K.R. MANGALAM UNIVERSITY
THE COMPLETE WORLD OF EDUCATION

SCHOOL OF BASIC AND APPLIED SCIENCES
(SBAS)

Programme Handbook

(Programme Structure & Evaluation Scheme)

Bachelor of Science (Honours) Forensic Science

Program Code- 37

THREE YEAR UNDERGRADUATE PROGRAMME

(with effect from 2024-25 session)

Approved in the 34th Meeting of Academic Council Held on 29 June 2024

Table of Contents		
S.No.	**Particulars**	**Page No.**
	Preamble	**1**
1.	**Introduction: About University**	**2**
2.	**University Vision and Mission** 2.1 Vision 2.2 Mission	**2**
3.	**About the School: School of Basic and Applied Sciences**	**3**
4.	**School Vision and Mission** 4.1 Vision 4.2 Mission	**3**
5.	**Programme Offered by the School** 5.1 About the programme: B.Sc. (Hons.) Forensic Science 5.2 Duration 5.3 Career Avenues 5.4 Class Timings 5.5 Definitions 5.6 Programme Educational Objectives (PEOs) 5.7 Programme Outcomes (POs) 5.8 Programme Specific Outcomes (PSOs)	**4**
6.	**Student Structured Learning Experience from entry to Exit** 6.1 Education and Philosophy 6.2 University Education Objective: Focus on Employability and Entrepreneurship through Holistic Education using Bloom's Taxonomy 6.3 Importance of Structured Learning Experiences 6.4 Educational Planning and Execution: What, when and how learning will happen 6.5 Course Registration and Scheduling 6.6 Academic Support Services 6.7 Student Career & personal Support Services	**7**
7.	**Assessment and Evaluation** 7.1 Evaluation scheme for theory courses 7.2 Evaluation scheme for Practical courses 7.3 Evaluation scheme for Research Project/Dissertation 7.4 Evaluation scheme for Internship 7.5 Grading System	**11**
8.	**Feedback and Continuous Improvement Mechanisms**	**14**
9.	**Academic Integrity and Ethics**	**14**
10.	**Programme Structure**	**15**
11.	**Syllabi**	**20**

Preamble

The objective of any programme at Higher Education Institute is to prepare their students for the society at large. The K. R. Mangalam University visualizes all its programmes in the best interest of their students and in this endeavour; it offers a new vision to all its Under-Graduate courses. It imbibes a Learning Outcome-based Curriculum Framework (LOCF) for all its Undergraduate programmes. The LOCF approach is envisioned to provide a focused, outcome-based syllabus at the undergraduate level with an agenda to structure the teaching-learning experiences in a more student-centric manner. The LOCF approach has been adopted to strengthen students' experiences as they engage themselves in the programme of their choice. The Under-Graduate Programmes will prepare the students for both, academia and employability. The programmes also state the attributes that it offers to inculcate at the graduation level. The graduate attributes encompass values related to emotional stability, well-being, critical thinking and skills for employability. The school acknowledges all the faculty members for their valuable contributions in preparing the curriculum.

Dr. Mandeep Kaur

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1. Introduction: About University

K.R. Mangalam University located on Sohna Road, Gurugram, is one of the fastest growing and most promising upcoming universities in India. It is a State Private University established in 2013 by an act of the legislature of the Haryana Government under Haryana Private Universities Act (Amendment) 8 of 2013.It is recognized by the UGC under Section 2f of the UGC Act, 1956. The primary aim of the University is to promote excellence in basic and professional education while upholding moral values. KRMU offers various Undergraduate, Postgraduate and Doctoral Degree programs across different disciplines. The group of educational units in the University promote education in the areas of Engineering& Technology, Legal Studies, Basic and Applied Sciences, Management Sciences, Commerce, Journalism and Mass Communication, Hotel Management and Catering Technology, Medical and Allied Sciences, Architecture and Planning, Agriculture, Fashion Designing, Humanities and Education. All the disciplines follow a well-defined curriculum design keeping in view the guidelines of UGC/AICTE and appropriate regulatory bodies like Council of Architecture (COA), Bar Council of India (BCI), Pharmacy Council of India (PCI), National Council for Teachers Education (NCTE) etc., wherever applicable. All courses are semester and credit based.

2. University Vision and Mission

2.1 Vision

K.R. Mangalam University aspires to become an internationally recognized institution of higher learning through excellence in inter-disciplinary education, research, and innovation, preparing socially responsible life-long learners contributing to nation building.

2.2 Mission

- Foster employability and entrepreneurship through futuristic curriculum and progressive

pedagogy with cutting-edge technology

- Instill the notion of lifelong learning through stimulating research, Outcomes-based education, and innovative thinking

- Integrate global needs and expectations through collaborative programs with premier universities, research centers, industries, and professional bodies.
- Enhance leadership qualities among the youth understanding of ethical values and environmental realities

3. About the School of Basic and Applied Sciences

The School of Basic and Applied Science imparts both teaching and research through its four disciplines of Forensic Science, Chemistry, Mathematics and Forensic science.

SBAS imparts students' disciplinary knowledge, enhances their skills and ability, motivating them to think ingeniously, helping them to act independently and take decisions accordingly in all their scientific pursuits and other endeavours. It strives to empower its students and faculty members to contribute for the development of society and Nation.

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

4. School Vision and Mission

4.1 Vision

To be a premier school for advance learning and research in the field of basic and applied sciences.

4.2 Mission

1. Collaborations with national, international academic & research organisations and industries for knowledge creation, advancement, and application of innovative practises in sciences.

2. Create conducive environment for lifelong learning.

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

5. Programme offered by the school

5. 1. Bachelor of Sciences (Honours) in Forensic Science

The B.Sc. (Hons.) Forensic Science is an undergraduate academic program designed to provide students with a comprehensive foundation in the fascinating world of Forensic Science. This program offers a rigorous and engaging curriculum that covers diverse areas of basic and applied sciences. Students in this program will study fundamental principles of forensic science, engage in complex problem-solving, and enhance their analytical and critical thinking skills. Combining hands-on lab work with theoretical learning, they'll gain practical experience and a solid grasp of scientific research methods. The B.Sc. (Hons.) Forensic Science program prepares students for exciting career opportunities in scientific research, technology, education, and various other fields that require a strong grasp of Forensic Science principles and applications.

5.2 Duration

The minimum period required for the B.Sc. (Hons.) Forensic Science offered by the Department of Forensic Science shall extend over a period of three academic years.

The maximum period for the completion of the B.Sc. (Hons) Forensic Science offered by the department of Forensic Science shall be five years.

5.3. Career Avenues

Graduates can pursue careers in research and development (R&D) in industries, work as research scientists or assistants in academic and research institutions, or continue with higher education (M.Sc., PhD) leading to academic or specialized roles in Forensic Science. Opportunities also exist in sectors like govt. jobs, defence services, data science, finance, and competitive examinations.

5.4 Class Timings

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

5.5 Duration

The duration of this programme is four years (eight semesters) with multiple entry/exit options.

6. Definitions

- **Programme Outcomes (POs)**

Programme Outcomes are statements that describe what the students are expected to know and would be able to do upon the graduation. These relate to the skills, knowledge, and behavior that students acquire through the programme.

- **Programme Specific Outcomes (PSOs)**

Programme Specific Outcomes are statements about the various levels of knowledge specific to the given program which the student would be acquiring during the program.

- **Programme Educational Objectives (PEOs)**

Programme Educational Objectives of a degree are the statements that describe the expected achievements of graduates in their career, and what the graduates are expected to perform, achieve and how they will conduct professionally during the first few years after graduation.

- **Credit**

Credit refers to a unit of contact hours/tutorial hours per week or 02 hours of lab/practical work per week.

6.1 Programme Educational Objectives (PEO*)*

These are deferred outcomes measured few years after completion of the programme, where the graduates of this program will:

PEO1: Graduates will evolve into proficient professionals, well-suited for roles in government, corporate, and research arenas, while also possessing the acumen for entrepreneurial pursuits in various interdisciplinary areas of forensic science.

PEO2: Graduates will demonstrate robust technical expertise to think critically and conduct thorough and accurate forensic analyses, interpreting results, and presenting findings effectively.

PEO3: Graduates will adhere to the ethical guidelines and legal frameworks governing the field, ensuring the responsible and unbiased application of forensic methodologies.

PEO4: Graduates will pursue lifelong learning and engage in advanced research, staying updated with emerging technologies and methodologies in forensic science.

PEO5: Graduates will demonstrate acumen for pursuing higher education and taking on roles in forensic laboratories, academic institutions, research or related industries, contributing to advancements in forensic science and public safety.

6.2 Programme Outcomes (PO)

At the end of the program, the students will be able to:

PO1- Critical Thinking: Develop high order critical thinking skills to address and resolve real world forensic issues.

PO2- Problem Solving: Develop problem solving skills and employ innovative approaches for effectively investigating and reconstructing crime scene, handling evidence, scientific instruments and legal reports.

PO3- Effective communication: Develop strong communication skills including reading, writing, listening, and speaking, to effectively express ideas and viewpoints.

PO4- Ethics: Apply ethical principles and commit to professional ethics, responsibilities, and norms in academic and industrial environment.

PO5- Interpersonal skills: Interact wisely and smartly within the society at personal and professional levels with a focus on achieving their target without affecting the societal harmony.

PO6- Environment and Sustainability: Practice and abide by processes required for a sustainable, healthy and safe environment and maintain contextual understanding of current environmental issues.

PO7- Team building and Leadership: Foster self-confidence, leadership and collaborative skills to navigate between multicultural and multidisciplinary environments.

6.3 Programme Specific Outcomes (PSO)

At the end of the program the students will be:

PSO 1: Understanding basic principles, concepts, techniques and theories in forensic science to build a strong foundational knowledge.

PSO 2: Applying appropriate forensic methodologies and techniques to analyze physical, biological, chemical and digital evidence in real-life crime scenarios and laboratory settings**.**

PSO 3: Analyzing complex civil and criminal cases to develop critical thinking and problem-solving skills, enabling the formation of well-informed conclusions while upholding ethical standards and legal compliance.

PSO 4: Evaluating the validity and efficacy of various forensic approaches and modify them to enhance the accuracy and reliability of forensic analyses.

PSO5: Observe and apply spatial awareness to reconstruct crime scenes, using technical skills to accurately position evidence and illustrate potential event sequences effectively.

PSO 6: Creating innovative strategies to address and tackle complex challenges during forensic investigations and provide expert testimony in court.

6 Student's Structured Learning Experience from Entry to Exit in the Programme

6.1 Education Philosophy and Purpose:

Learn to Earn a Living:
At KRMU we believe in equipping students with the skills, knowledge, and qualifications necessary to succeed in the job market and achieve financial stability. All the programmes are tailored to meet industry demands, preparing students to enter specific careers and contributing to economic development.

Learn to Live
The university believes in the holistic development of learners, fostering sensitivity towards society, and promoting a social and emotional understanding of the world. Our aim is to nurture well-rounded individuals who can contribute meaningfully to society, lead fulfilling lives, and engage with the complexities of the human experience.

6.2 University Education Objective: Focus on Employability and Entrepreneurship through Holistic Education using Bloom's Taxonomy

By targeting all levels of Bloom's Taxonomy—remembering, understanding, applying, analyzing, evaluating, and creating—students are equipped with the knowledge, skills, and attitudes necessary for the workforce and entrepreneurial success. At KRMU we emphasize on learners critical thinking, problem-solving, and innovation, ensuring application of theoretical knowledge in practical settings. This approach nurtures adaptability, creativity, and ethical decision-making, enabling graduates to excel in diverse professional environments and to innovate in entrepreneurial endeavours, contributing to economic growth and societal well-being.

6.3 Importance of Structured Learning Experiences

A structured learning experience (SLE) is crucial for effective education as it provides a clear and organized framework for acquiring knowledge and skills. By following a well-defined curriculum, teaching-learning methods and assessment strategies, learners can build on prior knowledge systematically, ensuring that foundational concepts are understood before moving on to more complex topics. This approach not only enhances comprehension but also fosters critical thinking by allowing learners to connect ideas and apply them in various contexts. Moreover, a structured learning experience helps in setting clear goals and benchmarks, enabling both educators and students to track progress and make necessary adjustments. Ultimately, it creates a conducive environment for sustained intellectual growth, encouraging learners to achieve their full potential. At K.R. Mangalam University SLE is

designed as rigorous activities that are integrated into the curriculum and provide students with opportunities for learning in two parts:

- **Inside the Classroom**: The approach emphasizes on cognitive outcomes through student-centred learning strategies. Methods like case studies, evidence analysis, and group investigations foster active engagement, problem-solving, and critical thinking. Students use open software tools for evidence collection and analysis for digital crimes to deepen their understanding of forensic concepts. Peer reviews, presentations, and collaborative discussions allow students to consolidate theoretical knowledge while honing analytical skills.
- **Outside the Classroom**: Activities focus on developing interpersonal and psychomotor skills through real-world forensic applications in labs, internships, and community engagements. Students participate in internships with law enforcement agencies, conduct lab-based forensic tests, and engage in community outreach projects. These experiences provide practical exposure, teamwork, and communication skills, allowing students to apply classroom knowledge in real-world forensic investigations and build essential competencies for professional practice in the field.

6.4 Educational Planning and Execution: What, when and how learning will happen

Plan – calendar, faculty, monitoring & review, correction & continuous improvement (short writeup)
The School of Basic and Applied Sciences (SBAS) emphasizes a holistic approach to educational planning and execution, ensuring that both academic and personal development are seamlessly integrated into the student experience. The curriculum encompasses core subjects that establish a solid academic foundation, complemented by open electives, discipline-specific electives, Value-Added Courses (VAC), and Ability Enhancement Compulsory Courses (AECC) to expand intellectual perspectives. In addition, students are offered the opportunity to pursue a Minor in fields such as Environmental Science, Data Science, Artificial Intelligence & Machine Learning, and Nanoscience, enhancing their specialization in the four-year bachelor's degree course. The selection of these minors happens in the first semester, continuing throughout the degree program.

The learning is thoughtfully planned across the curriculum. In the early stages, foundational knowledge and skills are built through core courses. As students' progress, learning becomes more specialized, with electives and minors supporting deeper exploration of disciplines. Co-curricular activities, including sports, technical events, and cultural activities, are integrated throughout to ensure all-around growth. Leadership training, teamwork, communication skills, and discipline are emphasized through structured personality development activities. Ethical values such as truthfulness, gender sensitization, and environmental consciousness are instilled from the outset, becoming a continuous part of the student journey.

At SBAS, learning is dynamic and flexible, utilizing a variety of teaching methods including lectures, case-based learning, problem-based learning, and project-based learning, all aimed at fostering critical thinking and problem-solving abilities. Hands-on learning is reinforced through lab sessions, internships,

research projects, and practical activities that connect theoretical knowledge to real-world applications. Workshops, seminars, and guest lectures from industry experts further provide practical insights and professional exposure. We have a strong students' support system in terms of differential learning (slow & fast learning), mentor-mentee system and personal counselling thereby ensuring students move up on the learning curve.

In terms of infrastructure, SBAS supports its academic planning with highly qualified faculty, smart classrooms, a well-equipped library, computer labs, and experimental research facilities. The inclusion of Massive Open Online Courses (MOOCs) and experiential learning ensures that students are prepared for both academic success and professional excellence. This carefully executed planning ensures that students are engaged at all levels of Bloom's Taxonomy, progressing from foundational understanding to higher-order thinking, while also fostering emotional, social, and ethical development. Continuous stakeholder feedback, including input from faculty, industry experts, students, and alumni, ensures that the curriculum remains relevant, aligned with academic advancements, and tuned to industry needs.

6.5 Course Registration and Scheduling

- ✓ **Major and Minor Selection** – Every student must register at the beginning of each semester for the courses offered in the given semester. Major courses are registered centrally for the students. However, for other multidisciplinary courses (Minor, VAC, OE) the students must register by themselves through ERP.

- ✓ **Internships/ Research Project**– Students need to do summer internship after second and fourth semesters, which carries 2 credits, during the summer breaks. The same will be evaluated in the upcoming odd semester. In the eighth semester students of B.Sc. (Hons. / Hons. with Research) Forensic Science will do Research Project (Dissertation). Projects are also mapped along with the Lab/ Practical Courses and Experiential Learning Activities.

- ✓ **Cocurricular Activities Credit Choices: Participation in Co/ Extracurricular activities is part of outside classroom learning.**
  Students must earn 2 credits from co/ extracurricular activities. One credit from participation in co-curricular activities like Club/Society activities and another credit from Community Service (1 credit each) through participation in NSS/ Redcross activities or NGOs that contribute to their personal development, leadership skills, and community engagement.
  - Under the category of **Club/Society**, 1 credit can be earned by registration in one of the Club/Societies of university and active participation in the events organized by the club/society **OR**
  - 15 hours of active engagement in any of the recreational/sports activities

  Under the category of **Community Service**, 1 credit can be earned by
  - 15 hours active engagement in community service through NGO/NSS/Redcross or any other society approved/ empanelled by the university.

- At the end of the semester, students are required to submit a log of hours, a report, and a certificate of participation/ completion summarizing their activities followed by a presentation.

6.6 Academic Support Services: (Differential learning needs)

The School of Basic and Applied Sciences offers a variety of academic support services tailored to meet the diverse learning needs of its students, ensuring success for all. These services include:

- **Personalized Tutoring**: One-on-one sessions with experienced tutors focus on specific areas such as laboratory techniques, experimental design, research projects, data analysis, and theoretical understanding. Tutoring is customized to each student's level, allowing for targeted support in areas like crystal structure analysis, magnetic properties, and dielectric behaviour.
- **Workshops and Seminars**: Regular workshops on topics such as advanced scientific research methods, materials characterization techniques, and the latest advancements in nanotechnology and superconductivity. These workshops, alongside industry connections, help students enhance both practical skills and theoretical knowledge.
- **Peer Mentoring Programs**: Advanced learners' mentor fellow students by leading study groups, assisting with assignments, and guiding practical projects, fostering a collaborative and supportive academic environment.
- **Accessible Learning Resources**: A variety of online platforms provide access to resources such as recorded lectures, research papers, interactive simulations, and experimental procedure guides, catering to different learning styles and enhancing independent study.
- **Outcome-Based Activities**: Students are encouraged to engage in hands-on practical, such as conducting experiments on material properties, to produce meaningful results. These outcomes are then showcased and celebrated, motivating students to further develop their skills.
- **Diversity and Inclusion Initiatives**: Programs promoting diversity and inclusion ensure that all students, regardless of background, feel valued and can contribute to a rich, collaborative learning environment.
- **Feedback and Assessment**: Continuous feedback mechanisms provide students with constructive evaluations of their work, allowing them to refine their techniques, improve their understanding, and achieve academic excellence.

