equations with constant co-efficients.

UNIT III

Classification of linear partial differential equations of second order, Hyperbolic, parabolic and elliptic types, Reduction of second order linear partial differential equations to Canonical (Normal) forms and their solutions, Solution of linear hyperbolic equations, Monge's method for partial differential equations of second order.

UNIT IV

Cauchy's problem for second order partial differential equations, Characteristic equations and characteristic curves of second order partial differential equation, Method of separation of variables: Solution of Laplace's equation, Wave equation (one and two dimensions), Diffusion (Heat) equation (one and two dimension) in Cartesian Coordinate system.

TEXT BOOK:

M.D. Raisinghania; *Ordinary And Partial Differential Equations*; S.Chand, New Delhi.

REFERENCE BOOKS:

1. D.A.Murray; *Introductory Course on Differential Equations;* Orient Longman (India).
2. Erwin Kreyszing; *Advanced Engineering Mathematics;* John Wiley & Sons, Inc., New York.
3. A.R. Forsyth; *A Treatise on Differential Equations;* Macmillan and Co. Ltd.
4. I. N.Sneddon; *Elements of Partial Differential Equations*; McGraw Hill Book Company.

BSMA221 STATICS (Credits 4)

Course Objective: The objective of the course module is to

- Provide a brief knowledge of Statics.
- The students will learn about the application of statics in mathematics.

UNIT I

Composition and resolution of forces. Parallel forces. Moments and Couples.

UNIT II

Analytical conditions of equilibrium of coplanar forces. Friction. Centre of Gravity.

UNIT III

Virtual work. Forces in three dimensions. Poinsots central axis.

UNIT IV

Wrenches. Null lines and planes. Stable and unstable equilibrium.

TEXTBOOK:

S.L. Loney; Statics, Macmillan Company; London.

REFERENCE BOOK:

R.S. Verma; A Text Book on Statics; Pothishala Pvt. Ltd., Allahabad.

BSPH217 PHYSICS-II (Credits 4)

Course objective: The course incorporated in this paper will help students to

- Understand concepts of electricity and magnetism.
- Gain insight about the theory of semiconductors.
- Knowledge about nuclear fission and fusion.

UNIT I

Electricity & Magnetism : Electric field and potential, potential energy, flux, Gauss's law and its applications, electric field in a dielectric, polarization, energy stored in an electric field, Magnetic properties of matter, Langevin's theory of dia and para magnetism, Weiss theory of ferromagnetism.

UNIT II

Electronics : Semiconductors, types of semi-conductors (qualitative), P-N junction diode, energy band diagram, biasing, I-V characteristics, halfwave, fullwave and bridge rectifiers, ripple factor, rectification efficiency, regulated power supply, Zener diode, Light Emitting Diode (LED), solar cell, Bipolar Junction Transistor (BJT), Configurations (CB,CE and CC), Characteristic curves of transistor static and dynamic load line, Transistor as an amplifier, logic gates, DeMorgan`s theorem, AND, OR, NAND, NOR, XOR, XNOR

UNIT III

Atomic Structure : Bohr's model of one electron atom, Wilson –Sommerfeld quantization rules (derivation of Planck's quantization of energy), Bohr's correspondence principle, orbital magnetic dipole moment, Larmor precession, space quantization, Electron spin , vector model of atom-coupling of orbital and spin angular momentum, spectroscopic terms- L-S and j-j coupling, Lande interval rule, selection rules for L-S and j-j coupling.

UNIT IV

Nuclear Physics : The Atomic Nucleus, Nuclear force, Static properties of nucleus-mass, radius, density charge, quantum states, spin and magnetic moments; Nuclear stability, binding energy , Nuclear models- liquid drop model and shell model; Meson theory of nuclear forces, Radioactivity, Half-life , Alfa, beta and gamma decay, nuclear fission and fusion, Nuclear reactors.

Reference Books:

1. Arthur Beiser; *Concepts of Modern Physics*; McGraw-Hill Company Inc.
2. Kenneth Krane; *Modern Physics*; Wiley India.
3. Albert Paul Malvino; *Electronic Principles*; McGraw-Hill School Publishing Company.
4. S.N. Ghoshal; *Nuclear Physics*; S. Chand Limited.

BSCH207 Chemistry-II (Credits-4)

Course Objective: The objective of this course is to:

- introduce basics of inorganic chemistry
- thermos chemistry and their application in engineering science,
- gain in site of phase and polymers

UNIT I

The periodic classification of elements and periodic properties: The relationship between chemical periodicity and electronic structure of the atom; The long form of the periodic table; Trends among representative elements; Atomic volume; Atomic and ionic radii; Periodic trends in atomic and ionic radii; Metallic/non-metallic character; standard electrode potential; Periodic trends in electrode potential; Ionization potential; Electron affinity and electronegativity; Electronegativity scale; Bond energies; Oxidation numbers and oxidation states; Periodicity in oxidation state of valence; Oxidizing or reducing behaviour; Acidic and basic character of oxides.

UNIT II

Fuels: Classification; Calorific value of fuel and its determination; Bomb calorimeter; Boy's Gas calorimeter; Solid fuels- Proximate and ultimate analysis, High & Low temperature carbonization, manufacture of coke (Otto-Hoffmann oven); Liquid Fuels - Petroleum- Chemical composition, fractional distillation, Thermal & catalytic cracking, Octane &Cetane No, and its significance; Power alcohol, Analysis of flue gases (Orsat's apparatus).

UNIT III

Gaseous state and thermo chemistry: Gas laws and kinetic theory of gases; Distribution of molecular velocities; Mean free path; Real gases-non ideal behavior; Causes of deviation from ideal behavior; Vander Waal's equation; liquefaction of gases,
Hess's Law; Heat of Reaction; Heat of dilution; Heat of Hydration; Heat of neutralization and Heat of Combustion; Effect of temperature on heat of reaction at constant pressure (Kirchhoff s equation); Flame Temperature.

UNIT IV

The phase rule and polymers: Definition of various terms, Gibb's Phase rule, Application of phase rule to one component system- The water system and carbon dioxide system, Two component system:Lead-silver,Na_2SO_4-water,

Polymers and its classification: Mechanism of addition and condensation polymers; Coordination polymerization; Synthesis, properties and uses of urea formaldehyde, phenol formaldehyde, poly vinyl acetate and polythene; Conducting and bio-polymers,

REFERENCE BOOKS:

1. J,C, Kuriacose & J, Rajaram ;*Chemistry in Engineering & Technology (Vol I & II*) .
2. Puri B,R,, Sharma L,R, and Pathania, M,S ;Principles of Physical Chemistry; (Latest ed,).
3. S,S, Dara; Text book of Engg, Chemistry; S, Chand & Co.