6.7 Student Career & personal Support Services

- **Mentor Mentee Relationship**

Every student enrolled in the school is considered a mentee and will be assigned a faculty member as their mentor. The mentor's role is to guide and support the mentee, helping them grow both personally

and professionally. Mentors act as coaches by giving feedback, sharing advice, and offering insights from their own experiences. They also challenge the mentee's thinking, help them make important decisions, and connect them to valuable resources and networks. Additionally, mentors provide emotional support, celebrating successes and offering encouragement during tough times. On the other hand, the mentee's role is to actively participate in the learning process by planning meetings, setting goals, and communicating openly with their mentor. Mentees should also apply what they learn, continue growing outside the mentor-mentee relationship, and stay proactive in seeking new opportunities. By staying committed and enthusiastic, mentees can make the most of this relationship and achieve their goals.

- **Counselling and Wellness Services**

Counselling and wellness services typically encompass a range of resources to support students' mental health, emotional well-being, and overall quality of life. The school has various counselling programs such as individual Counselling where one-on-one sessions with licensed counsellors or psychologists are held to address personal issues, stress, and mental health concerns, **Group Counselling** which support groups for shared experiences like anxiety, depression, or adjustment challenges, **Crisis Counselling** for Immediate support for students in urgent situations or experiencing severe emotional distress, **Career Counselling** for guidance on career planning, job search strategies, and professional development and **Academic Counselling** for managing academic stress, time management, and study strategies. School also has various Wellness Services like On-campus clinics which provides medical care, including physical exams, vaccinations, and treatment for minor illnesses. Various mental health workshops on topics like stress management, mindfulness, and coping strategies are organized**.** All the students have access to gyms, fitness classes to promote physical health. These services aim to support students in maintaining a balanced and healthy lifestyle while managing the demands of university life.

- **Career Services and Training**

Career services and training programs are designed to support students in their professional development and job search. School provides personalized advice on career paths, goal setting, and job search strategies to students. They are given proper guidance on creating and refining job application materials. Mock interviews are also held. They are given opportunities to connect with alumni, professionals, and potential employers. Students are given professional training in areas like communication, leadership, and time management. These services and programs aim to prepare students for successful careers by enhancing their skills, providing practical experience, and connecting them with potential employers.

7. Assessment and Evaluation

7.1 Evaluation scheme for theory courses

Evaluation Component	Weightage
Internal Marks (Theory): - **I) Continuous Assessment (30 Marks)**	

(All the components to be evenly spaced) Projects/ Quizzes/ Assignments and Essays/ Presentations/ Participation/ Case Studies/ Reflective Journals (minimum of five components to be covered)	30 Marks
Mid Term Exam	20 Marks
External Marks (Theory): – End Term Examination	50 Marks

*** (It is compulsory for a student to secure 40% marks in the Internal and End Term Examination separately to secure minimum passing grade).**

Overview of Internal Evaluation (30 Marks) –

Internal evaluation is designed to assess students' ongoing learning and application of course materials through diverse assessment methods. Instructors have full autonomy within the 30 marks to employ assessment strategies that best align with the course's learning objectives.

Recommended Assessment Types: -

Projects: - Individual or group projects focusing on research, analysis, and practical application of concepts.

Quizzes: - Regular, short assessments to evaluate understanding of the material.

Assignments and Essays: - In-depth tasks to assess critical thinking and problem-solving skills.

Presentations: - Assessing knowledge dissemination and communication skills.

Participation: - Evaluation of engagement and contributions to class activities.

Case Studies: - Application of theoretical knowledge to real-world scenarios.

7.2 Evaluation scheme for practical courses

Particular	**Weightage**
Internal Marks (Practical): - I) Conduct of Experiment II) Lab Records III) Lab Participation IV) Lab Project	 10 Marks 10 Marks 10 Marks 20 Marks
External Marks (Practical): - End Term Practical and Viva Voce	50 Marks

*** (It is compulsory for a student to secure 40% marks in Internal and End Term Practical's and Viva Voce separately to secure minimum passing grade).**

7.3 Evaluation scheme for research project

Particular	Weightage
Internal Marks: - (Punctuality, Performance, Work Ethics, Efforts and Research Output)	50 Marks
External Marks (Practical): - Presentation Report Writing Viva Voce	50 Marks 20 10 20

*(**It is compulsory for the student to provide an internship certificate issued by the relevant institution or organization where they completed their internship during the evaluation process.)**

7.4. Evaluation scheme for internship

Particular	Weightage
Internal Marks: - Internship completion certificate obtained from supervisor from host institute.	30 Marks
External Marks (Practical): - Presentation Report Writing Viva Voce	70 Marks 25 25 20

*(**It is compulsory for the student to provide an internship certificate issued by the relevant institution or organization where they completed their internship during the evaluation process.)**

7.5 GRADING SYSTEM

Based on the performance in all evaluation components of a Course, each student will be awarded a final grade in the Course registered, at the end of the semester. The total marks obtained by a student in the Course will be converted to a corresponding letter grade as described below.

Marks Range (%)	Letter Grade	Grade Points	Description of the Grade
%marks > 90%	O	10.0	Outstanding
80 < %marks ≤ 90	A+	9.0	Excellent

70 < %marks ≤ 80	A	8.0	Very Good
60 < %marks ≤ 70	B+	7.0	Good
55 < %marks ≤ 60	B	6.0	Above Average
50 < %marks ≤ 55	C	5.5	Average
40 ≤ %marks ≤ 50	P	5.0	Pass
%marks < 40	F	0	Fail
-	AB	0	Absent
%marks ≥ 50	S	-	Satisfactory
%marks < 50	U	-	Unsatisfactory
-	W	0	Withdrawal

8. Feedback and Continuous Improvement Mechanisms

Teaching-learning is driven by outcomes. Assessment strategies and andragogy are aligned to course outcomes. Every CO is assessed using multiple components. The attainment of COs is calculated for every course to know the gaps between the desired and actual outcomes. These gaps are analysed to understand where does the student lags in terms of learning levels. Thereafter each student's learning levels are ascertained, if found below desirable level, and intervention strategy is affected in the following semester to make necessary corrections. To cater to the diverse learning needs of its student body, K.R. Mangalam University employs a comprehensive assessment framework to identify both slow and advanced learners. Students' learning levels are continually assessed based on their performance at various stages. If a student's performance in internal assessments falls below or equal to 55%, they are categorized as slow learners. Conversely, if a student's performance score in internal assessments is greater than or equal to 80%, they are identified as advanced learners. Such students are encouraged to participate in advanced learning activities. Through periodic evaluations and the utilization of modern management systems, the institution adeptly tracks students' performance across various courses, allowing for targeted interventions and support mechanisms.

9. Academic Integrity and Ethics

The School of Basic and Applied Sciences (SBAS) is committed to promoting safety and academic integrity by enforcing rigorous behavioural standards. Alcohol consumption and substance abuse are strictly prohibited, with escalating penalties for repeat offenders, which may include rustication. Ragging is also banned, adhering to UGC regulations and Supreme Court directives, and is managed through a comprehensive anti-ragging policy. The Anti-Ragging Committee, led by student affairs advisors and comprising diverse members, is tasked with handling ragging complaints and making recommendations. The Anti-Ragging Squad plays a proactive role by monitoring the campus, patrolling potential ragging hotspots, and investigating incidents. Penalties for violations can range from suspension and withholding benefits to expulsion and filing an FIR, in line with UGC regulations.

Sexual harassment in any form is taken very seriously and will be addressed by the Internal Committee Against Sexual Harassment in accordance with the Institute's policies.

The school also enforces strict penalties for other forms of misconduct, including possession of weapons, theft, and misuse of Institute property or facilities. These actions are subject to severe disciplinary measures.

Academic integrity is a cornerstone of SBAS's research and educational missions. It encompasses honesty, responsibility, and the proper acknowledgment of others' contributions. Violations such as plagiarism and cheating are treated as serious offenses. Students are required to follow principles of academic integrity, including proper citation, ethical data collection, and respect for others' work. Examples of misconduct include copying, falsifying data, and submitting purchased materials. The Institute provides guidelines for accurate record-keeping, truthful reporting, and proper attribution to uphold high academic standards.

Both individual and collective responsibility are emphasized in maintaining academic integrity. Students must ensure their theses are free from plagiarism and original before submission and are encouraged to report any violations. Faculty members are responsible for guiding students in proper research methods, ensuring accurate data recording, and reviewing student work. Additionally, faculty must educate students on academic integrity and address any breaches.

Reporting academic violations involves several steps. Faculty members should report breaches to the School Dean, and any student-faculty conflicts are managed by the Dean with committee support. The Director may appoint a committee to investigate scientific misconduct. Penalties for academic breaches are severe, with initial offenses resulting in warnings or an "F" grade, and repeat offenses potentially leading to expulsion.

Students must also seek permission before engaging with media on behalf of the Institute or recording classroom activities. Unauthorized sharing of audio/video clippings or posting derogatory comments on social media is prohibited. Misconduct can be reported by students, staff, or faculty, and penalties may include warnings, community service, restrictions, fines, withholding grades, suspension, expulsion, or a ban on reapplying for admission. The disciplinary process involves a hearing, documentation, and recommendations by a committee, with final actions decided by the Dean and enforced by the academic office. Repeat offenders face harsher penalties.

10. Programme Study

S. No.	Course Code	Course	L	T	P	C	Hours/week	Category of Course
1	**SCFS101**	Introduction to Forensic Science	3	0	0	3	3	Core
2	**SCFS103**	Crime and society	3	0	0	3	3	Core
3	**UCH101**	Inorganic and Organic chemistry-I	3	0	0	3	3	Core

4	**UCH151**	Practical-Chemistry I	0	0	2	1	2	Core (Practical)
5	**SCFS105**	Cyber Forensics I	2	0	0	2	2	Core
6	**SEC078**	Forensic Practical I	0	0	4	2	4	SEC I
7	**VAC**	EVS + Disaster	2	0	0	2	2	VAC I
8	**SCFS107/SCFS109**	Choose any one (Group A or Group B)	3	0	0	3	3	DSE I
9	**CS001**	Co-curricular activities-I				1		
Total						**20**	**22**	

S. No.	Course Code	Course	L	T	P	C	Hours/week	Category of Course
1	**SCFS102**	Forensics Dermatoglyphics	3	0	0	3	3	Core
2	**SCFS104**	Questioned Document	3	0	0	3	3	Core
3	**UCH102**	Chemistry of elements	3	0	0	3	3	Core
4	**UCH152**	Practical-Chemistry II	0	0	2	1	2	Core (Practical)
5	**SCFS106**	Basics of Digital Forensics	2	0	0	2	2	Core
6	**SEC079**	Forensic Practical II	0	0	4	2	4	SEC II
7	**VAC**	Indian constitution	2	0	0	2	2	VAC II
8	**SCFS108/SCFS110**	Choose any one (Group A or Group B)	3	0	0	3	3	DSE II
9	**OEC**	Choose any one	3	0	0	3	3	OEC I*
10	**CS002**	Co-curricular activities-II				1		
Total						**23**	**25**	

S. No.	Course Code	Course	L	T	P	C	Hours/week	Category of Course
1	**SCFS201**	Forensic Ballistics and Explosives	4	0	0	4	4	Core

2	**SCFS203**	Forensic Biology and Serology	4	0	0	4	4	Core
3	**UCH103**	Physical chemistry	3	0	0	3	3	Core
4	**UCH153**	Practical-Chemistry III	0	0	2	1	2	Core (Practical)
5	**SCFS205**	Cyber Forensics II	3	0	0	3	3	Core
6	**SEC080**	Forensic Practical III	0	0	4	2	4	SEC III
7	**AEC**	New Age Life Skills	3	0	0	3	3	AEC I
8	**SCFS207/SCFS209**	Choose any one (Group A or Group B)	3	0	0	3	3	DSE III
9	**SIFS001**	Evaluation of summer internship-I	0	0	0	2	0	SI
10	**OEC**	Choose any one	3	0	0	3	3	OEC II*
Total						**28**	**29**	

S. No.	Course Code	Course	L	T	P	C	Hours/week	Category of Course
1	**SCFS202**	Forensic Physics and Biometric System	4	0	0	4	4	Core
2	**SCFS204**	Forensic Anthropology	4	0	0	4	4	Core
3	**UCH104**	Analytical chemistry-I	3	0	0	3	3	Core
4	**UCH154**	Practical-Chemistry IV	0	0	2	1	2	Core (Practical)
5	**SCFS206**	Digital Forensics	2	0	0	2	2	Core
6	**VAC**	Instrumentation for forensics	2	0	0	2	2	VAC III
7	**SEC081**	Forensic Practical IV	0	0	4	2	4	SEC IV
8	**SCFS208/SCFS210**	Choose any one (Group A or Group B)	3	0	0	3	3	DSE IV
9	**AEC002**	Communication skills I	3	0	0	3	3	AEC II

10	**OEC**	Choose any one	3	0	0	3	3	OEC III*
Total						**27**	**30**	

S. No.	Course Code	Course	L	T	P	C	Hours/week	Category of Course
1	**SCFS301**	Forensic Medicine	4	0	0	4	4	Core
2	**SCFS303**	Forensic Chemistry and Toxicology	4	0	0	4	4	Core
3	**UCH105**	Inorganic and Organic chemistry-II	3	0	0	3	3	Core
4	**UCH155**	Practical-Chemistry V	0	0	2	1	2	Core (Practical)
5	**SCFS303**	Cyber Forensics III	3	0	0	3	3	Core
6	**SCFS351**	Forensic Practical V	0	0	4	2	4	Core (Practical)
7	**SCFS307/SCFS309**	Choose any one (Group A or Group B)	3	0	0	3	3	DSE V
9	**SIFS002**	Evaluation of summer internship-II	0	0	0	2	0	Summer Internship
Total						**22**	**23**	
1	**SCFS301**	Forensic Medicine	4	0	0	4	4	Core

S. No.	Course Code	Course	L	T	P	C	Hours/week	Category of Course
1	**SCFS302**	Entrepreneurial skills in Forensic Science	4	0	0	4	4	Core
2	**SCFS304**	Forensic Psychology	4	0	0	4	4	Core
3	**UCH106**	Physical and Organic chemistry	3	0	0	3	3	Core
4	**UCH156**	Practical-Chemistry VI	0	0	2	1	2	Core (Practical)

5	**SCFS306**	Advanced Digital Forensics	3	0	0	3	3	Core
6	**SCFS352**	Forensic Practical VI	0	0	4	2	4	Core (Practical)
7	**SCFS312**	Research Project	0	0	0	8	0	Core (DSC)
8	**SCFS308/SCFS310**	Choose any one (Group A or Group B)	3	0	0	3	3	DSE VI
Total						**28**	**23**	

11. Syllabi

FIRST SEMESTER

SCFS101	Introduction to Forensic Science	**L**	**T**	**P**	**C**
Version 1.0		3	0	0	3
Category of Course	Core				
Total Contact Hours	45 Hours				
Pre-requisites/ Co-requisites	--				

Course Perspective: This course offers an in-depth understanding of forensic science's evolution, principles, and its application in criminal investigations. It covers the development of forensic labs, evidence types, and the role of expert testimony in court. Students will learn about crime scene investigation, documentation, and crime scene reconstruction, equipping them with practical skills in forensic analysis and legal applicability. The course blends theoretical knowledge with hands-on approaches, preparing students for real-world forensic challenges.

Course Outcome: Students will be:

CO1: Understanding the history and development of forensic science, including its definitions, principles, and the organizational structure of forensic laboratories, as well as the processes involved in report writing and chain of custody.

CO2: Applying knowledge of crime scene investigation techniques by defining crime scenes, identifying challenges associated with different types of crime scenes, and employing effective documentation and evidence handling practices.

CO3: Analysing the applicability of various types of evidence in court, exploring the laws of evidence and the significance of expert testimony in establishing the admissibility of scientific evidence within the legal framework.

CO4: Performing crime scene reconstruction procedures by understanding the requirements for reconstruction, analysing modus operandi, and evaluating the roles and responsibilities of the investigating officer and expert teams.

CO5: Interpreting the importance of crime scene management and the various searching techniques used for locating physical evidence, as well as the impact of effective documentation on the overall investigation process.

Course contents
Section I: History and development of Forensic Science Definition, Description, Principles, Concept, Needs and scope. History of Forensic Science and Forensic Science Labs; Progressive development and transformation of Forensic Science Labs; Hierarchical set up of Central Forensic Science Laboratories, State Forensic Science Laboratories; Basic services and optional services; Main Authority, Organizational structure of Forensic Science Laboratory – roles and responsibilities, Sections/ Divisions, Services provided, Process of report writing and submission to court, Chain of custody.
Section II: Evidence Applicability in Court Definition, Various types of evidences, Laws of evidence, Expert's testimony and admissibility of scientific evidence in Court of Law.
Section III: Crime Scene investigation Defining a crime and crime scene, Importance of crime scene, Problems associated with crime scenes (indoor and outdoor), Location and processing of Crime Scene; Introduction to Crime Scene Management, Handling clues and evidence; Types of crime scenes, Primary, Secondary crime scene, Mobile, Indoor and Outdoor crime scenes; Searching techniques used for locating physical evidences at scene of crime; Crime Scene documentation, Barrication of Crime Scene, Crime Scene Photography, Videography; Sketching; Notes making.
Section IV: Crime Scene Reconstruction Procedure and requirement for Crime Scene Reconstruction, Modus operandi, Expert team constitution for different crime scenes, Roles of Investigating Officer.

Learning Experience: Students will engage with the historical and practical aspects of forensic science, starting with its foundational principles and progressing to real-world applications like crime scene management and evidence analysis. Through case studies, mock crime scenes, and reconstruction exercises, they will develop critical investigative skills, gain insights into forensic lab functions, and learn the importance of scientific evidence in court proceedings.

Textbook:

1. Bodziak, W., Footwear Impression Evidence (2nd Edn.) CRC Press, Boca Raton, Florida,2000.
2. DeForest, P., Gaensslen, R., and Lee, H., Forensic Science; an Introduction to Criminalistics, McGraw Hill, New York, 1983.
3. Fisher, B., Techniques of Crime Scene Investigation (6th Edn.) CRC Press, Boca Raton,Florida, 2000.

Suggested Readings:

1. James, S. H. And Nordby, J. J. (Eds), Forensic Science - An Introduction to Scientific and Investigative Techniques, CRC Press, London, 2003.
2. James, S., and Eskerc, W., Interpretation of Blood Stain Evidence at Crime Scenes,(2nd Edn) CRC Press, Boca Raton, Florida, 1999.

3. Saferstein, Richard, Criminalistics, An Introduction to Forensic Science, 6th Ed. Prentice-Hall, New Jersey, 1998.
4. Sharma, B. R., Forensic Science in Criminal Investigation and Trials (3rdEdn) UniversalLaw Publishing Co. Ltd. New Delhi, 2001.