BSPH257 Physics-II Lab (Credits-1)

List of Experiments

1. To find unknown resistance by using Ohm`s law.
2. To measure high resistance by substitution method.
3. Study of transistor characteristics (CB, CE, CC configurations).
4. To verify experimentally OR, NAND, NOT, NOR, NAND gates.
5. To find the band gap of intrinsic semiconductor using four probe method.
6. To study of V-I characteristics of p-n junction diode.
7. To determine the Hystersis loss of ferromagnetic material using CRO.
8. To study the variation of magnetic field with distance and to find the radius of coils by using Stewart-Gee's apparatus.
9. Measurement of dielectric constant.
10. Study of Charging and discharging of a capacitor.
11. To find the Ionization potential of Xe using thyretron tube.

(Note: A candidate has to perform at least eight experiments in the lab. Anysuitable experiment maybeadded.)

Reference Book:

1. C. L. Arora; *B. Sc. Practical Physic*s; S Chand and Co. Ltd., New Delhi.

BSCH257 Chemistry Lab II (Credits-1)

1. Determine the percentage composition of sodium hydroxide in the given mixture of sodium hydroxide and sodium chloride.
2. Determine the amount of Oxalic acid and Sulphuric acid in one liter of solution, given standard sodium hydroxide and Potassium Permanganate.
3. Determine the amount of copper in the copper ore solution, provided hypo solution.
4. Argent metric titration one each by Vohlard's method and by Mohr's method.
5. Complex metric titrations.
6. Determine the heat of neutralization of strong acid with strong base.
7. Determine the surface tension of a liquid using drop weight method.
8. Determine viscosity of a given liquid (density to be determined).
9. Determine the reaction rate constant for the Ist order reaction.
10. Determine the cell constant of a conductivity cell.
11. Find out strength of given solution of HCl conduct metrically.
12. Preparation of urea formaldehyde and phenol formaldehyde resins.
13. Determination of dissolved oxygen in the given sample of water.
14. Determination of alkalinity in the given sample of water.

REFERENCE BOOKS:

1. O. P Pandey, D. N Bajpai and S. Giri; *Practical chemistry*; S. Chand & Company Pvt. Ltd.
2. F. G. Mann and P. C. Saunders; *Practical organic chemistry*; Green and Co. Ltd.
3. A.I. Vogel; *Text-Book of Practical Organic Chemistry;* Prentice Hall 5th Edition.
4. A.I. Vogel; *Qualitative Inorganic Analysis*; Prentice Hall 7th Edition.

Semester-IV

BSMA218 Special functions and integral transforms (Credits-4)

Course Objective: The objective of this course module is to

- Provide a brief knowledge of special function and integral transform.
- The students will learn about the application of special function and integral transform in mathematics.

UNIT-I

Series solution of differential equations – Power series method, Definitions of Beta and Gamma functions. Bessel equation and its solution: Bessel functions and their properties-Convergence, recurrence, Relations and generating functions, Orthogonality of Bessel functions.

UNIT-II

Legendre and Hermite differentials equations and their solutions: Legendre and Hermite functions and their properties-Recurrence Relations and generating functions. Orthogonality of Legendre and Hermite polynomials. Rodrigues' Formula for Legendre & Hermite Polynomials, Laplace Integral Representation of Legendre polynomial.

UNIT-III

Laplace Transforms – Existence theorem for Laplace transforms, Linearity of the Laplace transforms, Shifting theorems, Laplace transforms of derivatives and integrals, Differentiation and integration of Laplace transforms, Convolution theorem, InverseLaplace transforms, convolution theorem, Inverse Laplace transforms of derivatives andintegrals, solution of ordinary differential equations using Laplace transform.

UNIT-IV

Fourier transforms: Linearity property, Shifting, Modulation, Convolution Theorem, Fourier Transform of Derivatives, Relations between Fourier transform and Laplace transform, Parseval's identity for Fourier transforms, solution ofdifferential Equations using Fourier Transforms.

TEXT BOOK:

Erwin Kreyszing; *Advanced Engineering Mathematics*; John Wiley & Sons, Inc., New York.

REFERENCE BOOKS:

1. A.R. Forsyth; *A Treatise on Differential Equations*; Macmillan and Co. Ltd.
2. I.N. Sneddon*; Special Functions on mathematics*; Physics & Chemistry.
3. I.N. Sneddon; *The use of integral transform*; McGraw Hill.
4. Murray R. Spiegel*; Laplace transform*; Schaum's Series.

BSMA220 Linear Algebra (Credits-4)

Course Objective: The objective of the course module is to

- Provide a brief knowledge of linear algebra.
- The students will learn about the vector spaces, basis and inner product spaces.

UNIT I

Vector spaces, subspaces, algebra of subspaces, quotient spaces, linear combination of vectors, linear span, linear dependence and independence, basis and dimension, dimension of subspaces.

UNIT II

Linear transformations, null space, range, rank and nullity of a linear transformation, matrix representation of a linear transformation, algebra of linear transformations.

UNIT III

Change of basis. Dual spaces, bi dual space and natural isomorphism, Adjoint of Linear Transformation, Eigen values and eigen vectors of LT. Diagonalization, Cayley Hamilton theorem, Annihilator of a subspace, Bilinear, Quadratic and Hermitian forms.

UNIT IV

Inner product spaces, Cauchy-Schwarz inequality, orthogonal vectors, Orthonormal basis, Bessel's inequality, Gram-Schmidt Orthogonalization process.

TEXT BOOKS:

1. A. R. Vasishtha, J.N. Sharma, A. K. Vasishtha; Linear Algebra; Krishna Prakashan, Meerut.
2. Kenneth Hoffman, Ray Alden Kunz; *Linear Algebra*; Prentice-Hall of India Pvt.

REFERENCE BOOKS:

1. Joseph A. Gallian; *Contemporary Abstract Algebra;* Narosa Publishing House.
2. S. Lang*; Introduction to Linear Algebra*; Springer.
3. S. Kumaresan; *Linear Algebra- A Geometric Approach*; Prentice Hall of India.

BSMA224 Basics of MATLAB (Credits-2)

Course Objectives:

• Understand the MATLAB Desktop, Command window and the Graph Window.
• Be able to do simple and complex calculation using MATLAB.
• Be able to carry out numerical computations and analyses.
• Understand the mathematical concepts upon which numerical methods rely.
• Ensure you can competently use the MATLAB programming environment.
• Understand the tools that are essential in solving engineering problems.

UNIT I

Introduction to MATLAB: Starting and ending MATLAB session, MATLAB environment, MATLAB help, types of files, search path, some useful MATLAB commands, data types, constant and variables, Operators, built-in functions, assignment statement, illustrative programs.

UNIT II

Vectors and Matrix Computations: Scalars and vectors, entering data in matrices, line continuation, matrix subscripts/indices, Transpose, dot product, matrix multiplication, matrix powers, matrix inverse, determinants, solutions to systems of linear equations : solution using matrix inverse, solution using matrix left division, special Matrices: identity matrix, diagonal matrices

UNIT III

Polynomials: Entering a polynomial, polynomial evaluation, and roots of polynomial, polynomial operations - addition and subtraction, multiplication, division, formulation of polynomial equation, characteristic polynomial of a matrix, polynomial differentiation, integration, and curve fitting, evaluation of polynomial with matrix arguments.

UNIT IV

MATLAB Graphics: Two-dimensional plots, multiple plots, style options, legend command, subplots, specialized two-dimensional plots, three-dimensional plots.

Symbolic Processing With MATLAB: Symbolic Expressions and Algebra, Algebraic and Transcendental Equations, Calculus, Symbolic Linear Algebra, ordinary and partial differential equation, Symbolic Tutors

TEXT BOOK:

1. Rudra Pratap; *Getting started with MATLAB*; Oxford university press.

REFERENCE BOOKS:

1. David F. Griffiths; *An introduction to MATLAB*;
Jaydeep Chakravorty; *Introduction to MATLAB programming*, toolbox and Simulink

BSCS110 Object Oriented Programming (Credits-3)

Course Objective: The objective of the course module is to

- Acquaint students with object-oriented programming using Programming C++.
- Enhance the skill of Programming Language.

UNIT I

Introduction: Introducing Object-Oriented Approach related to other paradigms (functional, data decomposition), Characteristics of Object-Oriented Languages.

Basic terms and ideas: Abstraction, Encapsulation, Information hiding, Inheritance, Polymorphism, Review of C, Difference between C and C++, Cin, Cout, new, delete operators.

UNIT II

Classes and Objects: Abstract data types, Object & classes, attributes, methods, C++ class declaration, State identity and behavior of an object, Constructors and destructors, instantiation of objects, Default parameter value, Copy Constructor, Static Class Data, Constant and Classes, C++ garbage collection, dynamic memory allocation.

UNIT III

Inheritance and Polymorphism: Inheritance, Types of Inheritance, Class hierarchy, derivation – public, private & protected, Agrégations, composition vs classification hiérarchies, Polymorphism, Type of Polymorphism – Compile time and runtime, Method polymorphism, Polymorphism by parameter, Operator overloading, Parametric polymorphism, Generic function – template function, function name overloading, Overriding inheritance methods.

UNIT IV

Files and Exception Handling: Persistent objects, Streams and files, Namespaces, Exception handling, Generic Classes.

Standard Template Library: Standard Template Library, Overview of Standard Template Library, Containers, Algorithms, Iterates, Other STL Elements, The Container Classes, General Theory of Operation, Vectors.

TEXT BOOKS:

1. A.R. Venugopal, Rajkumar and T. Ravishanker; *Mastering C++;* TMH.
2. R. Lafore; *Object Oriented Programming using C++;* BPB Publications.
3. Schildt Herbert; *C++ Programming*; Wiley DreamTech.

REFERENCE BOOKS:

1. D. Parasons; *Object Oriented Programming with C++;* BPB Publication.
2. Steven C. Lawlor; *The Art of Programming Computer Science with C++*; Vikas Publication.
3. Yashwant Kanethkar; *Object Oriented Programming using C++;* BPB.

BSMC226 Portfolio Optimization (Credits-4)

Course Objective: The objective of this paper is to

- Acquaint the students about the investment decisions, risks involved and theories of security valuation.
- Develop theories and concepts involved in portfolio management.

UNIT I

Investment- Financial markets; Meaning and process of investment; Investment objectives; Meaning of return and risk; Measures of return and risk; Types of risks; Risk free assets.Expected risk and return of portfolio.

UNIT II

Meaning, advantages and selection; Selection Problems: Markowitz portfolio theory; expected return and standard deviation for portfolios; the efficient frontier; the efficient frontier and investor utility; the selection of the optimal portfolio.

UNIT III

Capital assets pricing model- the capital market line, beta of an asset, beta of a portfolio, security market line; Sharpe single -index model.

UNIT IV

Portfolio management strategies - Mutual funds; Portfolio of assets; Diversification; Portfolio performance evaluation measures; Portfolio revision.

TEXT BOOKS:

1. F. K. Reilly, Keith C. Brown*; Investment Analysis and Portfolio Management*; South-Western Publishers.
2. Sharpe, Alexander & Wiley; *Investment;* Prentice Hall of India, New Delhi.
3. Pandian; *Security Analysis and Portfolio Management*; Vikas Publishing House, New Delhi.

REFERENCE BOOKS:

1. H.M. Markowitz; *Mean-Variance Analysis in Portfolio Choice and Capital Markets*; Blackwell, New York.
2. M.J. Best*; Portfolio Optimization*; Chapman and Hall, CRC Press.

BSCS166 Object Oriented Programming Lab (Credits-1)

List of Experients

1. Write a program which accept principle, rate and time from user and print the simple interest. Solution.
2. Write a program which input principal, rate and time from user and calculate compound interest. You can use library function.

CI = P (1+R/100)T.

3. Write a program to display the following output using a single count statement.

Subject	Marks
Mathematics	90
Computer	77
Chemistry	69 solution

4. Write a program which accepts a character and display its ASCII value. Solution.
5. Write a program to swap the values of two variables. Solution.
6. Write a program to calculate area of circle. Solution
7. Write a program to check whether the given number is positive or negative (using ? : ternary operator) solution
8. Write a program which accepts days as integer and display total number of years, months and days in it.
9. Any year is input by the user. Write a program to determine whether the year is a leap year or not.
10. Write a program to find the roots of and quadratic equation of type ax^2+bx+c where a is not equal to zero.
11. The marks obtained by a student in 5 different subjects are input by the user.

The student gets a division as per the following rules:
Percentage above or equal to 60 - First division
Percentage between 50 and 59 - Second division
Percentage between 40 and 49 - Third division
Percentage less than 40 - Fail

12. Write a program to calculate the division obtained by the student.
13. Write a program which displays a number between 10 to 100 randomly.
14. Write a program using function which accept two integers as an argument and return its sum. Call this function from main ( ) and print the results in main ( ).
15. Write a function that receives two numbers as an argument and display all prime numbers between these two numbers. Call this function from main ( ).
16. Write a C++ program to find the sum and average of one dimensional integer array.
17. Write a C++ program to write number 1 to 100 in a data file NOTES.TXT.
18. Write a user-defined function in C++ to read the content from a text file OUT.TXT, count and display the number of alphabets present in it.
19. Declare a structure to represent a complex number (a number having a real part and imaginary part).

Write C++ functions to add, subtract, multiply and divide two complex numbers.

20. An array stores details of 25 students (roll no, name, and marks in three subjects). Write a program to create such an array and print out a list of students who have failed in more than one subject.

21. Write a program to find the length of string.

22. Write a program to reverse a string.

23. Write a program to check a string is palindrome or not.

24. Write a program which accept a letter and display it in uppercase letter.

25. Write a user-defined function in C++ to display the multiplication of row element of two-dimensional array A [4] [6] containing integer.