Open Educational Resources (OER)

1. https://www.open.edu/openlearn/science-maths-technology/what-forensic-science
2. https://www.coursera.org/learn/forensic-science
3. https://www.futurelearn.com/courses/introduction-to-forensic-science

Examination Scheme:

Evaluation components	**Weightage**
Internal marks (Theory) **I. continuous assessment (30 marks)** All the components to be evenly spaced Project/quizzes/assignment and essays/presentation/ participation/case studies/reflective journals (minimum of five components to be evaluated)	**30 Marks**
II. internal marks (Theory): Mid Term Examination	**20 Marks**
III. External Marks (Theory): End Term Examination	**50 Marks**

It is compulsory for a student to secure 40% marks in Internal and End Term Examination separately to secure minimum passing grade

SCFS103	Crime and Society	**L**	**T**	**P**	**C**
Version 1.0		3	0	0	3
Category of Course	Core				
Total Contact Hours	45 Hours				
Pre-requisites/ Co-requisites	--				

Course Perspective: This course provides a foundational overview of criminology, exploring criminal behavior theories, crime types, and the criminal justice system. Students will learn about investigative

strategies, crime prevention, and the role of media, while examining Indian laws and global crime issues. It prepares students to analyze crime and understand justice system processes.

Course Outcome: Students will be:

CO1: Understanding the foundational concepts of criminology, encompassing definitions, aims, and scope, while exploring various theories of criminal behavior, including classical, positivist, and sociological perspectives.

CO2: Applying the fundamental elements of crime by investigating its nature, causes, and consequences, with a focus on specific categories such as hate crimes, organized crimes, and juvenile delinquency.

CO3: Analysing knowledge of the criminal justice system through an examination of its broad components, policing styles, investigative powers, and community policing strategies, emphasizing human rights within the Indian context.

CO4: Performing an evaluation of punishment methods and crime prevention measures, considering the legal framework established by the IPC and CrPC, and the role of the Law Commission of India in addressing global crime trends.

CO5: Interpreting the effects of social change on crime and deviant behavior, analyzing the media's role in shaping public perceptions of crime and its impact on investigative strategies

Course contents
Section I: Basics of Criminology Definition, aims and scope. Theories of criminal behavior – classical, positivist, sociological; Criminal anthropology; Criminal profiling; Understanding modus operandi. Investigative strategy. Role of media.
Section II: Fundamentals of crime Elements, nature, causes and consequences of crime. Deviant behavior. Hate crimes, organized crimes and public disorder, domestic violence and workplace violence, White Collar crime, Victimology, Juvenile delinquency, Social change and crime.
Section III: Criminal Justice System Broad components of criminal justice system. Policing styles and principles. Police's power of investigation; Filing of criminal charges. Community policing; Policing a heterogeneous society; Correctional measures and rehabilitation of offenders; Human rights and criminal justice system in India.
Section IV: Punishment and Crime Prevention Measures Introduction, Sections and Punishments for different types of crimes in India (IPC and CrPC), Approaches for crime prevention, Law Commission of India, Global crimes.

Learning Experience: Students will engage with key criminology concepts, from criminal profiling to crime prevention strategies. Through case studies and discussions, they will connect theory to practice, developing analytical skills to assess criminal behavior, justice system operations, and crime prevention approaches.

Textbooks:

1. DeForest, P., Gaensslen, R., and Lee, H., Forensic Science; An Introduction to Criminalistics, McGraw Hill, New York, 1983.
2. Ahuja R., Criminology, Rawat Publishers, 2001
3. Sharma B.R. Forensic Science In Criminal Investigation And Trials 6Th Edition 2020
4. Nabar B.S. Forensic Science in Crime Investigation, Asian Law House, 3rd Edition, 2019

Suggested Readings:

1. Crime and Punishment by Fyodor Dostoevsky.
2. The Rules of the Game by Albert K. Cohen.
3. The Professional Thief by Edwin H. Sutherland

Open Educational Resources (OER)

1. https://www.open.edu/openlearn/society-politics-law/an-introduction-crime-and-criminology/content-section-0
2. https://www.edx.org/learn/justice/harvard-university-justice
3. https://www.coursera.org/courses?query=criminology
4. https://bjs.ojp.gov/
5. https://www.interpol.int/en

Examination Scheme:

Evaluation components	**Weightage**
Internal marks (Theory) **I. continuous assessment (30 marks)** All the components to be evenly spaced Project/quizzes/assignment and essays/presentation/ participation/case studies/reflective journals (minimum of five components to be evaluated)	**30 Marks**
II. internal marks (Theory): Mid Term Examination	**20 Marks**
III. External Marks (Theory): End Term Examination	**50 Marks**

It is compulsory for a student to secure 40% marks in Internal and End Term Examination separately to secure minimum passing grade

UCH101	Inorganic and Organic chemistry-I	L	T	P	C
Version 1.0		3	0	0	3
Category of Course	Core				
Total Contact Hours	45 Hours				
Pre-requisites/ Co-requisites	--				

Course Perspective: Inorganic and Organic Chemistry-I offers a comprehensive exploration of the fundamental principles governing the structure, properties, and reactions of inorganic and organic compounds. Through lectures, laboratory experiments, and problem-solving exercises, you'll develop a strong understanding of chemical bonding, acid-base reactions, and organic functional groups. This course provides a solid foundation for further studies in chemistry or related fields.

Course Outcome: Students will be:

CO1: Understandingthe foundational principles of atomic structure, encompassing Dalton's atomic theory, atomic and molecular masses, the mole concept, and the roles of quantum numbers and atomic orbitals in determining electronic configurations.

CO2: Applying various concepts of acids and bases, including Arrhenius, Bronsted-Lowry, and Lewis theories, and evaluate the relative strengths of acids and bases across different chemical contexts.

CO3: Analyzing knowledge of organic chemistry by classifying hydrocarbons, mastering IUPAC nomenclature, and identifying various types of organic reactions, focusing on the roles of electrophiles, nucleophiles, and reactive intermediates.

CO4: Performing stereochemical analysis by exploring conformational relationships in hydrocarbons, interconverting molecular structure representations, and understanding chirality and optical isomerism.

CO5: Interpreting the significance of resonance and electron movement in organic reactions, elucidating how these concepts influence molecular stability and reactivity across diverse chemical scenarios.

Course contents
Section I: Atomic Structure Dalton's atomic theory: concept of elements, atoms and molecules. Atomic and molecular masses. Mole concept and molar mass: molarity, normality, molality, percentage composition, empirical and molecular formula. de Broglie matter waves, Heisenberg uncertainty principle, atomic orbitals, quantum numbers, shapes of s, p, d orbitals. Aufbau and Pauli exclusion principles, Hund's Multiplicity rule. Electronic configurations of the elements, effective nuclear charge, Slater's rules.
Section II: Concept of Acids and Bases Arrhenius, Bronsted – Lowry and Lewis concepts of acids & bases, relative strength of acids & bases, Concept of Hard and Soft Acids & Bases.

Section III: Organic Chemistry General introduction, Classification of hydrocarbons: Alkanes, Alkenes, Alkynes, Aromatic hydrocarbons. IUPAC nomenclature of branched and unbranched alkanes, the alkyl group, classification of carbon atoms in alkanes. Curved arrow notation, drawing electron movements with arrows, half-headed and double-headed arrows, homolytic and heterolytic bond breaking. Types of reagents – electrophiles and nucleophiles.Types of organic reactions. Reactive intermediates carbocations, carbanions, free radicals. Localized and delocalized chemical bond, resonance effect and its applications.
Section IV: Stereochemistry: Conformations with respect to ethane, butane and cyclohexane. Interco version of Wedge Formula, Newmann, Sawhorse and Fischer representations. Concept of chirality (upto two carbon atoms). Optical Isomerism: Optical Activity, Specific Rotation, Chirality/Asymmetry, Racemic mixture and resolution.

Learning Experience: Through a combination of theoretical concepts and practical applications, you'll gain a hands-on understanding of chemical reactions and phenomena. You'll have the opportunity to conduct experiments in the laboratory, analyze data, and solve problems related to atomic structure, acid-base reactions, and organic chemistry. This course is designed to foster critical thinking, problem-solving skills, and a lifelong appreciation for the fascinating world of chemistry.

Textbooks:

1. J. R. Partington 1969 A History of Chemistry, Volume 2, , Macmillan.
2. Eding Darrel D, 1970 Introductory Chemistry.
3. Odian George, 1990 General, Organic And Biological Chemistry.
4. "Stereochemistry of Carbon Compounds" by Eliel and Wilen.

Suggested Readings:

1. Organic Chemistry by Wade
2. Organic Chemistry by Morrison and Boyd
3. Organic Chemistry by Solomons and Fryhle
4. Advanced Inorganic Chemistry by F. A. Cotton and G. Wilkinson

Open Educational Resources (OER)

1. https://chem.libretexts.org/Bookshelves/Organic_Chemistry
2. https://www.organic-chemistry.org/
3. https://www.masterorganicchemistry.com/
4. https://openstax.org/details/books/chemistry-2e/

5. https://chem.libretexts.org/Courses/Kutztown_University_of_Pennsylvania/CHM_320%3A_Advanced_Inorganic_Chemistry_**Textbook**/05%3A_Coordination_Chemistry_I_Structure_and_Isomers/5.06%3A_Hard_and_Soft_Acids_and_Bases

Examination Scheme:

Evaluation components	**Weightage**
Internal marks (Theory) **I. continuous assessment (30 marks)** All the components to be evenly spaced Project/quizzes/assignment and essays/presentation/ participation/case studies/reflective journals (minimum of five components to be evaluated)	**30 Marks**
II. internal marks (Theory): Mid Term Examination	**20 Marks**
III. External Marks (Theory): End Term Examination	**50 Marks**

It is compulsory for a student to secure 40% marks in Internal and End Term Examination separately to secure minimum passing grade

SCFS107	Basics of Biology	**L**	**T**	**P**	**C**
Version 1.0		3	0	0	3
Category of Course	DSE				
Total Contact Hours	45 Hours				
Pre-requisites/ Co-requisites	--				

Course Perspective: A Basics of Biology course explores the fundamental building blocks of life. It delves into the characteristics that define living organisms, investigates the structure and function of cells, and examines the essential molecules that compose them. Additionally, the course explores the vital cellular processes, genetics and heredity, evolution and biodiversity, and the interactions between organisms and their environment.

Course Outcome: Students will be:

CO1: Understanding the fundamental concepts of cellular structure and organization, including the distinctions between prokaryotic and eukaryotic cells and the specific structures of plant and animal cells.

CO2: Applying the composition and functions of cell organelles such as mitochondria, chloroplasts, endoplasmic reticulum, Golgi apparatus, lysosomes, and the nucleus, including their roles in cellular metabolism and genetic information processing.

CO3: Analyzing knowledge of the cell cycle, including the processes of interphase, mitosis, and meiosis, and evaluate the molecular controls regulating cell division.

CO4: Performing a comparative analysis of plant anatomy, focusing on the morphology and functions of leaves, stems, flowers, and roots, as well as the mechanical and conducting tissue systems in plants.

CO5: Interpreting the significance of cellular components and processes in the broader context of plant growth and development, integrating knowledge of cell biology and anatomy.

Course contents
Section I: The Cell, Structural unit of life, History of cell, Organization of Prokaryotic & eukaryotic Cell, Structure of Plant and animal cell
Section II: Cell Organelles Mitochondria: composition; mitochondrial biogenesis; Semiautonomous nature ;Symbiont hypothesis; Proteins synthesized within mitochondria; mitochondrial DNA Chloroplast: Structure composition; semiautonomous nature, chloroplast DNA ER, Golgi body & Lysosomes: Structures and roles, Lysosome formation. Nucleus: Nuclear Envelope- structure of nuclear pore complex. Cell Membrane and Cell Wall: Models of membrane structure; the fluidity of membranes; Membrane proteins and their functions
Section III: Cell Cycle: Interphase, Mitosis and Meiosis Role of Cell division; Overview of Cell cycle; Molecular controls; Meiosis
Section IV: Plant anatomy Morphology of leaves, stem, flower and roots; mechanical and conducting tissue systems in plants.

Learning Experience: A Basics of Biology course offers a comprehensive exploration of the fundamental principles of life. Through lectures, laboratory work, and hands-on activities, you'll gain a deep understanding of cellular processes, genetics, evolution, and ecology. This course provides a strong foundation for further studies in biology or related fields and fosters a lifelong appreciation for the natural world.

Textbooks:

1. I.E. Celis Cell biology Academic Press 2nd Edition.
2. Robertis & Robertis Cell & Microbiology 8th Edition.
3. M.S. Leffel, A.D. Donnenberg & N.R. Rose Handbook of Human Immunology CRC press, 1997
4. Essentials of Human Genetics by S.M. Bhatnagar et al (1999) IV edition. Orient Longman.
5. Basic Human Genetics by E.J. Manage and A.P. Manage (1997 India Reprint) Rastogi Publications, Meerut.

6. Mendelian inheritance in Man: Catalogues of Autosomal recessive and x-linked phenotypes.[12teditions – 1998] by McKusick, V.A. Johns Hopkins university press, Baltimore.

Suggested Reading:

1. Principles and Practice of Medical Genetics, by Emery, A.E.H and D.L. Rimoin (Eds_ (1990-2nd edition) Churchill Livingstone, Edinburgh.
2. Human Genetics by S.D. Gangane (2nd edition-Reprint 2001), B.L Churchill Livingstone Pvt.Ltd., New Delhi.
3. Genetics in Medicine by M.W. Thompson et al, 5th Edition, W.B. Sounders Company, London.

Open Educational Resources (OER)

1. LibreTexts Chemistry: https://chem.libretexts.org/
2. Chemistry for Majors: https://lumenlearning.com/courses/chemistry-for-majors/
3. Organic Chemistry: A Comprehensive Approach: https://open.umn.edu/open**Textbook**s/subjects/chemistry?page=2&scroll=true
4. ChemCollective: https://chemcollective.org/
5. Khan Academy: https://www.khanacademy.org/science/organic-chemistry
6. PhET Interactive Simulations: https://phet.colorado.edu/en/simulations/browse

Examination Scheme:

Evaluation components	**Weightage**
Internal marks (Theory) **I. continuous assessment (30 marks)** All the components to be evenly spaced Project/quizzes/assignment and essays/presentation/ participation/case studies/reflective journals (minimum of five components to be evaluated)	**30 Marks**
II. internal marks (Theory): Mid Term Examination	**20 Marks**
III. External Marks (Theory): End Term Examination	**50 Marks**

It is compulsory for a student to secure 40% marks in Internal and End Term Examination separately to secure minimum passing grade

SCFS109	Elements of Physics	**L**	**T**	**P**	**C**
Version1.0		3	0	0	3
Category of Course	DSE				
Total Contact Hours	45 Hours				

Pre-requisites/ Co-requisites	--

Course Perspective: An Elements of Physics course provides a foundational understanding of the fundamental laws and principles governing the physical world. It explores concepts such as motion, forces, energy, matter, and waves, laying the groundwork for further studies in physics and related fields. Through lectures, laboratory experiments, and problem-solving exercises, students develop critical thinking skills and a deeper appreciation for the underlying structure of the universe.

Course Outcome: Students will be:
CO1: Understanding the fundamental nature of light, including Planck's quantum theory, the photoelectric effect, and the properties of photons and matter waves.
CO2: Applying kinetic energy and work, including the work-energy theorem and conservation of energy in mechanical systems.
CO3: Analyzing atomic physics concepts such as the Rutherford and Bohr models, quantum numbers, and the hydrogen spectrum to explain atomic structure.
CO4: Performing calculations involving radioactive decay, including mean life, half-life, and energy released during fission and fusion processes.

Course contents
Section I: Light's nature: Planck's quantum, Planck's constant and light as a collection of photons; Photoelectric effect and Compton scattering. De Broglie wavelength and matter waves; Davisson-Germer experiment
Section II: Kinetic energy and work Energy, kinetic energy, work, work done by gravitational force, work done by spring force, power, work and potential energy, conservation of energy, work energy theorem.
Section III: Atomic Physics Rutherford model, Bohr atomic model, quantum numbers, Pauli's exclusion principle, hydrogen spectrum, - series(Lyman, Balmer, Paschen, Bracket and fund), vector atom model.
Section IV: Radioactivity: stability of nucleus; Law of radioactive decay; Mean life and half-life; decay; decayenergy released, spectrum and Pauli's prediction of neutrino; X-ray emission. Fission and fusion-mass decit, relativity and generation of energy; Fission - nature of fragments and emission of neutrons. Nuclear reactor: slow neutrons interacting with Uranium 235; Fusion and thermonuclear reactions

Learning Experience: A Basics of Physics course offers a comprehensive exploration of the fundamental principles of life. Through lectures, laboratory work, and hands-on activities, you'll gain a

deep understanding of cellular processes, genetics, evolution, and ecology. This course provides a strong foundation for further studies in biology or related fields and fosters a lifelong appreciation for the natural world.

Textbooks:

1. Amato, Joseph (December 1996). "The introductory calculus-based physics Textbook". PhysicsToday 49 (12): 46–51.
2. Thomas Brody (1993.) "The Philosophy Behind Physics" pp 18–24 (Chapter 2)

Suggested Reading:

1. OpenStax College Physics: https://openstax.org/details/books/college-physics-2e/
2. University Physics Volume 1, 2, and 3: https://openstax.org/details/books/university-physics-volume-1/.
3. College Physics for AP Courses: https://openstax.org/details/books/college-physics-ap-courses-2e/

Open Educational Resources (OER)

1. PhET Interactive Simulations: https://www.colorado.edu/csl/programs/phet-interactive-simulations
2. Khan Academy Physics: https://www.khanacademy.org/science/physics
3. MIT OpenCourseWare: https://ocw.mit.edu/courses/physics/

Examination Scheme:

Evaluation components	**Weightage**
Internal marks (Theory) **I. continuous assessment (30 marks)** All the components to be evenly spaced Project/quizzes/assignment and essays/presentation/ participation/case studies/reflective journals (minimum of five components to be evaluated)	**30 Marks**
II. internal marks (Theory): Mid Term Examination	**20 Marks**
III. External Marks (Theory): End Term Examination	**50 Marks**

SCFS105	Cyber Forensics I	**L**	**T**	**P**	**C**
Version 1.0		2	0	0	2
Category of Course	Core				
Total Contact Hours	30 Hours				
Pre-requisites/ Co-	--				

requisites	

Course Perspective: A cyber forensics course provides a comprehensive understanding of digital evidence collection, analysis, and presentation. It equips students with the skills to investigate cybercrimes, recover deleted data, and identify digital footprints. The course covers legal and ethical considerations, advanced forensic techniques, and emerging threats in the digital landscape.

Course Outcome:

CO1: Understanding the fundamental components of computer organization, including input/output devices, CPU, and memory hierarchy.

CO2: Applying various types of digital crimes and the role of forensics in investigating and collecting digital evidence.

CO3: Analyzing knowledge of file systems (FAT32, NTFS, APFS) and data structures (bit, byte, sector) in digital forensics investigations.

CO4: Performing techniques for imaging, extraction, and analysis of data from computer devices in forensic examinations.

CO5: Interpreting advancements in computer forensics tools and methodologies for effective evidence collection and preservation.

Course contents
Section I: Introduction to computers Basics of Computer organization,Components of computers – Input & Output devices, CPU Memory Hierarchy and types of Memory (RAM and ROM and their types) external storage devices Application Software and System Software.
Section II: Introduction to Cyber crimes Introduction to Cybercrimes and its type: Online scams and frauds- email scams, Phishing, Vishing, Smishing, Online job fraud, Online sextortion, Debit/ credit card fraud, Online payment fraud, Cyberbullying, website defacement, Cyber- squatting, Pharming, Cyber espionage, Cryptojacking, Darknet Associated crimer- illegal trades, drug trafficking, human trafficking.
Section III: Acts and standards Provision in Indian laws in dealing with cybercrimes and its critical analysis, IT act 2000, Penalties under IT act, Offences under IT act, Establishment of authorities under IT act and their functions, power etc. Intellectual Property Rights, Patent, Copyright, Trademark. Cyber Crime against Person, Cyber Crime against Organization, Penalties and Compensation, Objective, Applicability and Jurisdiction, Cyber Police stations, Crime reporting procedure, Case studies.

Section IV: Introduction to Operating System Introduction to Operating System (Batch Operating System, Distributed operating system, etc.),Basics of Operating System, memory structure, concurrency, scheduling, synchronization & memory management, process description and control. Application Software and System Software.

Learning Experience: A Basics of Computer Science course offers a comprehensive exploration of computer fundamentals. It covers computer organization, components, digital crimes, and forensics. You'll learn about hardware, software, memory, storage, and the legal aspects of digital evidence. The course also delves into advanced techniques for computer forensics, including tools and methods for analyzing digital data.

Textbooks:

1. Fundamentals of Computers –P. K. Sinha; BPB Publication
2. Fundamentals of computers –V Rajaraman; Prentice Hall of India
3. Introduction to Information Technology: Leon and Leon; Leon Tech World
4. Information Technology in Business Management: MukeshDhunna& and J. B. Dixit; LaxmiPublications, New Delhi.
5. Computer Applications in Business Management: Versha Mehta, N. Kumar; AnmolPublications

Suggested Readings:

1. File System Forensic Analysis by Brian Carrier
2. Incident Response & Computer Forensics by Ron Krutz and Russell Dean
3. Mobile Device Forensics by Chris Maynard
4. Network Forensics by Harold F. Tipton

Open Educational Resources (OER)

1. OER Commons: https://oercommons.org/
2. OpenStax: https://openstax.org/
3. MIT OpenCourseWare: https://ocw.mit.edu/
4. Coursera: https://www.coursera.org/
5. edX: https://www.edx.org/

Examination Scheme:

Evaluation components	Weightage

Internal marks (Theory) **I. continuous assessment (30 marks)** All the components to be evenly spaced Project/quizzes/assignment and essays/presentation/ participation/case studies/reflective journals (minimum of five components to be evaluated)	**30 Marks**
II. internal marks (Theory): Mid Term Examination	**20 Marks**
III. External Marks (Theory): End Term Examination	**50 Marks**

It is compulsory for a student to secure 40% marks in Internal and End Term Examination separately to secure minimum passing grade

VAC	EVS + Disaster	**L**	**T**	**P**	**C**
Version1.0		2	0	0	2
Category of Course	VAC				
Total Contact Hours	30 Hours				
Pre-requisites/ Co-requisites	Basics of Enviroment				

Course Perspective: A course in EVS and disaster management provides a holistic understanding of the environment and its interconnectedness with human society. It explores environmental issues, sustainable practices, and the principles of disaster preparedness, response, and recovery. By studying these topics, students can develop a sense of environmental responsibility and contribute to building resilient communities.

Course Outcome: Students will be:

CO1: Understanding the structure and function of ecosystems and energy flow through food chains and webs.

CO2: Applying the impact of natural resource management and the effects of deforestation and water over-exploitation.

CO3: Analyzing concepts of biodiversity conservation and identify strategies for protecting endangered species in India.

CO4: Performing assessments of environmental pollution and propose effective control measures.

CO5: Interpreting the relationship between human communities and the environment, emphasizing disaster management and ethical conservation practices.

Course Content
Section I: Ecosystem: Ecosystem, structure and function of ecosystem Energy flow in an ecosystem: food chains, food webs and ecological succession. Case studies of the following ecosystems: Forest ecosystem; Grassland ecosystem; desert ecosystem; aquatic ecosystem.
Section II: Natural Resources: Renewable and Non Renewable Resources: Land resources andland 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. Biodiversity and Conservation: Levels of biological diversity : genetic, species and ecosystem diversity; Biogeographic zones of India; Biodiversity patterns and global biodiversity hotspots; 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.
Section III: Environmental Pollution: Environmental pollution: types, causes, effects andcontrols; Air, water, soil and noise pollution; Nuclear hazards and human health risks; Solid waste management: Control measures of urban and industrial waste.; Environmental legalization and implementation in India. Environmental Policies & Practices: Sustainability and sustainable development.; Climate change, global warming, ozone layer depletion, acid rain and impacts on human communities andagriculture; Environment Laws: Environment Protection Act; Air (Prevention & Control ofPollution) Act; Water (Prevention and control of Pollution) Act; Wildlife Protection Act; Forest Conservation Act.; Nature reserves and human wildlife conflicts in Indian context.
Section IV: Human Communities and the Environment: Human population growth: Impacts on environment, human health and welfare.; Disaster management: floods, earthquake, cyclones and land slides.; Environmental movements: Chipko, Silent valley, Bishnois of Rajasthan.; Environmental ethics: Role of Indian and other religions and cultures in environmental conservation. Field Work: Visit to an area to document environmental assets: river/ forest/ flora/fauna,etc.; Visitto 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.

Learning Experience (describe how the course will be conducted and made experiential and participatory. Include the methods of instruction, use of technology, and the types of activities like case studies, hands-on learning, group work, assignments, and classroom and outside classroom experiences, and assessments that students will engage in to achieve the learning outcomes. Besides mentioning the support and feedback that shall be given, for eg course in charge will be available for additional support

and feedback, students are encouraged to seek help as needed. Students will have opportunities to collaborate and support each other through group activities and peer reviews).

Textbooks:

1. Bharucha, E. 2003, **Textbook** for Environmental Studies, University Grants Commission, New Delhi and Bharati Vidyapeeth Institute of Environmental Education and Research, Pune. 361.
2. Carson, Rachel. 1962. Silent Spring (Boston: Houghton Mifflin, 1962), Mariner Books, 2002
3. Economy, Elizabeth. 2010. The River Runs Black: The Environmental Challenge to China's Future.
4. Gadgil, M. &Ramachandra, G. 1993. This fissured land: an ecological history of India. Univ of California Press.

Suggested Reading:

1. Gleeson, B. and Low, N. (eds.) 1999. Global Ethics and Environment, London, Routledge.
2. Grumbine, R. Edward, and Pandit, M.K. Threats from India's Himalaya dams. Science 339.6115 (2013): 36-37.
3. Heywood V.H. & Watson, R.T. 1995. Global Biodiversity Assessment. Cambridge University Press.
4. McCully, P. 1996. Silenced rivers: the ecology and politics of large dams. Zed Books.
5. McNeill, John R. 2000. Something New Under the Sun: An Environmental History of the Twentieth Century.

Odum, E.P., Odum, H.T. & Andrews, J. 1971. Fundamentals of Ecology. Philadelphia: Saunders.

Open Educational Resources (OER)

http://diksha.gov.in/

https://oercommons.org/

https://ndma.gov.in/

https://ncert.nic.in/**Textbook**.php

https://ncert.nic.in/desm/material-for-teachers.php

Examination Scheme:

Evaluation components	**Weightage**
Internal marks (Theory) **I. continuous assessment (30 marks)** All the components to be evenly spaced Project/quizzes/assignment and essays/presentation/ participation/case studies/reflective journals (minimum of five components to be evaluated)	**30 Marks**
II. internal marks (Theory): Mid Term Examination	**20 Marks**

III. External Marks (Theory): End Term Examination	**50 Marks**

It is compulsory for a student to secure 40% marks in Internal and End Term Examination separately to secure minimum passing grade

UCH151	Practical-Chemistry I	**L**	**T**	**P**	**C**
Version 1.0		0	0	2	1
Category of Course	Core (Practical)				
Total Contact Hours	30 Hours				
Pre-requisites/ Co-requisites	--				

Course Perspective: The Chemistry Practical 1 course offers a hands-on approach to fundamental techniques in pH determination, buffer preparation, and organic reaction mechanisms. Students will explore the application of pH meters, indicators, and pH papers to assess solution acidity or alkalinity. By conducting buffer preparation and identifying organic compounds based on functional groups, learners gain practical exposure to essential chemistry concepts. This course builds the skills necessary for advanced experimental chemistry, fostering a deeper understanding of both theoretical and applied chemistry.

Course Outcome: Students will be:

CO1: Understanding the principles and techniques for determining the pH of various solutions using pH paper, pH meters, and universal indicators, and their significance in chemical analysis.

CO2: Applying the preparation of buffer solutions, including their composition and function, and determine their pH to understand their role in maintaining pH stability.

CO3: Analyzing knowledge of organic chemistry by performing and observing simple organic reactions, such as substitution, addition, and elimination, while accurately writing the corresponding reaction mechanisms.

CO4: Performing systematic identification of organic compounds by recognizing functional groups including alcohols, aldehydes, ketones, carboxylic acids, esters, and amines through qualitative analysis.

CO5: Interpreting the results of pH measurements and organic reaction observations to draw conclusions about chemical behavior and functional group presence in various organic compounds.

Course contents

1. Determination of the pH of different solutions using pH paper, pH meter, and universal indicators.
2. Preparation of buffer solutions and determination of their pH.

3. Performing and observing simple organic reactions (e.g., substitution, addition, and elimination) and writing the corresponding reaction mechanisms.
4. Systematic identification of organic compounds containing functional groups like alcohols, aldehydes, ketones, carboxylic acids, esters, and amines.

Learning Experience:

Students will engage in a laboratory setting to determine pH using various techniques, allowing them to compare the accuracy and utility of different tools. They will prepare buffer solutions and observe the role of pH in maintaining chemical stability. Through organic reactions, students will practice writing mechanisms, enhancing their problem-solving skills in organic chemistry. The systematic identification of functional groups introduces critical analytical techniques, helping students develop competency in qualitative analysis of organic compounds.

Textbooks:

1. J. R. Partington 1969 A History of Chemistry, Volume 2, , Macmillan.
2. Eding Darrel D, 1970 Introductory Chemistry.
3. Odian George, 1990 General, Organic And Biological Chemistry.

Suggested Reading:

1. Vogel's **Textbook** of Practical Organic Chemistry by B.S. Furniss, A.J. Hannaford, P.W.G. Smith, and A.R. Tatchell.
2. A Guide to pH Measurement by Hanna Instruments.
3. Organic Chemistry by Jonathan Clayden, Nick Greeves, and Stuart Warren.
4. Laboratory Manual of Organic Chemistry by Raj K. Bansal

Open Educational Resources:

1. Organic Reaction Mechanisms

Examination Scheme

Evaluation components	**Weightage**
Internal marks (practical) I. Conduct of experiment II. Lab Record III. Lab Participation IV. Lab Project	 **10 Marks** **10 Marks** **10 Marks** **20 Marks**
II. External Marks (practical) End Term Examination	**50 Marks**

It is compulsory for a student to secure 40% marks in Internal and End Term Examination separately to secure minimum passing grade

SEC078	Forensic practical I	**L**	**T**	**P**	**C**
Version 1.0		0	0	4	2
Category of Course	SEC				
Total Contact Hours	60 Hours				
Pre-requisites/ Co-requisites	--				

Course Perspective: It is a foundational exercise in forensic science, providing a hands-on opportunity to apply theoretical concepts. It focuses on crime scene investigation, sketching, photography, note-taking, searching, and camera basics. Students will learn to identify, document, and preserve evidence at crime scenes, create accurate sketches, capture relevant details through photography, record observations and evidence, employ various searching methods, and understand the parts and functions of a camera. This practical experience not only develops essential skills for forensic professionals but also fosters attention to detail, problem-solving abilities, and teamwork. Additionally, students will be introduced to the ethical considerations involved in crime scene investigation.

Course Outcomes: - Students will be:

CO1: Understanding the methodologies for investigating and sketching both indoor and outdoor crime scenes, emphasizing the importance of accuracy and detail in documentation.

CO2: Perform effective crime scene photography techniques for indoor and outdoor environments, ensuring that key evidence and contextual elements are captured accurately.

CO3: Analyzing proper note-taking procedures during crime scene investigations, ensuring that all observations and actions are thoroughly documented for later analysis and reference.

CO4: Demonstrate proficiency in the packaging and forwarding of evidence, including the construction of envelopes using the druggist fold method and adherence to sealing procedures.

CO5: Analyze the components of a camera and their functions in relation to crime scene photography, enhancing the quality and utility of visual evidence collected during investigations.

Course contents
1. Investigation and sketching of indoor scene of crime.
2. Investigation and sketching of outdoor scene of crime.
3. Crime Scene Photography: indoor, outdoor.
4. Notes making.
5. Searching of crime scene.
6. Parts of camera.

7. Packaging and forwarding. 8. Envelop making and Druggist fold method. 9. Sealing procedure.

Learning Experience: It is a foundational exercise in forensic science, providing a hands-on opportunity to apply theoretical concepts in a real-world setting. Students will develop meticulous observation and attention to detail as they identify, document, and preserve evidence at crime scenes. They will also enhance their problem-solving skills by navigating the challenges of crime scene investigation and making informed decisions. Additionally, the practical will foster teamwork and communication skills as students collaborate to effectively process crime scenes. Finally, students will gain an understanding of the ethical implications of crime scene investigation, emphasizing the importance of preserving evidence integrity and respecting the rights of victims and their families.

Textbooks:

1. A Glencoe Program Physics principles and problems: Forensic Laboratory Manual Student edition.
2. Thomas Kubic, Nicholas Petraco Forensic Science Laboratory Manual and Workbook, Third Edition 2009.
3. Kathy Mirakovits, Gina Londino, The Basics of Investigating Forensic Science: A Laboratory Manual 2015.

Suggested Readings:

1. Digital Photography for Crime Scene Investigators by David H. Garvin
2. Washington state patrol Forensic Laboratory services: Crime Laboratory: Technical & Training Manuals.

Open Educational Resources (OER)

1. https://lsc.cornell.edu/how-to-study/taking-notes/cornell-note-taking-system/
2. https://www.nationalgeographic.com/photography/article/digital-photography-tips
3. https://www.fbi.gov/how-we-can-help-you/more-fbi-services-and-information/identity-history-summary-checks

Evaluation Scheme

Evaluation components	**Weightage**
Internal marks (practical) I. Conduct of experiment II. Lab Record III. Lab Participation IV. Lab Project	 **10 Marks** **10 Marks** **10 Marks** **20 Marks**

II. External Marks (practical) End Term Examination	**50 Marks**

It is compulsory for a student to secure 40% marks in Internal and End Term Examination separately to secure minimum passing grade

SYLLABUS
SECOND SEMESTER

SCFS102	Forensic Dermatoglyphics	**L**	**T**	**P**	**C**
Version1.0		3	0	0	3
Category of Course	Core				
Total Contact Hours	45 Hours				
Pre-requisites/ Co-requisites	--				

Course Perspective: A Forensic Dermatoglyphics course provides a comprehensive understanding of the history, principles, and techniques involved in fingerprint analysis. You will delve into the biological significance of skin patterns, learn various fingerprint classification systems, and master the methods of lifting and developing latent fingerprints. This course equips you with the knowledge and skills necessary for identifying and analyzing fingerprints in criminal investigations, ensuring accurate and reliable forensic evidence.

Course Outcome: Students will be:

CO1: Understanding the historical development and significance of fingerprinting, including its origins, principles, and role in criminal investigations.

CO2: Applying the biological significance of skin patterns and the various types of fingerprints, including their class and individual characteristics, as well as methods for their collection, lifting, and preservation.

CO3: Analyzing classification systems for fingerprints, including Henry's system and Batley's Single Digit classification, to effectively categorize and organize fingerprint evidence using AFIS.

CO4: Performing techniques for the development and lifting of latent fingerprints, utilizing both physical methods (such as powder and iodine fuming) and chemical methods (such as ninhydrin and silver nitrate) in forensic applications.

CO5: Interpreting and present fingerprint evidence in a court setting, including the importance of photography and proper documentation in the judicial process.

Course contents
Section I: History and Development of Fingerprinting Origin & History of fingerprints, Principles of Fingerprint identification, Searching, location and significance of fingerprints in criminal investigation.
Section II: Introduction of Fingerprint and its characteristics Biological significance of skin pattern, Types of fingerprints, Fingerprint characteristics: class and individual, Collection, lifting and preservation of fingerprints, Photography of latent fingerprints and presentation of fingerprint evidence in court.
Section III: Classification of Fingerprints Henry's system of classification, Batley's Single Digit classification, Extension of Henry's system of classification. Primary, secondary, sub-secondary, major, Second sub-secondary, key and final Classifications, AFIS
Section IV: Fingerprint Developmental techniques Methods of lifting and developing latent fingerprints – Physical methods - Powder method (Black, silver, florescent, red, yellow), Iodine fuming etc. Chemical methods - Ninhydrin, Silver nitrate method.

Learning Experience: Through a combination of theoretical lectures, practical exercises, and case studies, you will gain hands-on experience in fingerprint collection, preservation, and analysis. You will learn to apply the principles of fingerprint identification to real-world scenarios, developing critical thinking and problem-solving skills. The course also emphasizes the importance of ethical considerations and quality control in forensic fingerprint analysis.

Textbooks:

1. Nath, S., Fingerprint Identification, CRC Press, 2nd edition, 2002.
2. Champhod, C., Fingerprint and other ridge skin impressions, CRC Press, 2004.
3. Bridges, B. C., Vollmar, A. Monir, M., Criminal Investigation, Practical Fingerprinting, Thumb Impression, Handwriting, Expert Testimony Opinion Evidence, The University Book Agency, Allahbad, 2000.
4. James, S. H. and Nordby, J. J. (Eds), Forensic Science - An Introduction to Scientific and Investigation Techniques, CRC Press, London, 2003.

Suggested Reading:

1. Nanda, B. B., and Tewari, R. K., Forensic Science in India. Select Publishers, New Delhi, 2001.
2. Saferstein, Richard, Criminalistics, An Introduction to Forensic Science, 6th Ed. Prentice-Hall, New Jersey, 1998.
3. Sharma, B. R., Forensic Science in Criminal Investigation and Trials (3rdEdn) Universal Law Publishing Co. Ltd. New Delhi, 2001.