BSMA254 MATLAB Progamming Lab (Credits-1)

List of Experiments

S. No.	Name of Experiments
1.	Find the factorial of n numbers.
2.	Finding Matrix multiplication and it's inverse.
3.	Calculate limit of function.
4.	Compute the sum of n integers
5.	Plot the graph of any function.
6.	Finding derivative of any function.
7.	Finding the integral of any function
8.	Create a vector of 4 linearly spaced numbers from 1 to 12
9.	Solving the linear and nonlinear equations.
10.	Solving the system of linear equations.

BSMA332 Combinatorial Mathematics (Credits 4)

Course Objective: The objectives of this course can be illustrated as:

- To provide conceptual understanding of Permutations and Combinations, Generating functions and Recurrence relations.
- To develop basic skills of Combinatorial designs.

UNIT I

Basic counting principles, Permutations and Combinations (with and without repetitions), Binomial theorem, Multinomial theorem, Counting subsets, Set-partitions, Stirling numbers. Principle of Inclusion and Exclusion, Derangements, Inversion formulae.

UNIT II

Generating functions: Algebra of formal power series, Generating function models, Calculating generating functions, Exponential generating functions.

UNIT III

Recurrence relations: Recurrence relation models, Divide and conquer relations, Solution of recurrence relations, Solutions by generating functions. Integer partitions, Systems of distinct representatives.

UNIT IV

Polya theory of counting: Necklace problem and Burnside's lemma, Cyclic index of a permutation group, Polya's theorems and their immediate applications. Latin squares, Hadamard matrices, Combinatorial designs: *t* designs, BIBDs, Symmetric designs.

TEXT BOOK:

V. Krishnamurthy; *Combinatorics, Theory and Application*; Affiliated East-West Press.

REFERENCE BOOKS:

1. J.H. van Lint and R.M. Wilson; *A Course in Combinatorics;* Cambridge University Press.
2. P.J. Cameron; *Combinatorics, Topics, Techniques, Algorithms;* Cambridge University Press.
3. M. Jr. Hall; *Combinatorial Theory*; John Wiley & Sons.
4. S.S. Sane; *Combinatorial Techniques;* Hindustan Book Agency.
5. R.A. Brualdi; *Introductory Combinatorics;* Pearson Education Inc.

Semester-V

BSMA323 Metric Spaces (Credits-4)

Course Objective: Study of the topics of the course will enable the students to

- Provide a brief knowledge of metric spaces.
- The students will learn about the compactness and connectedness of sets.

UNIT I

Definition and examples of metric Spaces. Neighbourhoods. Limit points. Interior points. Open and closed sets. Closure and interior. Boundary points Subspace of a metric space.

UNIT II

Cauchy sequences. Completencess. Cantor's intersection theorem. Contraction principle. Construction of real numbers as the completion of the incomplete metric space of rationales. Real numbers as a complete ordered field. Dense subsets. Baire Category theorem.

UNIT III

Separable, second countable and first countable spaces. Continuous functions. Extension theorem.Uniform continuity.Isometry and homeomorphism.Equivalent metrics.

UNIT IV

Compactness.Sequential compactness.Totally bounded spaces.Finite intersection property. Continuous functions and compact sets. Connectedness components. Continuous functions and connected sets.

TEXT BOOK:

G.F.Simmons; *Introduction to Topology and Modern Analysis;* Mc Graw-Hill.

REFERENCE BOOKS:

1. T.M.Apostol; *Mathematical Analysis*; Narosa Publishing House, New Delhi.
2. E.T.Copson; *Metric Spaces*; Cambridge University Press.
3. P.K. Jain and K. Ahmad*; Metric Spaces*; Narosa Publishing House, New Delhi.

BSMA325 Complex Analysis (Credits-4)

Course Objective: Study of the topics of the course will enable the students to

- Provide a brief knowledge of complex analysis.
- The students will learn about the limit and continuity, analytic function and residues.

UNIT I

Limits, Limits involving the point at infinity, continuity.Properties of complex numbers, regions in the complex plane, functions of complex variable, mappings.Derivatives, differentiation formulas, Cauchy-Riemann equations, sufficient conditions for differentiability.

UNIT II

Analytic functions, examples of analytic functions, exponential function, Logarithmic function, trigonometric function, derivatives of functions, definite integrals of functions. Contours, Contour integrals and its examples, upper bounds for moduli of contour integrals. Cauchy- Goursat theorem, Cauchy integral formula.

UNIT III

Liouville's theorem and the fundamental theorem of algebra.Convergence of sequences andseries, Taylor series and its examples.Laurent series and its examples, absolute and uniform convergence of power series.

UNIT IV

Calculation of residues.Residue theorem, Evaluation and real integrals.

TEXT BOOKS:

1. Murray Spiegel, Seymour Lipschutz ; John Schiller and Dennis Spellman; Schaum's Outline of Complex Variables.
2. J.N.Sharma*; Functions of a Complex Variable*; Krishna Prakashan, Meerut.

REFERENCE BOOKS:

1. James Ward Brown and Ruel V. Churchill; *Complex Variables and Applications*; McGraw – Hill International Edition.
2. Joseph Bak and Donald J. Newman; *Complex analysis*, *Undergraduate Texts in Mathematics*; Springer-Verlag New York.

BSMA327 Dynamics (Credits-4)

Course Objective: The objective of the course module is to

- Provide a brief knowledge of dynamic.
- The students will learn about the application of dynamics in mathematics.

UNIT I

Velocity and acceleration along radial, transverse, tangential and normal directions. Relative velocity and acceleration.

UNIT II

Simple harmonic motion. Motion under different Laws of forces. Elastic strings.

UNIT III

Motion on smooth and rough plane curves. Projectile motion of a particle in a plane. Vector angular velocity.

UNIT IV

General motion of a rigid body. Central Orbits, Kepler laws of motion. Motion of a particle in three dimensions. Acceleration in terms of different co-ordinate systems.

TEXT BOOK:

S.L.Loney, An Elementary Treatise on the Dynamics of a Particle and aRigid Bodies, Cambridge University Press.

REFERENCE BOOKS:

1. F. Chorlton; *Dynamics;* CBS Publishers, New Delhi.
2. A.S. Ramsey; *Dynamics Part-1&2*; CBS Publisher & Distributors.

BSCS214 Theory of Computation (Credits-4)

Introduction to formal proof: Additional forms of proof, Inductive proofs, Finite Automata (FA), Deterministic Finite Automata (DFA), Non-deterministic Finite Automata (NFA), Finite Automata with Epsilon transitions.

Regular Expression: FA and Regular Expressions, Proving languages not to be regular, Closure properties of regular languages, Equivalence and minimization of Automata.

Context-Free Grammar (CFG): Parse Trees, Ambiguity in grammars and languages, Definition of the Pushdown automata, Languages of a Pushdown Automata, Equivalence of Pushdown automata and CFG, Deterministic Pushdown Automata. Normal forms for CFG, Pumping Lemma for CFL, Closure Properties of CFL, Turing Machines, Programming Techniques for TM.

A language that is not Recursively Enumerable (RE): An undecidable problem that is RE, Undecidable problems about Turing Machine, Post's Correspondence Problem.

REFERENCE BOOKS:

1. H.R. Lewis and C.H. Papadimitriou, "Elements of the theory of Computation", Second Edition, Pearson Education.
2. Thomas A. Sudkamp," An Introduction to the Theory of Computer Science, Languages and Machines", Third Edition, Pearson Education.
3. Raymond Greenlaw an H.James Hoover, "Fundamentals of Theory of Computation, Principles and Practice", Morgan Kaufmann Publishers.
4. MichealSipser, "Introduction of the Theory and Computation", Thomson Brokecole.
5. J. Martin, "Introduction to Languages and the Theory of computation" Third Edition, Tata Mc Graw Hill.
6. J.E. Hopcroft, R. Motwani and J.D. Ullman, "Introduction to Automata Theory, Languages and Computations", second Edition, Pearson Education.

BSMA329 Discrete Mathematics (Credits-4)

Course Objective: Study of the topics of the course will enable the students to

- Understand the concept of Boolean algebra.
- Understand the concept of Graph Theory.

UNIT I

Definition, examples and basic properties of ordered sets, maps between ordered sets, Duality Principle, maximal and minimal elements, lattices as ordered sets, complete lattices, lattices as algebraic structures, sub lattices, products and homomorphism's.

UNIT II

Definition, examples and properties of modular and distributive lattices, Boolean algebras, Boolean polynomials, minimal forms of Boolean polynomials, Quinn-McCluskey method, Karnaugh diagrams, switching circuits and applications of switching circuits.

UNIT III

Graph Theory: Basic Terminology, Models and Types, multigraphs and weighted graphs, Graph Representation, Graph Isomorphism, Connectivity.

UNIT IV

Euler and Hamiltonian Paths and Circuits, Planar Graphs, Graph Coloring, Trees, Basic Terminology and properties of Trees, Introduction to Spanning Trees.

TEXT BOOKS:

Kenneth H. Rosen; *Discrete Mathematics and Its Applications*; McGraw-Hill Education.

REFERENCE BOOKS:

1. C.L. Liu & Mahopatra; *Elements of Discrete mathematics*; Tata McGraw Hill.
2. N. Deo; *Graph Theory with Applications to Computer Science;* Prentice-Hall of India.
3. T.H. Coremen, C.E. Leiserson, R. L. Rivest*; Introduction to algorithms;* Prentice Hall on India.
4. M. O. Albertson and J. P. Hutchinson; *Discrete Mathematics with Algorithms*; John wiley Publication.
5. J. L. Hein; *Discrete Structures, Logic, and Computability*; Jones and Bartlett Publishers.

BSMA331 Numerical Analysis (Credits-4)

Course objective: The objective of the course is to

- provide a brief knowledge of numerical techniques.
- Understand the concept of numerical differentiation and integration.

UNIT I

Algorithms, Convergence, Errors: Relative, Absolute, Round off, Truncation. Transcendental and Polynomial equations: Bisection method, Newton's method, Secant method. Rate of convergence of these methods.

UNIT II

System of linear algebraic equations: Gaussian Elimination and Gauss Jordan methods. GaussJacobi method, Gauss Seidel method and their convergence analysis.

UNIT III

Interpolation: Lagrange and Newton's methods. Error bounds. Finite difference operators. Gregory forward and backward difference interpolation.

UNIT IV

Numerical Integration: Trapezoidal rule, Simpson's rule, Simpsons 3/8th rule, Boole's Rule. Midpoint rule, Composite Trapezoidal rule, Composite Simpson's rule. Ordinary Differential Equations: Picard's method, Euler's method and Runge-Kutta method.

TEXT BOOK:

B. S. Grewal, *Numerical Methods in Engineering and Science*, Khanna Publishers.

REFERENCE BOOKS:

1. M. K. Jain, S.R.K. Iyengar and R.K. Jain; *Numerical Methods for Scientific and Engineering Computation*; New age International Publisher.
2. Brian Bradie; *A Friendly Introduction to Numerical Analysis*; Pearson Education.
3. C.F. Gerald and P.O. Wheatley; *Applied Numerical Analysis*; Pearson Education.
4. Uri M. Ascher and Chen Greif; *A First Course in Numerical Methods*; PHI Learning Private Limited.
5. John H. Mathews and Kurtis D. Fink; *Numerical Methods using Matlab;* PHI Learning Private Limited.

BSMA351 Numerical Analysis Lab (Credits-1)

List of Practical's (using any software)

1. Calculate the sum 1/1 + 1/2 + 1/3 + 1/4 + ----------+ 1/ N.
2. To find the absolute value of an integer.
3. Enter 100 integers into an array and sort them in an ascending order.
4. Bisection Method.
5. Newton Raphson Method.
6. Secant Method.
7. Regulai Falsi Method.
8. LU decomposition Method.
9. Gauss-Jacobi Method.
10. SOR Method or Gauss-Siedel Method.
11. Lagrange Interpolation or Newton Interpolation.
12. Simpson's rule.

Note: For any of the CAS (Computer aided software) Data types-simple data types, floating data
types, character data types, arithmetic operators and operator precedence, variables and constant
declarations, expressions, input/output, relational operators, logical operators and logical expressions, control statements and loop statements, Arrays should be introduced to the students.

BSDM301A DISASTER MANAGEMENT (Credits 3)

COURSE OBJECTIVE: The objective of the course is to create awareness about various types of disasters and to educate the learners about basic disaster management strategies. The course examines disaster profile of our country and illustrates the role played by various governmental and non- governmental organizations in its effective management. It also acquaints learners with the existing legal frame work for disaster management.

LEARNING OUTCOME: The course will -

1. Provide students an exposure to disasters, their significance and types.
2. Ensure that the students begin to understand the relationship between vulnerability, disasters, disaster prevention and risk reduction.
3. Provide the students a preliminary understanding of approaches of Disaster Risk Reduction (DRR)
4. Develop rudimentary ability to respond to their surroundings with potential disaster response in areas where they live, with due sensitivity.

Introduction to Disasters: Concept and definitions- Disaster, Hazard, vulnerability, resilience, risks.

Different Types of Disaster: Causes, effects and practical examples for all disasters.

- Natural Disaster: such as Flood, Cyclone, Earthquakes, Landslides etc
- Man-made Disaster: such as Fire, Industrial Pollution, Nuclear Disaster, Biological Disasters, Accidents (Air, Sea, Rail & Road), Structural failures (Building and Bridge), War & Terrorism etc.