Open Educational Resources (OER)

1. International Association for Identification (IAI): https://www.theiai.org/
2. National Institute of Standards and Technology (NIST): https://www.nist.gov/
3. Forensic Science Digital Library: https://forensiclibrary.org/az/databases?v=137728

Examination Scheme:

Evaluation components	**Weightage**
Internal marks (Theory) **I. continuous assessment (30 marks)** All the components to be evenly spaced Project/quizzes/assignment and essays/presentation/ participation/case studies/reflective journals (minimum of five components to be evaluated)	**30 Marks**
II. internal marks (Theory): Mid Term Examination	**20 Marks**
III. External Marks (Theory): End Term Examination	**50 Marks**

It is compulsory for a student to secure 40 % marks in Internal and End Term Examination separately to secure minimum passing grade.

SCFS104	Questioned Document	L	T	P	C
Version1.0		3	0	0	3
Category of Course	Core				
Total Contact Hours	45 Hours				
Pre-requisites/ Co-requisites	--				

Course Perspective: A Questioned Document Examination course provides a comprehensive understanding of the techniques used to analyze documents that may be disputed or questioned. It focuses on the scientific methods employed to determine the authenticity, origin, and authorship of documents.

Course Outcome: Students will be:

CO1: Understanding the definition and significance of questioned documents, including the types of cases encountered, and the procedures for their collection, handling, and presentation in forensic investigations.

CO2: Applying various types of documents such as charred, security, and counterfeit currency, utilizing appropriate examination equipment and techniques for accurate document analysis.

CO3: Analyzing principles of handwriting analysis to identify individual characteristics, distinguishing between authentic, forged, disguised, and traced signatures while considering external and internal factors affecting handwriting.

CO4: Performing comparative analysis of typewritten and computer-generated documents, including the detection of alterations and conducting ink analysis to ascertain document authenticity.

CO5: Interpreting findings from examinations of photocopies, printouts, and scanned documents to draw conclusions regarding their authenticity and integrity in forensic contexts.

Course contents
Section I: Introduction to Questioned Documents Definition: Documents, questioned documents and the type of cases encountered; Importance, nature and problems of documents, Location, collection, handling and presentation of documents, adequacy of exemplars and standards.
Section II: Document analysis Charred documents, security documents, torn documents, and Counterfeit currency. General Equipment for Examination: Hand lens, Camera, Compound Microscope, Stereo microscope, TLC, Transmitted light source, UV-IR radiation chamber and Oblique Light source, ESDA, VSC.
Section III: Handwriting Characteristics Identification – principle individual handwriting characteristics, external, internal and physical factors affecting handwriting or signature of a person, Authentic Signatures, forged signatures, disguised signatures, traced signatures, and their characteristics
Section IV: Typewritten and Computer-generated documents Comparison of typewritten documents, common types of styles, detection of altered typewritten documents, and ink analysis. Working of photocopiers and printers, scanners, examination of photocopies/ Xerox, printouts and scanned documents.

Learning Experience: A Basics of Questioned Document course offers a comprehensive exploration of the fundamental principles of document examination. Through lectures, laboratory work, and hands-on activities, you'll gain a deep understanding of various techniques used to analyze questioned documents, such as handwriting analysis, paper and ink examination, and forgery detection. This course provides a strong foundation for further studies in forensic science or related fields and equips you with valuable skills for careers in law enforcement, private investigation, or document authentication.

Textbooks:

1. Albert, S. Osborn, Questioned Documents, Second Ed., Universal Law Publishing, Delhi, 1998.
2. Charles, C. Thomas, I.S.Q.D. Identification System for Questioned Documents, Billy Prior Bates, Springfield, Illinois, USA, 1971.

3. Kelly, J. S. Lindblom, B. S. (2006). Science, Handwriting Examination and the Courts. Scientific Examinations of Questioned Documents, 2nd edition, CRC Press, Taylor & Francis group.

Suggested Readings:

1. Huber, A. R. Headrick, A. M. (1999). The Discrimination and Identification of writing. Handwriting Identification Facts and Fundamentals, CRC Press, Boca Raton London.
2. James, S. H. And Nordby, J. J. (Eds), Forensic Science; An Introduction to Scientific and Investigative Techniques, CRC Press, London, 2003.
3. Saferstein, Richard, Criminalistics - An Introduction to Forensic Science, 6th Ed. Prentice-Hall, New Jersey, 1998.

Open Educational Resources (OER):

1. https://oercommons.org/
2. https://ocw.mit.edu/
3. https://openstax.org/

Examination Scheme:

Evaluation components	**Weightage**
Internal marks (Theory) **I. continuous assessment (30 marks)** All the components to be evenly spaced Project/quizzes/assignment and essays/presentation/ participation/case studies/reflective journals (minimum of five components to be evaluated)	**30 Marks**
II. internal marks (Theory): Mid Term Examination	**20 Marks**
III. External Marks (Theory): End Term Examination	**50 Marks**

It is compulsory for a student to secure 40 % marks in Internal and End Term Examination separately to secure minimum passing grade.

SCFS108	Fundamentals of Cell biology	**L**	**T**	**P**	**C**
Version1.0		3	0	0	3
Category of Course	DSE				
Total Contact Hours	45 Hours				
Pre-requisites/ Co-requisites	--				

Course Perspective: Human Physiology (Biology-II) delves into the complex mechanisms that govern the functions of the human body. It provides a comprehensive understanding of how various systems work together to maintain life and health.

Course Outcome: Students will be:

CO1: Understand the structure and functions of the human physiology systems, including the nervous, respiratory, digestive, circulatory, and endocrine systems, focusing on their components and regulatory mechanisms.

CO2: Analyze the human skeletal system, including the types of bone tissue, factors affecting bone growth and maintenance, and the various types of joints and their movements.

CO3: Apply knowledge of odontology, including ossification processes, dental structure, types of teeth, and their arrangement within the human mouth.

CO4: Perform microscopy techniques, including light microscopy, phase contrast, fluorescence, and electron microscopy, while mastering sample preparation and analysis for each method.

CO5: Interpret data obtained from various biological techniques, including X-ray diffraction analysis and microscopy, to draw conclusions about biological structures and processes.

Course contents
Section I: Human physiology: Nervous system: introduction, central and peripheral nervous system, neurons and neuroglia, synaptic transmission, neurotransmitters Respiratory system: overview, upper and lower respiratory tract, gas exchange in the alveoli, neural and chemical regulation, functions Digestive system: Structure, mechanical and chemical digestion, absorption and elimination, accessory organs Circulatory system: Structure, components, cardiac cycle, Systemic and pulmonary circulation Endocrine system: Structure, major endocrine glands, types of hormone, mechanisms of hormone action, feedback mechanisms
Section II: Human skeletal system: Function of skeletal system, Types of Bone Tissue, Factors affecting bone growth and maintenance, types of joints and movement.
Section III: Introduction odontology: Ossification, Dental structure of humans, types of teeth and arrangement.
Section IV: Techniques in Biology Principles of microscopy; Light Microscopy; Phase contrast microscopy; Fluorescence microscopy; Confocal microscopy; Sample Preparation for light microscopy; Electron microscopy (EM)- Scanning EM and Scanning Transmission EM (STEM); Sample Preparation for electron microscopy; X-ray diffraction analysis.

Learning Experience: A Basics of Biology course offers a comprehensive exploration of the fundamental principles of life. Through lectures, laboratory work, and hands-on activities, you'll gain a deep understanding of cellular processes, genetics, evolution, and ecology. This course provides a strong foundation for further studies in biology or related fields and fosters a lifelong appreciation for the natural world.

Textbooks:

1. I.E. Celis Cell biology Academic Press 2nd Edition.
2. Robertis & Robertis Cell & Microbiology 8th Edition.
3. M.S. Leffel, A.D. Donnenberg & N.R. Rose Handbook of Human Immunology CRC press, 1997
4. Essentials of Human Genetics by S.M. Bhatnagar et al (1999) IV edition. Orient Longman.

Suggested Readings:

1. Basic Human Genetics by E.J. Manage and A.P. Manage (1997 India Reprint) Rastogi Publications, Meerut.
2. Mendelian inheritance in Man: Catalogues of Autosomal recessive and x-linked phenotypes.[12teditions – 1998] by McKusick, V.A. Johns Hopkins university press, Baltimore.
3. Principles and Practice of Medical Genetics, by Emery, A.E.H and D.L. Rimoin (Eds_ (1990-2nd edition) Churchill Livingstone, Edinburgh.
4. Human Genetics by S.D. Gangane (2nd edition-Reprint 2001), B.L Churchill Livingstone Pvt.Ltd., New Delhi.
5. Genetics in Medicine by M.W. Thompson et al, 5th Edition, W.B. Sounders Company, London.

Open Educational Resources (OER)

1. https://openstax.org/details/books/anatomy-and-physiology-2e/
2. https://oercommons.org/browse?f.keyword=human-biology
3. https://openstax.org/details/books/biology-2e/

Examination Scheme:

Evaluation components	**Weightage**
Internal marks (Theory) **I. continuous assessment (30 marks)** All the components to be evenly spaced Project/quizzes/assignment and essays/presentation/ participation/case studies/reflective journals (minimum of five components to be evaluated)	**30 Marks**
II. internal marks (Theory): Mid Term Examination	**20 Marks**

III. External Marks (Theory): End Term Examination	**50 Marks**

It is compulsory for a student to secure 40 % marks in Internal and End Term Examination separately to secure minimum passing grade.

SCFS110	Mechanics	**L**	**T**	**P**	**C**
Version1.0		3	0	0	3
Category of Course	DSE				
Total Contact Hours	45 Hours				
Pre-requisites/ Co-requisites	--				

Course Perspective: A Mechanics course in Physics provides a comprehensive understanding of the fundamental principles that govern the motion of objects. It serves as a cornerstone for many other physics disciplines and engineering fields.

Course Outcomes: Students will be:

CO1: Understanding the principles of motion, including Newton's laws, dynamics of particles, conservation of momentum and energy, as well as the concepts of torque, angular momentum, and gravitation.

CO2: Applying the implications of the Special Theory of Relativity, including the constancy of the speed of light, postulates of relativity, length contraction, time dilation, and the relativistic addition of velocities.

CO3: Analyzing the principles of sound, including velocity, intensity measurement, and acoustics, to evaluate the performance of sound in various environments, such as auditoriums, and understand the production and applications of ultrasonic waves.

CO4: Performing calculations involving light behavior, including refraction through different lens types, analysis of aberrations, and phenomena such as interference, diffraction, and polarization in optical systems.

Course contents
Section I: Motion: Newton's Laws of motion. Dynamics of a system of particles. Centre of Mass. Momentum and Energy: Conservation of momentum. Work and energy, Conservation of energy, Angular velocity and angular momentum. Torque, Conservation of angular, Momentum, Gravitation, Newton's Law of Gravitation. Motion of a particle in a central force Field, Kepler's Laws.
Section II: Special Theory of Relativity: Constancy of speed of light. Postulates of Special Theory of

Relativity. Length contraction. Time dilation. Relativistic addition of velocities
Section III: Sound: Velocity of sound, noise and sound intensity measurement, echo, reverberation, Sabine's Formula, absorption coefficient, acoustics of buildings and factors affecting acoustics of buildings. Sound distribution in an auditorium, introduction to ultrasonic, production of ultrasonic waves, applications of ultrasonics.
Section IV: Light: Refraction through thin layers, thick lens, thin lens and lens combinations, aberrations, interference in thin films, fringes in wedge shaped films, Newton's rings, total internal reflection, Diffraction and polarization, simple table spectrophotometer.

Learning Experience: This course offers a rich and engaging content, covering a wide range of topics in classical mechanics, relativity, acoustics, and optics.

Textbooks:

1. Allied Physics – Prof. Dhanalakshmi and others.
2. Elements of Properties of Matter – D.S. Mathur, S. Chand & Co. (1999).
3. Modern Physics – R. Murugesan S. Chand & Co. (2004).

Suggested Readings:

1. Classical Mechanics by Herbert Goldstein, Charles Poole, and John Safko
2. Classical Dynamics of Particles and Systems by Stephen T. Thornton and Jerry D. Marion
3. Classical Mechanics by Louis N. Hand and Janet Finch

Open Educational Resources (OER):

1. https://phet.colorado.edu/en/simulations/browse
2. https://academo.org/physics/
3. https://www.physicsclassroom.com/

Examination Scheme:

Evaluation components	**Weightage**
Internal marks (Theory) **I. continuous assessment (30 marks)** All the components to be evenly spaced Project/quizzes/assignment and essays/presentation/ participation/case studies/reflective journals (minimum of five components to be evaluated)	**30 Marks**
II. internal marks (Theory): Mid Term Examination	**20 Marks**
III. External Marks (Theory): End Term Examination	**50 Marks**

It is compulsory for a student to secure

40 % marks in Internal and End Term Examination separately to secure minimum passing grade.

UCH102	Chemistry of elements	**L**	**T**	**P**	**C**
Version1.0		3	0	0	3
Category of Course	Core				
Total Contact Hours	45 Hours				
Pre-requisites/ Co-requisites	--				

Course Perspective: This course covers periodic properties, bonding theories, and the chemistry of s-, p-, d-, and f-block elements. It explores periodic trends, bonding models like VSEPR and MO theory, and coordination chemistry, with a focus on element groups and their key compounds. The course provides a comprehensive understanding of element behavior and bonding.

Course Outcome: Students will be:

CO1: Understanding the periodic law and the current structure of the periodic table, including trends in atomic and ionic radii, ionization energy, electron affinity, and electronegativity across different blocks of elements.

CO2: Applying the chemistry of s-block and p-block elements, focusing on bonding types (ionic, covalent, and coordinate bonds), VSEPR theory, hybridization, allotropy, and the structures and properties of key compounds within these groups.

CO3: Analyzing the principles of valence bond theory and molecular orbital theory to predict the shapes, bond strengths, and energy characteristics of various inorganic molecules and coordination compounds.

CO4: Performing comparative studies of the properties of transition elements, including their oxidation states, magnetic behavior, and spectral characteristics, along with the coordination chemistry of d-block elements.

CO5: Interpreting the significance of Werner's coordination theory, the concept of effective atomic numbers, and the crystal-field theory in understanding the structure and properties of coordination compounds, including their isomerism and bonding characteristics.

Course contents
Section I: Periodic Properties Periodic law and the present form of periodic table, Atomic and ionic radii, ionization energy, electron affinity and electronegativity – definition, trends in periodic table (in s, p, d & f block elements). Comparative study of the elements including, diagonal relationships. Chemistry of s-block elements Ionic bond, Covalent bond, Coordinate bond. Valence shell electron pair repul2sion (VSEPR)

theory to NH_3, H_3O^+, SF_4, ClF_3, ICl^- and H_2O. Valence bond theory and its limitations, directional cha[4]racteris[4]tics of covalent bond, various types of hybridization and shapes of simple inorganic molecules and ions (BeF_2, BF_3, CH_4, PF_5, SF_6, IF_7 SO^{2-}, ClO^-). MO theory of heteronuclear (CO and NO) diatomic molecules, bond strength and bond energy, percentage ionic character from dipole moment and electronegativity difference.
Section II: Chemistry of p-block elements Boron family (13th group): Diborane – properties and structure (as an example of electron – deficientcompound and multicentre bonding), Borazene – chemical properties and structure. Carbon Family (14th group): Allotropy of carbon, Catenation, pה– d הbonding, carbides, fluorocarbons– general methods of preparations, properties and uses. Nitrogen Family (15th group): Oxides – structures of oxides of N, P. oxyacids – structure and relativeacid strengths of oxyacids of Nitrogen and phosphorus. Oxygen Family (16th group): Oxyacids of sulphur – structures and acidic strength. Halogen Family (17th group): Basic properties of halogen, hydro and oxyacids of chlorine – structure andcomparison of acid strength. Noble Gases (18th group): Basic properties of noble gases, physical properties and structure of importantcompounds of Xenon.
Section III: Chemistry of d-block elements Definition of transition elements, position in the periodic table, General characteristics & properties of d- block elements, Comparison of properties of 3d elements with 4d & 5d elements with reference only to ionic, oxidation state, magnetic and spectral properties. Coordination Compounds Werner's coordination theory, effective atomic number concept, chelates, nomenclature of coordination compounds, isomerism in coordination compounds, valence bond theory of transition metal complexes. Limitations of valence bond theory, an elementary idea of crystal-field theory, crystal field splitting in octahedral and tetrahedral complexes, factors affecting the crystal-field parameters.
Section IV: Chemistry of f-block elements Lanthanides: General features and Electronic structure, oxidation states and ionic radii and lanthanidecontraction. Actinides: General features and chemistry of actinides, actinide contraction. Comparison of properties of Lanthanides and Actinides and with transition elements. Elementary idea about the transuranic elements.

Learning Experience: Chemistry II builds upon the foundational concepts introduced in Chemistry I, offering a more in-depth exploration of chemical principles and their applications. This course is designed to enhance your understanding of chemical reactions, atomic structure, bonding, and the properties of matter.

Textbook:

1. J. R. Partington 1969 A History of Chemistry, Volume 2, , Macmillan.
2. Eding Darrel D, 1970 Introductory Chemistry.
3. Odian George, 1990 General, Organic and Biological Chemistry.

Suggested Readings:

1. Inorganic Chemistry by J. E. Huheey, E. A. Keiter, and R. L. Keiter.
2. Advanced Inorganic Chemistry by F. A. Cotton and G. Wilkinson
3. Inorganic Chemistry by D. F. Shriver, P. W. Atkins, and C. H. Langford
4. Inorganic Chemistry by Gary L. Miessler and Donald A. Tarr
5. Inorganic Chemistry by A. F. Wells

Open Educational Resources (OER):

1. https://chem.libretexts.org/
2. https://openstax.org/details/books/chemistry-2e/
3. https://www.youtube.com/playlist?list=PLVaArxw9lrsl4oW6Nt9j5trOs9MWrJNbe

Examination Scheme:

Evaluation components	**Weightage**
Internal marks (Theory) **I. continuous assessment (30 marks)** All the components to be evenly spaced Project/quizzes/assignment and essays/presentation/ participation/case studies/reflective journals (minimum of five components to be evaluated)	**30 Marks**
II. internal marks (Theory): Mid Term Examination	**20 Marks**
III. External Marks (Theory): End Term Examination	**50 Marks**

It is compulsory for a student to secure 40 % marks in Internal and End Term Examination separately to secure minimum passing grade.

SCFS106	Basics of Digital Forensics	**L**	**T**	**P**	**C**
Version1.0		2	0	0	2
Category of Course	Core				
Total Contact Hours	30 Hours				

Pre-requisites/ Co-requisites	---

Course Perspective: The course "Basics of Digital Forensics" provides a foundational understanding of the principles and techniques used to investigate digital evidence. It equips learners with the knowledge and skills necessary to identify, collect, preserve, analyze, and present digital evidence in legal proceedings. The course covers various aspects of digital forensics, including computer forensics, network forensics, and mobile device forensics.

Course Outcome: Students will be:

CO1: Understanding the principles of cloud forensics, including the identification and investigation of security incidents, as well as the anti-forensic techniques employed in cloud environments.

CO2: Applying the processes for collecting electronic evidence in the cloud, including strategies for data recovery of deleted and overwritten information, and the role of ethical hacking in cloud forensics.