Disaster Preparedness and Response Preparedness

- Disaster Preparedness: Concept and Nature
- Disaster Preparedness Plan
- Prediction, Early Warnings and Safety Measures of Disaster.
- Role of Information, Education, Communication, and Training, Role of Government, International and NGO Bodies.
- Role of IT in Disaster Preparedness
- Role of Engineers on Disaster Management.
- Relief and Recovery
- Medical Health Response to Different Disasters

Rehabilitation, Reconstruction and Recovery

- Reconstruction and Rehabilitation as a Means of Development.
- Damage Assessment
- Post Disaster effects and Remedial Measures.
- Creation of Long-term Job Opportunities and Livelihood Options,
- Disaster Resistant House Construction
- Sanitation and Hygiene
- Education and Awareness,
- Dealing with Victims' Psychology,
- Long-term Counter Disaster Planning
- Role of Educational Institute.

Disaster Management in India

Disaster Management Act, 2005:

Disaster management framework in India before and after Disaster Management Act, 2005, National Level Nodal Agencies, National Disaster Management Authority

Liability for Mass Disaster

Statutory liability

- Contractual liability
- Tortious liability
- Criminal liability
- Measure of damages

Epidemics Diseases Act, 1897: Main provisions, loopholes.

Project Work: The project/ field work is meant for students to understand vulnerabilities and to work on reducing disaster risks and to build a culture of safety. Projects must be conceived based on the geographic location and hazard profile of the region where the institute is located.

Reference Books:

- Government of India, Department of Environment, Management of Hazardous Substances Control
- Act and Structure and Functions of Authority Created Thereunder.
- Indian Chemical Manufacturers' Association & Loss Prevention Society of India, Proceedings of the National Seminar on Safety in Road Transportation of Hazardous Materials: (1986).
- Author Title Publication Dr. Mrinalini Pandey Disaster Management Wiley India Pvt. Ltd.
- Tushar Bhattacharya Disaster Science and Management McGraw Hill Education (India) Pvt. Ltd.

- Jagbir Singh Disaster Management: Future Challenges and Opportunities K W Publishers Pvt. Ltd.
- J. P. Singhal Disaster Management Laxmi Publications.
- Shailesh Shukla, Shamna Hussain Biodiversity, Environment and Disaster Management Unique Publications
- C. K. Rajan, Navale Pandharinath Earth and Atmospheric Disaster Management: Nature and Manmade B S Publication
- Indian law Institute (Upendra Baxi and Thomas Paul (ed.), Mass Disasters and Multinational Liability: The Bhopal Case (1986)
- Indian Law Institute, Upendra Baxi (ed.), Environment Protection Act: An Agenda for Implementation (1987)
- Asian Regional Exchange for Prof. Baxi., Nothing to Lose But our Lives: Empowerment to Oppose
- Industrial Hazards in a Transnational world (1989)
- Gurudip Singh, Environmental Law: International and National Perspectives (1995), Lawman (India) Pvt. Ltd.
- Leela Krishnan, P, The Environmental Law in India, Chapters VIII, IX and X (1999), Butterworths, New Delhi.

SEMESTER-VI

BSMA324 Riemann Integration and Series of Functions (Credits-4)

Course Objective: The objective of the course is to

- Provide a brief knowledge of Riemann integration and series of functions.
- The students will learn about the application of function in mathematics.

UNIT I

Riemann integration; inequalities of upper and lower sums; Riemann conditions of integrability. Riemann sum and definition of Riemann integral through Riemann sums; equivalence of twodefinitions; Riemann integrability of monotone and continuous functions, Properties of theRiemann integral; definition and integrability of piecewise continuous and monotone functions.

UNIT II

Intermediate Value theorem for Integrals; Fundamental theorems of Calculus. Improper integrals; Convergence of Beta and Gamma functions.

UNIT III

Pointwise and uniform convergence of sequence of functions. Theorems on continuity, derivability and integrability of the limit function of a sequence of functions. Series of functions;Theorems on the continuity and derivability of the sum function of a series of functions; Cauchycriterion for uniform convergence and Weierstrass M-Test.

UNIT IV

Limit superior and Limit inferior. Power series, radius of convergence, Cauchy HadamardTheorem, Differentiation and integration of power series; Abel's Theorem; Weierstrass Approximation Theorem.

TEXT BOOK:

Savita Arora and S.C.Malik*; Mathematical Analysis*; New Age Publishing.

REFERENCE BOOKS:

1. K.A. Ross, Elementary Analysis; *The Theory of Calculus, Undergraduate Texts in Mathematics*; Springer (SIE), Indian reprint.
2. R.G. Bartle D.R. Sherbert; *Introduction to Real Analysis;* John Wiley and Sons (Asia)Pvt. Ltd., Singapore.
3. Charles G. Denlinger; *Elements of Real Analysis*; Jones & Bartlett.

BSMA326 Operational Research (Credits-4)

Course Objective: Study of the topics of the course will enable the students to

- Formulate linear programming problems.
- The students will learn about the application of OR in practical problems.

UNIT I

Definition, scope, methodology and applications of OR. Types of OR models.Concept of optimization, Linear Programming: Introduction, Formulation of a Linear Programming Problem (LPP), Requirements for an LPP, Advantages and limitations of LP. Graphical solution: Multiple, unbounded and infeasible solutions.

UNIT II

Principle of simplex method: standard form, basic solution, basic feasible solution. Computational Aspect of Simplex Method: Cases of unique feasible solution, no feasible solution, multiple solutions and unbounded solution and degeneracy. Two Phase and Big-M methods.

UNIT III

Duality in LPP, primal-dual relationship. Transportation Problem: Methods for finding basic feasible solution of a transportation problem, Modified distribution method for finding the optimum solution, Unbalanced and degenerate transportation problems, transshipment problem, maximization in a transportation problem.

UNIT IV

Assignment Problem: Solution by Hungarian method, Unbalanced assignment problem, maximization in an assignment problem, Crew assignment and Travelling salesman problem.

Game Theory: Two person zero sum game, Game with saddle points, the rule of dominance; Algebraic, graphical and linear programming methods for solving mixed strategy games.

TEXT BOOKS:

1. Kanti Swarup, P.K. Gupta and Manmohan; *Operations Research*; Sultan Chand & Sons.
2. H.A.Taha*; Operations Research – An Introduction;Wiley.*

REFERENCE BOOKS:

1. Gupta, P.K. and Hira, D.S.; *Operations Research*; S. Chand & Co.
2. S.I. Gass; *Linear Programming* (3rd Edition); McGraw Hill, NY.
3. G. Hadley*; Linear Programming*; Narosa Publishing.

Discipline Specific Elective

BSMA334 Differential Geometry (Credits-4)

Course Objective: The objectives of this course can be illustrated as:

- To provide conceptual understanding of Theory of Space Curves and Surfaces.
- To understand the concept of Geodesics and Tensors.

UNIT I

Theory of Space Curves: Space curves, Planer curves, Curvature, torsion and Serret-Frenet formulae. Osculating circles, Osculating circles and spheres. Existence of space curves. Evolutes and involutes of curves.

UNIT II

Theory of Surfaces: Parametric curves on surfaces. Direction coefficients. First and second Fundamental forms. Principal and Gaussian curvatures. Lines of curvature, Euler's theorem. Rodrigue's formula, Conjugate and Asymptotic lines. Developables: Developable associated with space curves and curves on surfaces, Minimal surfaces.

UNIT III

Geodesics: Canonical geodesic equations. Nature of geodesics on a surface of revolution. Clairaut's theorem. Normal property of geodesics. Torsion of a geodesic. Geodesic curvature. Gauss-Bonnet theorem. Surfaces of constant curvature. Conformal mapping. Geodesic mapping. Tissot's theorem.

UNIT IV

Tensors: Summation convention and indicial notation, Coordinate transformation and Jacobian, Contra-variant and Covariant vectors, Tensors of different type, Algebra of tensors and contraction, Metric tensor and 3-index Christoffel symbols, Parallel propagation of vectors, Covariant and intrinsic derivatives, Curvature tensor and its properties, Curl, Divergence and Laplacian operators in tensor form, Physical components.

TEXT BOOK:

S. Lang; *Fundamentals of Differential Geometry*; Springer.

REFERENCE BOOKS:

1. T.J. Willmore; *An Introduction to Differential Geometry*; Dover Publications.
2. B. O'Neill; *Elementary Differential Geometry*; Academic Press.
3. C.E. Weatherburn; *Differential Geometry of Three Dimensions*; Cambridge University Press.
4. D.J. Struik; *Lectures on Classical Differential Geometry*; Dover Publications.
5. B. Spain; *Tensor Calculus: A Concise Course*; Dover Publications.

Discipline Specific Elective

BSMA336 Number Theory (Credits-4)

Course Objective: The objectives of this course can be illustrated as:

- To provide conceptual understanding of number theory.
- To understand the concept of coding theory.

UNIT I

Linear Diophantine equation, prime counting function, statement of prime number theorem, Goldbach conjecture, linear congruences, complete set of residues, Chinese Remainder theorem, Fermat's Little theorem, Wilson's theorem.

UNIT II

Number theoretic functions, sum and number of divisors, totally multiplicative functions, definition and properties of the Dirichlet product, the Mobius Inversion formula.

UNIT III

The greatest integer function, Euler's phi-function, Euler's theorem, reduced set of residues, some properties of Euler's phi-function. Order of an integer modulo n, primitive roots for primes, composite numbers having primitive roots,

UNIT IV

Euler's criterion, the Legendre symbol and its properties, quadratic reciprocity, quadratic congruences with composite moduli. Public key encryption, RSA encryption and decryption, the equation x2 + y2= z2, Fermat's Last theorem.

TEXT BOOK:
David M. Burton; *Elementary Number Theory*; Tata McGraw-Hill, Indian reprint.

REFERENCE BOOKS:
1. Neville Robinns; *Beginning Number Theory*; Narosa Publishing House Pvt. Ltd.
2. Ethan D. Bolker; *Elementary Number Theory : An Algebraic Approach*; Dover Publications.
3. A K Vaishisth; *Number System and Set Theory*; Neha Publishers & Distributors.

Discipline Specific Elective

BSMA338 Mathematical Modelling (Credits-4)

Course Objective: The objectives of this course can be illustrated as:
- To provide conceptual understanding of formulation of mathematical models.
- To develop the skill of solving real world problems.

UNIT I
Need, Techniques, Classifications, Characteristic and Limitations of Mathematical Models. Mathematical Modelling through Ordinary Differential Equation of First Order: Linear Growth and Decay Models, Non-Linear Growth and Decay Models, Compartment Models, Dynamics Problems.

UNIT II
Mathematical Modelling through systems of Ordinary Differential Equation of First Order: Population Dynamics, Epidemics and Compartment Models. Modelling in Economics, Medicine, Arms Race, Battles and International Trades.

UNIT III
Mathematical Modelling through Ordinary Differential Equation of Second Order: Planetary Motion, Circular Motion and Motion of Satellites.

UNIT IV
Mathematical Modelling through Graphs: Directed and Signed graphs, Weighted Di-graphs.

TEXTBOOK:
J. N. Kapur, Mathematical Modelling, New Age International Publishers.

REFERENCE BOOKS:
1. Frank R. Giordano, Maurice D. Weir and William P. Fox, A First Course in Mathematical Modeling, Thomson Learning, London and New York.
2. ReinhardIllner, Mathematical Modelling: A Case Studies Approach, Indian Editions of AMS Titles.

Discipline Specific Elective

BSMA340 Theory of Reliability (Credits-4)

Course Objective: The objective of the course is to

- Covers interpretations of the concept of probability.
- Elements of statistics; methods for reliability and risk assessment of complex systems.
- Examples and applications are drawn from nuclear and other industries, waste repositories, and mechanical systems.

UNIT I

Probability, Random Variables and Distribution Functions: Definitions and Interpretations (Axiomatic; Subjectivistic; Frequentistic), Basic Rules, Theorem of Total Probability, Bayes' Theorem, Discrete and Continuous Random Variables, Cumulative Distribution Functions, Probability Mass and Density Functions, Moments, Failure Models and Reliability, Failure Rates.

UNIT II

Useful Probability and Multivariate Distributions, Functions of Random Variables: Bernoulli Trials and the Binomial Distribution, The Poisson Distribution, The Exponential Distribution, The Normal and Lognormal Distributions, The Concept of Correlation, Joint and Conditional Distribution Functions, Moments, The Multivariate Normal and Lognormal Distributions, Single Random Variable, Multiple Random Variables, Moments of Functions of Random Variables, Approximate Evaluation of the Mean and Variance of a Function, Analytical Results for the Normal and Lognormal Distributions.

UNIT III

Applications to Reliability: Simple Logical Configurations (Series; Parallel; Standby Redundancy), Complex Systems, Stress-Strength Interference Theory, Modeling of Loads and Strength, Reliability-Based Design, Elementary Markov Models.

UNIT IV

Probabilistic Risk Assessment of Complex Systems: Risk Curves and Accident Scenario Identification, Event-Tree and Fault-Tree Analysis, Unavailability Theory of Repairable and Periodically Tested Systems, Dependent (Common-Cause) Failures, Human Reliability Models, Component Importance, Examples from Risk Assessments for Nuclear Reactors, Chemical Process Systems, and Waste Repositories.

TEXT BOOKS:

1. Ang, A. H-S., and W. H. Tang. Probability Concepts in Engineering Planning and Design, vol. 1, Basic Principles. New York, NY: John Wiley & Sons, 1975. ISBN: 9780471032007.
2. Rausand, M., and A. Hoyland. System Reliability Theory: Models, Statistical Methods, and Applications. 2nd ed. New York, NY: John Wiley & Sons, 2003. ISBN: 9780471471332.