CO3: Analyzing knowledge of metadata and metadata logs in the analysis of various cloud storage models, such as OneDrive, Dropbox, and Google Drive, as well as different cloud service models (SaaS, PaaS, IaaS, and FaaS).

CO4: Performing forensic investigations involving AWS, utilizing case studies to illustrate practical applications and challenges in cloud forensic analysis.

CO5: Interpreting the fundamentals of operating systems, including batch and distributed operating systems, focusing on memory structure, process control, scheduling, synchronization, and memory management.

Course contents
Section I: Introduction to Digital Forensics Introduction, branches of digital forensics, fundamentals of digital forensics, Digital crimes and their types, benefits of forensics in digital crimes, digital forensics evidence, Collection and preservation of evidences, legal concerns and private issues.
Section II: Digital crimes and evidence Digital crimes and their types: targeting Computer systems and Mobiles- data diddling attacks, spyware, logic bombs, DoS, DDoS, APTs, virus, Trojans, ransomware, data breach., benefits of forensics in digital crimes, digital forensics evidence, Collection and preservation of evidences, legal concerns and private issues.
Section III: Web Browsers Web Browsers: Cookies, Favourites or bookmarks, cache, session data and plugins. Email: Types of Email and protocols, Analysing the header details and tracking the email, Spoofed mails, H T M L and other internetprotocols, internet history, e-mail and header interpretation

Section IV: Advancements in computer forensics
Tools used for computer forensics, Imaging/ extraction/analysis of computer devices, Disc forensics, Windows Registry Collection of electronic devices.

Learning Experience: The learning experience in this course is designed to be both theoretical and practical. Students will engage in hands-on exercises and simulations to gain practical experience in digital forensics techniques. They will learn about various forensic tools and software used in the field. Additionally, the course will explore real-world case studies to understand how digital evidence is collected, analyzed, and presented in court.

Textbooks:

1. Compute Crime and Computer Forensic by Dr. R.K. Tiwari
2. Introduction to Forensic Science in Crime Investigation By Dr.(Mrs.) Rukmani Krishnamurthy
3. Cyber Law in India by Farooq Ahmad- Pioneer Books
4. Information Technology Law and Practice by Vakul Sharma- Universal Law Publishing Co. Pvt. Ltd.
5. The Indian Cyber Law by Suresh T. Vishwanathan- Bharat Law House New Delhi
6. Guide to Cyber and E- Commerce Laws by P.M. Bukshi and R.K. Suri- Bharat Law House, New Delhi
7. Guide to Cyber Laws by Rodney D. Ryder- Wadhwa and Company, Nagpur
8. The Information technology Act, 2000- Bare Act- Professional Book Publishers, New Delhi.

Suggested Reading:

1. Digital Forensics: A Field Guide by Brian Carrier
2. Computer Forensics: Incident Response and Investigations by Rod V. McKown
3. Mobile Device Forensics by Jonathan Zdziarski

Open Educational Resources (OER):

1. Open Digital Forensics Survival Guide: https://www.cyberdefensemagazine.com/
2. Introduction to Digital Forensics: https://nij.ojp.gov/library/publications/forensic-examination-digital-evidence-guide-law-enforcement
3. Digital Forensics Course Materials: https://dfrws.org/

Examination Scheme:

Evaluation components	**Weightage**

Internal marks (Theory) **I. continuous assessment (30 marks)** All the components to be evenly spaced Project/quizzes/assignment and essays/presentation/ participation/case studies/reflective journals (minimum of five components to be evaluated)	**30 Marks**
II. internal marks (Theory): Mid Term Examination	**20 Marks**
III. External Marks (Theory): End Term Examination	**50 Marks**

It is compulsory for a student to secure 40 % marks in Internal and End Term Examination separately to secure minimum passing grade.

VAC	Indian constitution	**L**	**T**	**P**	**C**
Version1.0		2	0	0	2
Category of Course	VAC				
Total Contact Hours	30 Hours				
Pre-requisites/ Co-requisites	---				

Course Perspective: Indian Constitution is a foundational course that delves into the intricate framework of India's governance system. It offers a comprehensive understanding of the constitutional principles, rights, and duties that shape the nation. By exploring the historical context, philosophical underpinnings, and contemporary challenges, students gain valuable insights into the democratic values and legal framework that govern India.

Course Outcome: Students will be:

CO1: Understanding the historical background and significance of the Indian Constitution, including the role of Dr. B.R. Ambedkar in its formation from 1946 to 1949.

CO2: Applying the components of the Constitution, focusing on the Preamble, Fundamental Rights, Fundamental Duties, and Directive Principles of State Policy (Articles 12 to 51), to comprehend their content and significance.

CO3: Analyzing knowledge of important constitutional amendments, evaluating their impact and the procedures involved in amending the Constitution in the context of sustainable development in India.

CO4: Performing critical assessments of special rights established in the Indian Constitution for marginalized groups, including Dalits, backward classes, women, children, and religious and linguistic minorities.

CO5: Interpreting the implications of constitutional provisions on social justice and equity, particularly concerning the rights and protections afforded to various communities within Indian society.

Course contents
Section I: Introduction to Indian constitution Historical Background, Preamble and its Significance, Meaning of term Constitution; making of Indian Constitution 1946 to 1949 and role played by Dr. B.R. Ambedkar; salient features of Indian Constitution
Section II: Components and articles Preamble, fundamental rights, fundamental duties, and Directive Principles of State Policy – Their content and significance. (Article 12 to 51)
Section III: Constitutional amendments Important Constitutional Amendments and their Impact, Procedure for Amendments, Constitution and sustainable development in India
Section IV: Special rights Special rights created in Indian constitution for dalits, backward class, women and children and religious and linguistic minorities.

Learning Experience: Indian Constitution is enriched through a combination of theoretical knowledge and practical applications. Students engage in discussions, debates, and case studies to analyze real-world scenarios and understand the implications of constitutional provisions. The course fosters critical thinking, legal reasoning, and a deep appreciation for the democratic process.

Textbooks:

1. "Introduction to the Constitution of India" by D.D. Basu
2. "Indian Polity" by M. Laxmikanth
3. "The Oxford Handbook of the Indian Constitution" edited by Sujit Choudhry, Madhav Khosla, and Pratap Bhanu Mehta

Suggested Readings:

1. Indian Constitutional Law by Durga Das Basu
2. Introduction to the Constitution of India by Granville Austin
3. The Constitution of India by V. N. Shukla

Open Educational Resources (OER)

1. National Council of Educational Research and Training (NCERT): https://ncert.nic.in/
2. India Knowledge Portal: https://www.india.gov.in/

3. National Legal Services Authority (NALSA): https://nalsa.gov.in/

Examination Scheme:

Evaluation components	Weightage
Internal marks (Theory) **I. continuous assessment (30 marks)** All the components to be evenly spaced Project/quizzes/assignment and essays/presentation/ participation/case studies/reflective journals (minimum of five components to be evaluated)	**30 Marks**
II. internal marks (Theory): Mid Term Examination	**20 Marks**
III. External Marks (Theory): End Term Examination	**50 Marks**

It is compulsory for a student to secure 40 % marks in Internal and End Term Examination separately to secure minimum passing grade.

UCH152	Practical-Chemistry II	**L**	**T**	**P**	**C**
Version1.0		0	0	2	1
Category of Course	Core (Practical)				
Total Contact Hours	30 Hours				
Pre-requisites/ Co-requisites	--				

Course Perspective: Chemistry Practical II is designed to provide students with hands-on experience in the identification and analysis of elements across the periodic table, focusing on s, p, d, and f block elements. Through various experimental techniques such as flame tests, spot tests, and spectroscopic methods, students will explore the properties and behavior of metals, including their reactions in different environments. The course emphasizes real-world applications, such as detecting heavy metals in water, preparing students for environmental and analytical chemistry challenges.

Course Outcome: Students will be:

CO1: Acquire a thorough understanding of the properties of s, p, d, f Block elements.

CO2: Learn about the chemistry of alkali metals and alkaline earth metals.

CO3: Explore the properties and compounds of main group and their roles in various chemical reactions.

CO4: Acquire skills in designing and performing synthetic reactions involving s,p,d,f block elemnts.

CO5: Recognize the environmental impact and considerations related to the chemistry of these elements and their compound.

Course contents

1. Identification of s, p, d, f Block Elements
2. Flame test for alkali and alkaline earth metals.
3. Spot tests for transition metals (d-block) and lanthanides (f-block).
4. Detection and quantification of lead, cadmium, and mercury in water samples using colorimetric and spectroscopic methods.
5. Study of the effect of pH on the solubility of heavy metals.

Learning Experience: Students will gain practical skills in qualitative and quantitative analysis through a series of laboratory experiments. The flame test for alkali and alkaline earth metals will enhance their understanding of element-specific flame colors, while spot tests will allow for the identification of transition metals and lanthanides. Working with colorimetric and spectroscopic methods to detect toxic metals like lead, cadmium, and mercury in water will expose students to modern environmental monitoring techniques. The study of pH effects on metal solubility will help solidify concepts in chemical equilibria.

Textbooks:

1. J. R. Partington 1969 A History of Chemistry, Volume 2, , Macmillan.
2. Eding Darrel D, 1970 Introductory Chemistry.
3. Odian George, 1990 General, Organic and Biological Chemistry.

Suggested Reading:

4. Vogel's Qualitative Inorganic Analysis by G. Svehla
5. Inorganic Chemistry by J.D. Lee
6. Advanced Inorganic Chemistry by F.A. Cotton, G. Wilkinson
7. Fundamentals of Analytical Chemistry by D.A. Skoog, D.M. West, F.J. Holler

Open Educational Resources:

1. MIT OpenCourseWare - Principles of Inorganic Chemistry
2. Khan Academy - Chemistry
3. ChemCollective Virtual Labs
4. LibreTexts - Analytical Chemistry

Examination Scheme:

Evaluation components	Weightage

Internal marks (practical) I. Conduct of experiment II. Lab Record III. Lab Participation IV. Lab Project	 **10 Marks** **10 Marks** **10 Marks** **20 Marks**
II. External Marks (practical) End Term Examination	**50 Marks**

It is compulsory for a student to secure 40% marks in Internal and End Term Examination separately to secure minimum passing grade

SEC079	Forensic Practical II	**L**	**T**	**P**	**C**
Version1.0		0	0	4	2
Category of Course	SEC				
Total Contact Hours	60 Hours				
Pre-requisites/ Co-requisites	--				

Course Perspective:

The course offers a comprehensive introduction to the field of forensic science, focusing on the analysis and interpretation of fingerprints and questioned documents. Students will gain practical skills in fingerprint identification, development, and comparison, as well as document examination techniques. This knowledge will be invaluable in various forensic investigations, including criminal cases and civil disputes.

Course Outcome: Students will be:

CO1: Observe and document fingerprint patterns and ridge characteristics using classification techniques and analysis tools for forensic identification.

CO2: Imitate the process of lifting, developing, and preserving latent fingerprints using powders, chemicals, and alternative light sources to maintain evidence integrity.

CO3: Perform practical exercises in fingerprint identification and comparison, including poroscopy and edgeoscopy, to match and individualize fingerprint evidence in forensic cases.

CO4: Adapt methods for analyzing questioned documents by examining handwriting, ink, paper, and alterations, using tools like magnifiers, microscopes, and VSC for document authenticity verification.

CO5: Evaluate and compare fingerprint and handwriting samples from questioned documents, identifying forgeries and providing forensic conclusions in practical case scenarios.

Course contents
Fingerprints: 1. Prepare fingerprint card and identify the patterns. 2. Tape lifting of fingerprint. 3. Casting of foot prints/ fingerprint. 4. Ninhydrin method for fingerprint development. 5. Iodine fuming method for fingerprint development. 6. Silver nitrate method for fingerprint development. Questioned Documents: 1. Handwriting analysis based on class and individual characteristics. 2. Examination of documents under different light sources- transmitted, oblique, UV. 3. Identification of genuine and fake currencies. 4. Identification features of security documents.

Learning Experience:

Students will have the opportunity to engage in hands-on activities that simulate real-world forensic scenarios. They will learn how to prepare fingerprint cards, identify different fingerprint patterns, and employ various techniques for fingerprint development, including tape lifting, casting, ninhydrin, iodine fuming, and silver nitrate methods. In addition, students will analyze handwriting samples to determine class and individual characteristics, examine documents under different light sources, and identify genuine and fake currencies. Through these practical experiences, students will develop critical thinking skills and a deep understanding of forensic science methodologies.

Textbooks:

1. Thomas Kubic, Nicholas Petraco Forensic Science Laboratory Manual and Workbook, Third Edition2009.
2. A. I. Vogel, Textbook of Practical organic Chemistry including Qualitative organic analysis.
3. Kathy Mirakovits, Gina Londino, The Basics of Investigating Forensic Science: A Laboratory Manual 2015.
4. Washington state patrol Forensic Laboratory services: Crime Laboratory: Technical & Training Manuals.

Suggested Readings:

1. "Forensic Science: An Introduction" by Richard Saferstein
2. "Fundamentals of Forensic Science" by James E. O'Hara and Richard E. Babich

3. "Handbook of Forensic Science" edited by Richard Saferstein

Open Educational Resources:

1. National Institute of Justice: https://nij.ojp.gov/
2. The Open University: https://www.open.edu/openlearn/
3. Forensic Science Education Resources: https://www.justice.gov/archives/dag/forensic-science

Examination scheme:

Evaluation components	**Weightage**
Internal marks (practical) I. Conduct of experiment II. Lab Record III. Lab Participation IV. Lab Project	 **10 Marks** **10 Marks** **10 Marks** **20 Marks**
II. External Marks (practical) End Term Examination	**50 Marks**

It is compulsory for a student to secure 40% marks in Internal and End Term Examination separately to secure minimum passing grade

SYLLABUS
THIRD SEMESTER

SCFS201	Forensic Ballistics and Explosives	**L**	**T**	**P**	**C**
Version1.0		4	0	0	4
Category of Course	Core				
Total Contact Hours	60 Hours				
Pre-requisites/ Co-requisites	---				

Course Perspective: Forensic ballistics and explosives is a specialized field that combines the principles of physics, chemistry, and criminalistics to investigate firearms and explosives related crimes. This course delves into the examination of firearms, ammunition, and explosive devices, providing students with the knowledge and skills necessary to analyze evidence and reconstruct crime scenes. By studying the dynamics of projectiles, the chemistry of explosives, and the techniques used to identify

and classify firearms and explosives, students gain a comprehensive understanding of this critical area of forensic science.

Course Outcome: Students will be:

CO1: Understanding the classification, parts, and forensic importance of firearms and ammunition, including the Indian Arms Act.

CO2: Applying the range of fire through the examination of muzzle patterns, GSR analysis, and the characteristics of firearm injuries such as entrance and exit wounds.

CO3: Analyzing techniques for reconstructing the sequence of events in shooting incidents and the presentation of ballistic evidence in court.

CO4: Performing identification of various types of explosives, including high and low explosives, and differentiate between black powder, smokeless powder, and dynamite.

CO5: Interpreting the characteristics of ammunition and cartridge cases, focusing on class and individual characteristics for identification purposes.

Course contents
Section I: Firearms & Ammunition Definition, Indian Arms Act, Forensic Importance; Nature of firearms, parts of a firearm, classification of firearm, Types, Bullet comparisons, cartridge case examination, class and individual characteristics of identification
Section II: Range of Fire Muzzle pattern, scorching, blackening, tattooing, wad distribution, pellet patterns, GSR analysis, and primer residues, Entrance wound, exit wound and internal wound, evaluation of firearm injuries.
Section III: Analysis and Reconstruction Reconstruction of the sequence of events in a shooting case. Presentation of evidence in the court. accidental firing
Section IV: Explosives Introduction to explosives, definition, High explosives and low explosives, difference and classification, Identifying the explosives, Black and smokeless powder identification, dynamite identification, identifying other explosives, reconstructing the destructive devices.

Learning Experience: in forensic ballistics and explosives involves a combination of theoretical knowledge and practical skills. Students will engage in classroom lectures, laboratory exercises, and potentially fieldwork to gain hands-on experience. They will learn about the various types of firearms, ammunition, and explosives, as well as the techniques used to examine and analyze evidence. Additionally, students may have the opportunity to visit forensic laboratories or crime scenes to observe real-world applications of their studies. Through a combination of theoretical and practical learning, students will develop the expertise necessary to contribute to investigations involving firearms and explosives.

Textbooks:

1. Nath, S., Fingerprint Identification, CRC Press, 2nd edition, 2002.
2. Champhod, C., Fingerprint and other ridge skin impressions, CRC Press, 2004.
3. Bridges, B. C., Vollmar, A. Monir, M., Criminal Investigation, Practical Fingerprinting, Thumb Impression, Handwriting, Expert Testimony Opinion Evidence, The University Book Agency, Allahbad, 2000.
4. James, S. H. and Nordby, J. J. (Eds), Forensic Science - An Introduction to Scientific and Investigation Techniques, CRC Press, London, 2003.
5. Nanda, B. B., and Tewari, R. K., Forensic Science

Suggested Readings:

1. Forensic Ballistics: Theory and Practice by James Henry Beveridge
2. The Encyclopedia of Explosives and Related Compounds by George G. Sumner
3. Forensic Science: An Introduction by Richard Saferstein

Examination Scheme:

Evaluation components	**Weightage**
Internal marks (Theory) **I. continuous assessment (30 marks)** All the components to be evenly spaced Project/quizzes/assignment and essays/presentation/ participation/case studies/reflective journals (minimum of five components to be evaluated)	**30 Marks**
II. internal marks (Theory): Mid Term Examination	**20 Marks**
III. External Marks (Theory): End Term Examination	**50 Marks**

It is compulsory for a student to secure 40% marks in Internal and End Term Examination separately to secure minimum passing grade

SCFS203	Forensic Biology and Serology	L	T	P	C
Version1.0		4	0	0	4
Category of Course	Core				
Total Contact Hours	60 Hours				
Pre-requisites/ Co-requisites	--				

Course Perspective: Forensic Biology and Serology is a specialized field that bridges the gap between biology and the legal system. This course delves into the application of biological principles in criminal investigations, focusing on the analysis of biological evidence such as blood, semen, saliva, and hair. Students will gain a deep understanding of the techniques used to identify and analyze these materials, as well as the legal implications of their findings. The course will cover topics such as DNA profiling, bloodstain pattern analysis, and serological testing, equipping students with the knowledge and skills necessary for a successful career in forensic science.

Course Outcome: Students will be:

CO1: Understanding the characteristics and forensic significance of various body fluids, including semen, saliva, urine, and sweat.

CO2: Applying blood evidence collection, preservation, and packing methods, along with ABO and Rh blood group determination techniques.

CO3: Analyzing species of origin analysis using spectrophotometric and immunological methods for blood identification.

CO4: Performing DNA fingerprinting techniques, including STR, VNTR, and SNP analysis, and explore the applications of PCR and CODIS in forensic science.