REFERENCE BOOKS:

1. Rausand, Marvin, *Reliability centered maintenance, Reliability Engineering and System Safety* 60 (1998): 121-132.
2. Vatn, J., P. Hokstad, and L. Bodsberg, *An overall model for maintenance optimization, Reliability Engineering and System Safety* 51 (1996): 241-257..
3. DelMar, Donald, and George W. Sheldon. Introduction to Quality Control. St. Paul, MN: West Publishing Co., 1988. ISBN: 9780314684592

BSMA342 Mathematical Statistics (Credits-4)

Course Objective: The objective of the course is to

- Provide a brief knowledge of probability and statistics.
- The students will be able to solve the daily life problems based on probability.

UNIT I

Sample space, probability axioms, real random variables (discrete and continuous), cumulative distribution function, probability mass/density functions, mathematical expectation, moments, moment generating function, characteristic function.

UNIT II

Probability distributions: Uniform, Binomial, Poisson, Geometric, Normal, Exponential, Weibul.

UNIT III

Joint cumulative distribution function and its properties, joint probability density functions, marginal and conditional distributions, expectation of function of two random variables, conditional expectations, independent random variables, bivariate normal distribution, correlation coefficient, joint moment generating function (jmgf) and calculation of covariance(from jmgf).

UNIT IV

Chebyshev's inequality, statement and interpretation of (weak) law of large numbers and strong law of large numbers, Central Limit theorem for independent and identically distributed random variables with finite variance, Markov Chains, Chapman-Kolmogorov equations, classification of states.

TEXT BOOK:

S.C.Gupta and V. K. Kapoor*; Fundamentals of Mathematical Statistics*; Sultan Chand and Sons.

REFERENCE BOOKS:

1. Robert V. Hogg, Joseph W. McKean and Allen T. Craig; *Introduction to Mathematical Statistics*; Pearson Education.
2. Irwin Miller and Marylees Miller, John E. Freund; *Mathematical Statistics with Applications*, Pearson Education, Asia.
3. Sheldon Ross; *Introduction to Probability Models*; Academic Press, Indian Reprint.
4. Alexander M. Mood, Franklin A. Graybill and Duane C. Boes; *Introduction to the Theory of Statistics*; Tata McGraw- Hill, Reprint.

SBAS		B.SC. MATHEMATICS								
YEAR		EVEN SEMESTER								
	SN	COURSE CODE	NATURE	COURSE TITLE	C	SN	COURSE CODE	NATURE	COURSE TITLE	C
FIRST	1	BSMA137	CC	ALGEBRA	4	1	BSMA132	CC	MODERN ALGEBRA	4
	2	BSMA133	CC	CALCULUS	4	2	BSMA134	CC	ORDINARY DIFFERENTIAL EQUATIONS	4
	3	BSMA135	CC	VECTOR CALCULUS	4	3	BSMA136	CC	SOLID GEOMETRY	4
	4	BSCH125	AECC	ENVIRONMENTAL STUDIES	3	4	BSEL101	AECC	COMMUNICATION SKILLS	4
	5	BSMC119	CC	MATHEMATICAL FINANCE	4	5	BSPH120	GEC	PHYSICS-I	4
	6	BSCS131	SEC	INTRODUCTION TO COMPUTERS AND IT , OFFICE AUTOMATION	4	6	BSCH120	GEC	CHEMISTRY-I	4
	7	BSCS157	SEC	C PROGRAMMING LAB	1	7	BSPH158	SEC	PHYSICS LAB-I	1
	8	BSMA131	SEC	DATA PRESENTATION FOR SCIENCES	1	8	BSCH154	SEC	CHEMISTRY LAB-I	1
						9	BSEL171	SEC	COMMUNICATION SKILLS LAB	1
	TOTAL				25	TOTAL				27

SECOND	1	BSMA217	CC	REAL ANALYSIS	4	1	BSMA218	CC	SPECIAL FUNCTIONS AND INTEGRAL TRANSFORMS	4
	2	BSMA219	CC	PARTIAL DIFFERENTIAL EQUATIONS	4	2	BSMA220	CC	LINEAR ALGEBRA	4
	3	BSMA221	CC	STATICS	4	3	BSMA224	SEC	BASICS OF MATLAB	2
	4	BSPH217	GEC	PHYSICS-II	4	4	BSCS110	CC	OBJECT ORIENTED PROGRAMMING	3
	5	BSCH207	GEC	CHEMISTRY -II	4	5	BSMC226	CC	PORTFOLIO OPTIMIZATION	4
	6	BSEL217	SEC	PERSONALITY DEVELOPMENT AND COMMUNICATION SKILLS	3	6	BSCS166	SEC	OBJECT ORIENTED PROGRAMMING LAB	1
	7	BSPH257	SEC	PHYSICS-II LAB	1	7	BSMA254	SEC	MATLAB PROGRAMMING LAB	1
	8	BSCH257	SEC	CHEMISTRY LAB-II	1	8	BSMA332	CC	COMBINATORIAL MATHEMATICS	4
	TOTAL				**25**	**TOTAL**				**23**

THIRD	1	BSMA323	CC	METRIC SPACES	4		1	BSMA324	CC	REIMANN INTEGRATION AND SERIES OF FUNCTIONS	4
	2	BSMA325	CC	COMPLEX ANALYSIS	4		2	BSMA326	CC	OPERATIONAL RESEARCH	4
	3	BSMA327	CC	DYNAMICS	4		3		DSE	ELECTIVE	4
	4	BSCS214	CC	THEORY OF COMPUTATION	4		4		DSE	ELECTIVE	4
	5	BSMA329	CC	DISCRETE MATHEMATICS	4		5	BSMA342	CC	MATHEMATICAL STATISTICS	4
	5	BSMA331	CC	NUMERICAL ANALYSIS	4		6	BSMA354	CC	PROJECT	5
	6	BSMA351	SEC	NUMERICAL ANALYSIS LAB	1						
	7	BSDM301	AECC	DISASTER MANAGEMENT	3						
	TOTAL				**28**		**TOTAL**				**25**

Discipline Electives

1	BSMA336	DSE	NUMBER THEORY	4		3	BSMA338	DSE	MATHEMATICAL MODELING	4
2	BSMA334	DSE	DIFFERENTIAL GEOMETRY	4		4	BSMA340	DSE	THEORY OF RELIABILITY	4

TOTAL HOURS: LECT [L]+PRAC [P]+TUT [T] (EXCLUDING NO L, T, S, P COURSES)	**154**
TOTAL CREDITS [C]	**153**

Course Type	**Nomenclature**
CC	Core Course
SEC	Skill Enhancement Course
AECC	Ability Enhancement Compulsory Course
GEC	Generic Elective Course
DSE	Discipline Specific Elective
VAC	Value added course
MOOC	Massive open online course