CO5: Interpreting the forensic significance of semen, including its composition, functions, and methods for identification and individualization.

Course contents
Section I: Introduction and analysis of Body Fluids Introduction to various body fluids, their nature and characteristics and Forensic analysis of Semen, Saliva, Urine, Sweat etc.
Section II: Blood and its analysis The nature of blood, collection, preservation and packing of blood evidence, procedures and precautions. ABO system, Rh system; Techniques for the determination of blood groups; Identification of bloodstains by microscopic methods, Catalytic tests, crystal tests, bloodstain patterns.

Species of Origin analysis: Application of Spectrophotometric method and immunological methods (Ring, Precipitin, reverse agglutination, normal/mixed agglutination).
Section III: DNA fingerprinting Short tandem repeats (STR), Variable number of tandem repeats (VNTR), single nucleotide polymorphism (SNP), Applications of PCR in forensics, DNA fingerprinting, CODIS, DNA footprinting.
Section IV: Semen and its analysis Forensic significance of semen. Composition, functions and morphology of spermatozoa. Collection, evaluation and tests for identification of semen. Individualization on the basis of semen examination.

Learning Experience: Forensic Biology and Serology is both challenging and rewarding. Students will engage in hands-on laboratory exercises, where they will learn to collect, preserve, and analyze biological evidence. They will also have the opportunity to study real-world case studies and learn about the ethical considerations involved in forensic investigations. By combining theoretical knowledge with practical experience, students will develop a strong foundation in forensic biology and serology.

Textbooks:

1. Eckert, W.G., & James S.H., Interpretation of bloodstain evidence at crime scene, CRC Press, Florida, 1989.
2. James, S.H. and Nordby, J.J. (Eds.), Forensic Science - An introduction to Scientific and investigative Techniques, CRC Press, London, 2003.
3. Saferstein, R. (1998). Criminalistics, An Introduction to Forensic Science, 6th Ed. 6th Ed. Prentice –Hall
4. Kirk, P.L., Introduction in crime investigation (2nd), John Willey and, New York, 1974.

Suggested Readings:

1. Forensic Biology by Mark Benecke
2. Introduction to Forensic Biology by David E. Buffington
3. Forensic Serology by Richard Saferstein

Open Educational Resources (OER):

1. OpenStax College Biology (https://openstax.org/books/biology/pages/1-introduction)
2. Khan Academy Biology (https://www.khanacademy.org/science/biology)
3. National Institutes of Health (NIH) Genetics Home Reference (https://ghr.nlm.nih.gov/)

Examination Scheme:

Evaluation components	Weightage
Internal marks (Theory) **I. continuous assessment (30 marks)** All the components to be evenly spaced Project/quizzes/assignment and essays/presentation/ participation/case studies/reflective journals (minimum of five components to be evaluated)	**30 Marks**
II. internal marks (Theory): Mid Term Examination	**20 Marks**
III. External Marks (Theory): End Term Examination	**50 Marks**

It is compulsory for a student to secure 40% marks in Internal and End Term Examination separately to secure minimum passing grade

SCFS205	Cyber forensics II	**L**	**T**	**P**	**C**
Version1.0		**3**	**0**	**0**	**3**
Category of Course	Core				
Total Contact Hours	45 Hours				
Pre-requisites/ Co-requisites	---				

Course Perspective: Cyber Forensics II delves into the advanced techniques and tools used to investigate digital crimes. This course builds upon the foundational knowledge acquired in Cyber Forensics I, providing in-depth understanding of forensic methodologies, evidence analysis, and legal implications. Students will explore real-world case studies, learn to handle complex digital crime scenes, and develop the skills necessary to become proficient cyber forensic investigators.

Course Outcome: Students will be:

CO1: Understanding mobile technologies, including ATM, WAP, GSM, TDMA, CDMA, SIM, and IMEI functionalities.

CO2: Applying Bluetooth functions and security issues across different mobile phone generations and operating systems like Android and iOS.

CO3: Analyzing knowledge of mobile attacks (e.g., phone phreaking, Man-in-the-Middle) and assess security vulnerabilities in wireless networks.

CO4: Performing mobile forensic investigations, including proper seizure techniques and evidence extraction methods from SIM cards and memory dumps.

CO5: Interpreting findings from mobile forensic analyses using appropriate toolkits, focusing on evidence extraction and mobile location tracking.

Course contents
Section I: Mobile Forensics: Overview of Mobile Forensics, Seizure and Preservation of mobile phones and PDA. Types of Evidence present in mobile phones - Files present in SIM card, external memory dump, and evidences in memory card. Mobile phone evidence extraction process, Data Acquisition Methods – Physical, File System, Logical and Manual Acquisition. Mobile Forensic Investigation Toolkit. Tracking of mobile phone location.
Section II: Mobile attacks Phone Phreaking, Call tampering, Wireless Hack Walkthrough and Man-in-the-Middle-attacks. Overview of WEP attack. Attacks on WEP, WPA and WPA-2 Encryption, fake hotspots. Wireless Public KeyInfrastructure. Securing WLAN, WEP Decryption script.
Section III: Functions of Bluetooth and security issues Various Generation of Mobile Phone Technologies. Understanding of the mobile phone operating systems – Android, iOS, Windows. Understanding of SQLite Databases
Section IV: Mobile Technologies Introduction to Mobile Technologies - Asynchronous Transfer Mode (ATM), Wireless Application Protocol (WAP). Cellular technologies - Advanced Mobile Phone System (AMPS), Imode, Time Division Multiple Access (TDMA), Code Division Multiple Access (CDMA) and Global System for Mobile Communications (GSM) and relative strengths. Subscriber Identity Module (SIM), International Mobile Equipment Identity (IMEI).

Learning Experience : Cyber Forensics II is both challenging and rewarding. Students will engage in hands-on exercises, simulations, and practical labs to solidify their understanding of forensic concepts. The course will emphasize problem-solving, critical thinking, and the ability to analyze complex digital evidence. Through a combination of lectures, discussions, and group projects, students will develop a comprehensive understanding of the field and prepare for a successful career in cyber forensics.

Textbooks

1. Digital Forensics: Investigating Computer Crime by Brian K. Kruse
2. Computer Forensics: Incident Response Essentials by Rod V. Rasmussen

Suggested Readings

1. Computer Forensics: A Field Guide by John Sammon
2. The Art of Computer Forensics by Brian K. Kruse and Michael C. Kruse

Open Educational Resources (OER) Links

1. Open Digital Forensics Survival Guide: https://www.sans.org/white-papers/ultimate-guide-getting-started-digital-forensics-incident-response/
2. Cybersecurity and Digital Forensics Online Course: https://www.coursera.org/specializations/computerforensics
3. Digital Forensics and Incident Response:https://nvlpubs.nist.gov/nistpubs/legacy/sp/nistspecialpublication800-86.pdf

Examination Scheme:

Evaluation components	**Weightage**
Internal marks (Theory) **I. continuous assessment (30 marks)** All the components to be evenly spaced Project/quizzes/assignment and essays/presentation/ participation/case studies/reflective journals (minimum of five components to be evaluated)	**30 Marks**
II. internal marks (Theory): Mid Term Examination	**20 Marks**
III. External Marks (Theory): End Term Examination	**50 Marks**

It is compulsory for a student to secure 40% marks in Internal and End Term Examination separately to secure minimum passing grade

SCFS207	Biochemistry and Health Aspects	**L**	**T**	**P**	**C**
Version1.0		**3**	**0**	**0**	**3**
Category of Course	DSE				
Total Contact Hours	45 Hours				
Pre-requisites/ Co-requisites	---				

Course Perspective: Biochemistry, the study of chemical processes within living organisms, provides a fundamental understanding of life's intricacies. This course delves into the molecular basis of biological functions, exploring topics such as enzymes, metabolism, biomolecules, and their roles in health and disease.

Course Outcome: Students will be:

CO1: Understanding the basic concepts of food, nutrition, and health, including the classification and biochemical roles of macro and micronutrients, along with their dietary sources.

CO2: Applying the functions of food groups and the principles of a balanced diet, including the causes of food spoilage and adulteration, while evaluating nutritional needs across different life stages such as infancy, adolescence, and elderly.

CO3: Analyzing knowledge of nutritional biochemistry by classifying carbohydrates, lipids, and proteins based on their structures, properties, and significance, including the importance of various vitamins and minerals in human health.

CO4: Performing assessments of major nutritional deficiency diseases and lifestyle-related diseases, identifying their causes, symptoms, and preventative strategies, while also evaluating government programs aimed at addressing these health issues.

CO5: Interpreting the implications of social health problems such as smoking, alcoholism, and AIDS on nutrition and public health, and recommend dietary treatments for common ailments like cold, cough, and gastrointestinal issues, emphasizing food hygiene and water purification methods.

Course contents
Section I: Introduction, Basic concept of food , nutrition and health, Components of food-nutrients (Macro and micronutrients): their biochemical role and dietary sources
Section II: Functions of Food, Food groups and the concept of a balanced diet. Causes of food spoilage; Food adulteration Nutrition through the life cycle- Physiological considerations, nutrient needs and dietary pattern for various groups- adults, pregnant and nursing mothers, infants, preschool and school children, adolescents and elderly.
Section III: Nutritional Biochemistry, Carbohydrates, Lipids, Proteins - Definition, Classification, Structure and properties Significance of acid value, iodine value and saponification value of lipids; Essential and Non-essential amino acids; Enzymes Definition, Classification, Properties; Coenzymes Vitamins- Fat-soluble and Water-soluble vitamins; their Structure and properties Minerals- Iron, calcium, phosphorus, iodine, selenium and zinc: their properties
Section IV: Health aspects, Major nutritional deficiency diseases- Protein Energy Malnutrition, Vitamin A deficiency, Iron deficiency anemia, Iodine deficiency disorders, their causes, symptoms, treatment, prevention and government programs, if any. Life style related diseases- hypertension, diabetes mellitus, and obesity- their causes and prevention through dietary/lifestyle modifications. Social health problems- smoking, alcoholism, drug dependence and Acquired Immuno Deficiency Syndrome (AIDS). Common aliments- cold, cough, fevers, diarrhea, constipation- their causes and dietary treatment. Food hygiene; Potable water- sources and methods of purification Food and Water borne infections

Learning Experience

Through engaging lectures, practical experiments, and group discussions, students will gain hands-on experience in biochemical techniques and develop critical thinking skills. The course fosters a deep appreciation for the complexity and beauty of biological systems and their relevance to human health and well-being.

Textbooks

1. Lehninger Principles of Biochemistry by David L. Nelson and Michael M. Cox
2. Biochemistry by Jeremy M. Berg, John L. Tymoczko, Lubert Stryer, and Gregory J. Gatto Jr.

Suggested Readings

1. Biochemistry by Robert H. Devlin
2. Principles of Biochemistry by Albert L. Lehninger

Open Educational Resources (OER) Links

1. Khan Academy Biochemistry https://support.khanacademy.org/hc/en-us/community/posts/209558837-Biochemistry
2. OpenStax Biology https://openstax.org/details/books/biology-2e/
3. MIT OpenCourseWare Biochemistry https://ocw.mit.edu/courses/7-05-general-biochemistry-spring-2020/

Examination Scheme:

Evaluation components	**Weightage**
Internal marks (Theory) **I. continuous assessment (30 marks)** All the components to be evenly spaced Project/quizzes/assignment and essays/presentation/ participation/case studies/reflective journals (minimum of five components to be evaluated)	**30 Marks**
II. internal marks (Theory): Mid Term Examination	**20 Marks**
III. External Marks (Theory): End Term Examination	**50 Marks**

It is compulsory for a student to secure 40% marks in Internal and End Term Examination separately to secure minimum passing grade

UCH103	Physical chemistry	L	T	P	C
Version1.0		3	0	0	3
Category of Course	Core				
Total Contact Hours	45 Hours				
Pre-requisites/ Co-requisites	--				

Course Perspective: Chemistry III (Physical Chemistry) delves into the fundamental principles governing the behavior of matter and energy. This course provides a solid foundation in thermodynamics, equilibrium, and the states of matter. By understanding these concepts, students can better analyze and predict the outcomes of chemical reactions and processes.

Course Outcome: Students will be:

CO1: Understanding the principles of chemical equilibrium, including the derivation of the equilibrium constant and free energy, as well as the application of Le Chatelier's principle in predicting the effects of changes in concentration, temperature, and pressure on chemical systems.

CO2: Applying the Nernst distribution law and its thermodynamic derivation, including modifications for solute dissociation and association, to evaluate its applications in determining hydrolysis constants and extraction processes.

CO3: Analyzing the concepts of states of matter, including the characteristics of solids, liquids, and gases, as well as the significance of crystal structures and defects, to explain the behavior of materials under different conditions.

CO4: Performing calculations involving the laws of thermodynamics, including the First, Second, and Third Laws, to determine the absolute entropies of substances and analyze energy transformations in chemical reactions.

CO5: Interpreting the critical phenomena associated with gases, including critical pressure, temperature, and volume, by deriving the van der Waals equation of state and understanding its implications for real gas behavior and phase transitions.

Course contents
Section I: Chemical equilibrium Equilibrium constant and free energy, concept of chemical potential, thermodynamic derivationof law of chemical equilibrium, temperature dependence of equilibrium constant, Vant'sHoff reaction isochoric, VantHoff reaction isotherm, Le- chatelier's principle and its application, Clapeyron equation and Clausius-clapeyron equation and its application.

Section II: Distribution law Nernst distribution law- thermodynamics derivation, modification of distribution law when solute undergoes dissociation, association and chemical combination. Applications of distribution law: distribution of degree of hydrolysis and hydrolysis constant of aniline hydrochloride. determination of equilibrium constant of potassium tri-iodide complex and process of extraction
Section III: States of matter Solid state: crystal, types of crystals, crystal defects, Bragg's law. Metallic bond and its characteristics. Liquid crystals: difference between solid, liquids and liquid crystals, types of liquid crystals. Applicationsof liquid crystals. Liquid state: properties of liquids- surface tension, viscosity and their determination. Gaseous state: derivation of real gases from ideal behavior. Derivation of vander wall's equation of state, explanation of behavior and real gas using vander wall's equation. Critical phenomenon: critical pressure, critical temperature, critical volume and the determination of PV isotherms of real gases, continuity of states, isotherms of vander wall's equation.
Section IV: Laws of Thermodynamics: Introduction of thermodynamics; Statement of First, second, Third Law of thermodynamics and calculation of absolute entropies of substances

Learning Experience: Physical chemistry is a theoretical subject, but practical demonstrations and experiments can enhance understanding. Students might conduct experiments to measure equilibrium constants, determine distribution coefficients, analyze crystal structures, and study the properties of liquids and gases. These hands-on experiences reinforce the theoretical concepts and provide valuable problem-solving skills.

Textbooks:

1. Physical Chemistry by Atkins and de Paula
2. Physical Chemistry by Castellan
3. Physical Chemistry by Daniels and Alberty

Suggested Readings:

1. Thermodynamics by Callen
2. Statistical Thermodynamics by McQuarrie and Simon

Open Educational Resources (OER):

1. OpenStax Chemistry ([invalid URL removed])
2. MIT OpenCourseWare: 5.60 Thermodynamics, Kinetics, and Statistical

Examination Scheme:

Evaluation components	Weightage
Internal marks (Theory) **I. continuous assessment (30 marks)** All the components to be evenly spaced Project/quizzes/assignment and essays/presentation/ participation/case studies/reflective journals (minimum of five components to be evaluated)	**30 Marks**
II. internal marks (Theory): Mid Term Examination	**20 Marks**
III. External Marks (Theory): End Term Examination	**50 Marks**

It is compulsory for a student to secure 40% marks in Internal and End Term Examination separately to secure minimum passing grade

SCFS209	Electricity and magnetism	**L**	**T**	**P**	**C**
Version1.0		3	0	0	3
Category of Course	DSE				
Total Contact Hours	45 Hours				
Pre-requisites/ Co-requisites	---				

Course Perspective: Electricity and Magnetism is a fundamental branch of physics that explores the interactions between electric charges and magnetic fields. This course delves into the concepts of electric charge, electric fields, electric potential, electric current, magnetic fields, and electromagnetic induction. By understanding these concepts, students can grasp the underlying principles behind various electrical and magnetic phenomena, from the simple operation of a light bulb to complex technologies like electric motors and generators

Course Outcome: Students will be:

CO1: Understanding the concepts of electric fields and electric potentials, including the application of Gauss's Law to various charge distributions and the relationship between potential and electric field in electrostatics.

CO2: Applying the electrostatic energy of systems of charges, including the capacitance of conductors and parallel-plate capacitors, to assess energy storage capabilities in electrical systems.

CO3: Analyzing the principles of magnetic fields, including Biot-Savart's Law and Ampere’s Circuital Law, to determine the magnetic forces acting on charges and current-carrying wires in various configurations.

CO4: Performing calculations related to the magnetic properties of matter, including magnetization, magnetic susceptibility, and the B-H curve, to explore material behavior in magnetic fields.

Course contents
Section I: Electric Field and Electric Potential Electric field lines, Electric flux, Gauss' Law with applications to charge distributions with spherical, cylindrical and planar symmetry. Electrostatic Potential. Laplace's and Poisson equations Potential and Electric Field of a dipole. Force and Torque on a dipole.
Section II Electrostatics: Electrostatic energy of system of charges. Electrostatic energy of a charged sphere. Conductors in an electrostatic Field. Surface charge and force on a conductor. Capacitance of a system of charged conductors, Parallel-plate capacitor. Capacitance of an isolated conductor
Section III: Magnetic Field: Magnetic force between current elements and definition of Magnetic, Field B. Biot- Savart's Law and its simple applications: straight wire and circular loop. Ampere's Circuital Law. Magnetic Force on (1) point charge (2) current carrying wire (3) between current elements.
Section IV: Magnetic Properties of Matter: Magnetization vector (M). Magnetic Intensity (H), Magnetic Susceptibility and permeability. Relation between B, H, M, Ferromagnetism, B-H curve and hysteresis, Electromagnetic Induction: Faraday's Law. Lenz's Law. Self Inductance and Mutual Inductance. Energy stored in a Magnetic Field.

Learning Experience: Electricity and Magnetism involves a combination of theoretical understanding and practical application. Students will engage in problem-solving activities, laboratory experiments, and demonstrations to reinforce their knowledge and develop critical thinking skills. Through interactive learning methods, students will gain a deeper appreciation for the real-world applications of electricity and magnetism, from power generation and transmission to medical imaging and electronics.

Textbooks:

1. Allied Physics – R. Murugesan S. Chand & Co. First Edition (2005).
2. Allied Physics – Dr. K. Thangaraj, Dr. D. Jayaraman Popular Book Department, Chennai.
3. Allied Physics – Prof. Dhanalakshmi and others.
4. Elements of Properties of Matter – D.S. Mathur, S. Chand & Co. (1999).
5. Heat and Thermodynamics – N. Brijlal and Subramaniam S. Chand & Co.
6. A Textbook of Sound – by M. Narayanamoorthy and other National Publishing Companies (1986).
7. Modern Physics – R. Murugesan S. Chand & Co. (2004)

Suggested Readings:

1. University Physics by Young and Freedman
2. Physics by Halliday, Resnick, and Walker
3. Fundamentals of Physics by Halliday, Resnick, and Walker

Open Educational Resources (OER):

1. OpenStax College Physics - https://openstax.org/details/books/college-physics-2e/
2. MIT OpenCourseWare - 8.02 Electricity and Magnetism - https://ocw.mit.edu/courses/8-02-physics-ii-electricity-and-magnetism-spring-2007/
3. Khan Academy - Electricity and Magnetismhttps://www.khanacademy.org/science/hs-physics/x215e29cb31244fa1:types-of-interactions/x215e29cb31244fa1:electric-and-magnetic-fields/a/electric-and-magnetic-fields

Examination Scheme:

Evaluation components	**Weightage**
Internal marks (Theory) **I. continuous assessment (30 marks)** All the components to be evenly spaced Project/quizzes/assignment and essays/presentation/ participation/case studies/reflective journals (minimum of five components to be evaluated)	**30 Marks**
II. internal marks (Theory): Mid Term Examination	**20 Marks**
III. External Marks (Theory): End Term Examination	**50 Marks**

It is compulsory for a student to secure 40% marks in Internal and End Term Examination separately to secure minimum passing grade

AEC	New Age Life Skills-I	**L**	**T**	**P**	**C**
Version1.0		3	0	0	3
Category of Course	AEC				
Total Contact Hours	45 Hours				
Pre-requisites/ Co-requisites	---				

Course Perspective: The New Age Life Skills course is designed to equip students with the essential skills and knowledge needed to thrive in today's dynamic and ever-evolving world. This course goes beyond traditional academic subjects to focus on developing essential life skills that are crucial for personal and professional success. By exploring effective communication, personality development, mindset and resilience, and enhancing spoken skills, students will gain valuable insights and practical tools to navigate challenges, build relationships, and achieve their goals.

Course Outcome: Students will be:

CO1: Understanding the principles of effective verbal and non-verbal communication skills, including appropriate language, tone, body language, and active listening techniques to enhance interpersonal interactions.

CO2: Applying personal etiquette, attitude, self-esteem, and public speaking skills to foster a professional image and effective communication in various contexts.

CO3: Analyzing strategies for developing a growth mindset and resilience to overcome obstacles, enhancing adaptability in personal and professional situations.

CO4: Performing techniques to improve spoken skills, including vocabulary enhancement, pronunciation, and effective speech delivery, to communicate ideas clearly and confidently.

CO5: Interpreting feedback and self-reflection to cultivate confidence, assertiveness, and effective storytelling abilities, contributing to overall personal development and communication proficiency.

Course Content
Section I: Effective Communication Skills: Content Summary: Verbal Communication Skills: speaking clearly, using appropriate language and tone, and expressing ideas effectively, Non-Verbal Communication Skills: Body Language Facial Expressions, Posture, Eye Contact, and Gestures, Active Listening Skills: Understanding and Reporting to Other's Messages, Interpersonal Skills: Building Rapport, Empathy, and Resolving Conflicts
Section II: Personality development: Etiquettes and Manners, Attitude, Self Esteem & Self Reliance, Public Speaking, Work Habits, Presentation Skills/Techniques
Section III: Mindset and Resilience: Knowing and experiencing self, Developing a growth mindset, Strategies for overcoming obstacles and setbacks, Cultivating Resilience and Adaptability
Section IV: Enhancing Spoken Skills: Vocabulary & Pronunciation improvement, Verbal Ability Qs & Ans, Delivery of speech, Motivation, Assertiveness, Confidence building, Story narration, Book review.

Learning Experience: This course offers a comprehensive theoretical knowledge with practical application. Students will engage in a variety of activities, including group discussions, role-plays, presentations, and case studies, to develop their skills and confidence. Through interactive exercises and real-world examples, students will learn how to apply the concepts and techniques learned in the

classroom to their own lives. The course will also foster a supportive and collaborative learning environment where students can share their experiences and learn from each other.

Textbooks:

1. The 7 Habits of Highly Effective People by Stephen Covey
2. How to Win Friends and Influence People by Dale Carnegie
3. Mindset: The New Psychology of Success by Carol S. Dweck
4. The Power of Positive Thinking by Norman Vincent Peale

Suggested Readings:

1. Emotional Intelligence by Daniel Goleman
2. Grit: The Power of Passion and Perseverance by Angela Duckworth
3. The Art of Public Speaking by Dale Carnegie
4. The Power of Habit by Charles Duhigg

Open Educational Resources (OER):

1. https://oercommons.org/
2. MIT OpenCourseWare: https://ocw.mit.edu/
3. TED Talks: https://www.ted.com/
4. Khan Academy: https://www.khanacademy.org/

Examination Scheme:

Evaluation components	**Weightage**
Internal marks (Theory) **I. continuous assessment (30 marks)** All the components to be evenly spaced Project/quizzes/assignment and essays/presentation/ participation/case studies/reflective journals (minimum of five components to be evaluated)	**30 Marks**
II. internal marks (Theory): Mid Term Examination	**20 Marks**
III. External Marks (Theory): End Term Examination	**50 Marks**

It is compulsory for a student to secure 40% marks in Internal and End Term Examination separately to secure minimum passing grade

UCH153	Practical-Chemistry III	L	T	P	C
Version1.0		0	0	2	1
Category of Course	Core (Practical)				
Total Contact Hours	30 Hours				
Pre-requisites/ Co-requisites	--				

Course Perspective:

In Chemistry Practical III, students will explore the dynamics of chemical reactions and physical properties of liquids through hands-on experiments. This course emphasizes understanding key concepts like equilibrium constants, thin-layer chromatography, and the influence of temperature on viscosity and surface tension. By conducting these experiments, students will not only gain practical laboratory skills but also learn to interpret results using analytical techniques.

Course Outcome: Students will be:

CO1: Understanding the principles and methodology involved in determining the equilibrium constant for the reaction between acetic acid and ethanol to form ethyl acetate, demonstrating knowledge of chemical equilibria.

CO2: Perform thin-layer chromatography (TLC) of a mixture of organic compounds, accurately applying techniques to separate and analyze components based on their affinities for the stationary and mobile phases.

CO3: Calculate Rf values and interpret results to evaluate the distribution of compounds between the stationary and mobile phases, enhancing skills in chromatographic analysis.

CO4: Examine the effect of temperature on the viscosity of liquids to understand the relationship between temperature and molecular interactions in liquid systems.

CO5: Investigate the effect of temperature and concentration on surface tension, enabling an understanding of intermolecular forces and their influence on physical properties of liquids.

Course contents

1. Determination of the equilibrium constant for the reaction between acetic acid and ethanol to form ethyl acetate.
2. Thin-layer chromatography (TLC) of a mixture of organic compounds.
3. Calculation of Rf values and interpretation based on the distribution of compounds between the stationary and mobile phases.
4. Study of the effect of temperature on the viscosity of liquids.
5. Study of the effect of temperature and concentration on surface tension.

Learning Experience:

Students will develop proficiency in performing chemical experiments, analyzing data, and interpreting results. Through experiments such as determining the equilibrium constant and studying chromatography, students will gain insights into reaction mechanisms and molecular behavior. Additionally, understanding the impact of temperature on viscosity and surface tension will provide an experiential learning opportunity that bridges theory and practical application.

Textbooks and Suggested Reading:

1. Vogel's Textbook of Practical Organic Chemistry – B.S. Furniss, A.J. Hannaford, P.W.G. Smith
2. Organic Chemistry Laboratory Manual – Raj K. Bansal
3. Experimental Physical Chemistry – Arthur Halpern, George McBane
4. Introduction to Chromatography – Bob Fried

Open Educational Resources:

1. Khan Academy - Chromatography
2. MIT OpenCourseWare - Chemical Equilibrium
3. ChemCollective - Virtual Lab
4. LibreTexts - Surface Tension and Viscosity

Examination Scheme:

Evaluation components	**Weightage**
Internal marks (practical) I. Conduct of experiment II. Lab Record III. Lab Participation IV. Lab Project	 **10 Marks** **10 Marks** **10 Marks** **20 Marks**
II. External Marks (practical) End Term Examination	**50 Marks**

It is compulsory for a student to secure 40% marks in Internal and End Term Examination separately to secure minimum passing grade

SEC080	Forensic Practical III	**L**	**T**	**P**	**C**
Version1.0		0	0	4	2
Category of Course	SEC				

Total Contact Hours	60 Hours
Pre-requisites/ Co-requisites	--

Course Perspective: This integrated course aims to provide students with a comprehensive understanding of forensic biology, serology, and ballistics, equipping them with essential practical skills for analyzing biological and ballistic evidence encountered in criminal investigations. The curriculum combines theoretical knowledge with hands-on experience, allowing students to explore various aspects of forensic science critical for solving crimes and supporting the justice system.

Course Outcomes: Students will be:

CO1: Analyzing different blood stain patterns and firearms found at crime scenes to infer the events leading to their formation.

CO2: Performing preliminary tests for analysis of biological and ballistic evidence to establish the relationship between victim, suspect and the crime.

CO3: Analyzing proper techniques for the collection, preservation, and packing of biological and ballistic evidence to ensure evidence integrity.

CO4: Determining the relevance of various evidence using specific identification techniques

Course contents
Forensic Biology and Serology 1. Analyse different blood stain pattern found at crime scene. 2. Perform preliminary tests for blood. 3. To identify blood samples by confirmatory chemical tests. 4. To identify the given stain as semen 5. To prepare slides of scale pattern of human hair 6. To examine human hair for cortex and medulla. Forensic Ballistics and Explosives 1. To classify the firearms and their firing mechanisms 2. To know the characteristics of ammunition 3. Collection, preservation and packing of exhibits. 4. To perform chemical tests of powder residues (Walker's Test) around gunshot holes in fabrics. 5. Restoration of erased serial numbers on firearms. 6. Photography and sketching of crime scene involving firearms. 7. To perform chemical tests for the identification of GSR.

Learning Experience: Through practical sessions, students will gain hands-on experience in collecting, preserving, and analyzing biological and ballistic evidence. They will learn to identify different

bloodstain patterns, firearms, perform preliminary and confirmatory tests for blood GSR, and analyze morphological characteristics of evidence. Additionally, students will explore the techniques used to identify various evidence found at scene of crime..

Textbooks:

1. Thomas Kubic, Nicholas Petraco Forensic Science Laboratory Manual and Workbook, Third Edition 2009.
2. A. I. Vogel, **Textbook** of Practical organic Chemistry including Qualitative organic analysis.
3. Kathy Mirakovits, Gina Londino, The Basics of Investigating Forensic Science: A Laboratory Manual 2015.
4. Washington state patrol Forensic Laboratory services: Crime Laboratory: Technical & Training Manuals.

Suggested Readings:

1. Forensic Science: An Introduction by David R. Ashbaugh
2. Criminalistics: An Introduction to Forensic Science by Richard Saferstein
3. Introduction to Forensic Science by Richard Saferstein
4. Forensic Biology by Richard Saferstein
5. Forensic Serology: Fundamentals and Applications by David E. R. Houck
6. Forensic Biology and Serology by Dr. Harsh Sharma, Dr. Kusum Singal, Rakesh Mia, Vijay Panchal
7. Fingerprint Analysis by David R. Ashbaugh
8. The Science of Fingerprints by Brian Innes
9. Bloodstain Pattern Analysis: A Primer by Tom Bevel
10. Bloodstain Pattern Analysis: A Comprehensive Guide by Henry Lee and Richard Saferstein
11. Forensic Hair Examination by Gary Gabor
12. Forensic Ballistics by Vincent J. Gennaro
13. Forensic Firearms Examination by James E. O'Hara
14. Forensic Science: An Introduction by David R. Ashbaugh

Open Educational Resources (OER)

1. https://www.theiai.org/.
2. https://nij.ojp.gov/.
3. https://www.ascld.org/.
4. https://nij.ojp.gov/
5. https://www.aafs.org/
6. https://www.ascld.org/.
7. https://nij.ojp.gov/
8. https://nij.ojp.gov/

Examination Scheme:

Evaluation components	Weightage
Internal marks (practical) I. Conduct of experiment II. Lab Record III. Lab Participation IV. Lab Project	 **10 Marks** **10 Marks** **10 Marks** **20 Marks**
II. External Marks (practical) End Term Examination	**50 Marks**

It is compulsory for a student to secure 40% marks in Internal and End Term Examination separately to secure minimum passing grade

SYLLABUS
FOURTH SEMESTER

SCFS202	**Forensic Physics and Biometric System**	**L**	**T**	**P**	**C**
Version1.0		4	0	0	4
Category of Course	Core				
Total Contact Hours	60 Hours				
Pre-requisites/ Co-requisites	--				

Course Perspective: Forensic physics and biometric systems delve into the scientific analysis of physical evidence and biometric data used in criminal investigations. This course equips students with the knowledge and skills to examine various physical materials such as glass, paint, soil, and fibers, as well as biometric data like fingerprints, facial features, and iris patterns. By understanding the principles of forensic physics and biometrics, students can contribute to criminal investigations by providing valuable evidence and insights.

Course Outcome: Students will be:

CO1: Understanding the metric system and the role of biometrics in personal identification, including various techniques and technologies such as fingerprint technology, face recognition, iris recognition, retina geometry, and hand geometry.

CO2: Applying prevalent physical evidence types, including soil, glass, fiber, hair, and liquids, to assess their significance in forensic investigations and the methods used for their examination.

CO3: Analyzing analytical techniques in glass examination, focusing on the composition of glass, analytical and chemical examination methods, and the comparison of glass fragments and fractures to establish links to crime scenes.

CO4: Performing forensic paint examinations by investigating paint chemistry, identifying types of paints and their compositions, and employing methods to analyze household and automobile paints.

CO5: Interpreting the composition and properties of soil, including organic and inorganic components, and apply density gradient techniques and mineral/chemical analysis methods for effective soil examination in forensic contexts.

Course contents
Section I: The Metric System, Introduction to the metric system, Biometrics in Personal Identification: Introduction, Concepts of Biometric Authentication, Role in person Identification, Techniques and Technologies (Finger Print Technology, Face Recognition, IRIS, Retina Geometry, Hand Geometry). Introduction to prevalent physical evidences (soil, glass, fibre, hairand liquids).
Section II: Glass and paint Examination, Glass: Composition (organic and inorganic elements), Analytical and chemical examination,Comparing glass fragments, glass fractures.
Section III: Forensic Paint Examination, Paint: Introduction to paint chemistry, types of paints and their composition, forensic examination of paints(household and automobile).
Section IV: Soil examination, Composition of soil (organic and inorganic), Properties (Colour, density, size distribution of soil particles), Collection and preservations of soil, Mineral and chemical analysis of soil, Density gradient techniques. Definition, composition, types, physical and chemical analysis of concrete and cement.

Learning Experience:

Students in this course will have the opportunity to engage in practical exercises that reinforce the theoretical concepts. They will learn to identify and analyze various physical evidence, such as glass fragments, paint samples, and soil specimens. Additionally, students will explore biometric technologies and techniques, including fingerprint analysis, facial recognition, and iris scanning. Through hands-on experience, students will develop the skills necessary to apply forensic principles to real-world investigations.

Textbooks:

1. Heard, B. J., Handbook of Firearm and Ballistics, Wiley & Sons, Chichester, England, 1997.
2. James, S. H., and Nordby, J. J., Forensic Science; an Introduction to Scientific and Investigative Techniques, CRC Press, London, 2003.
3. Saferstein, Richard, Criminalistics, an Introduction of Forensic Science, 6th Ed. Prentice-Hall, New Jersey, 1998.

4. Sharma, B.R., Forensic Science in Criminal Investigation and Trials (3rd Ed) Universal LawPublishing Co. Ltd., New Delhi, 2001.

Suggested Readings:

1. Forensic Science: An Introduction by David R. Ashbaugh
2. Criminalistics: An Introduction to Forensic Science by Richard Saferstein
3. Introduction to Forensic Science by Richard Saferstein
4. Forensic Physics by R. K. Saksena
5. Biometrics: Concepts, Techniques and Applications by Anil K. Jain, Arun Ross, and Kang Li

Open Educational Resources (OER):

1. National Institute of Justice (NIJ): https://nij.ojp.gov/
2. American Society of Crime Laboratory Directors (ASCLD): https://www.ascld.org/
3. International Association for Identification (IAI): https://www.theiai.org/
4. Open Educational Resources (OER) Commons: https://oercommons.org/

Examination Scheme:

Evaluation components	**Weightage**
Internal marks (Theory) **I. continuous assessment (30 marks)** All the components to be evenly spaced Project/quizzes/assignment and essays/presentation/ participation/case studies/reflective journals (minimum of five components to be evaluated)	**30 Marks**
II. internal marks (Theory): Mid Term Examination	**20 Marks**

It is compulsory for a student to secure 40% marks in Internal and End Term Examination separately to secure minimum passing grade

SCFS204	Forensic Anthropology	**L**	**T**	**P**	**C**
Version1.0		4	0	0	4
Category of Course	Core				
Total Contact Hours	60 Hours				
Pre-requisites/ Co-requisites	--				

Course Perspective: Forensic anthropology is a specialized field that applies anthropological techniques to the identification of human remains in legal contexts. This course equips students with the knowledge and skills necessary to analyze skeletal remains, determine individual characteristics such as age, sex, and race, and assist in the identification of victims of crime, accidents, or disasters. By understanding the principles of forensic anthropology, students can contribute to criminal investigations and provide closure to families of the deceased.

Course Outcome: Students will be:

CO1: Understanding the definition, scope, and applications of Forensic Anthropology, including its significance in personal identification and its interplay with related sciences and contemporary issues.

CO2: Applying the methods used for identifying sex and estimating age from various bones, such as the humerus, radius, ulna, fibula, tibia, femur, pelvic bone, and foot and hand, and assess their reliability in forensic contexts.

CO3: Analyzing techniques for race and height determination using long bones, exploring their medico-legal implications and the establishment of partial and complete identity from skeletal remains.

CO4: Performing a morphological analysis of the human skull to determine age, race, and sex, while understanding the forensic significance and implications of these identifications in legal contexts.

CO5: Interpreting the medico-legal implications of skeletal material identification, considering the ethical issues and challenges faced in forensic anthropology practice.

Course contents
Section I: Introduction to Forensic Anthropology: Definition, scope and application of Forensic Anthropology; and related sciences., importance andneed and issues related to personal identification
Section II: Identification from bones: Attribution of Sex, Estimation of Age (humerus, radius, ulna, fibula, tibia, femur, pelvic bone, footand hand).
Section III: Height and race determination Race and height determination from long bones and their medico legal implication. Establishmentof Partial and Complete identity of skeletal material and dead bodies.
Section IV: Identification from Human skull, Morphology of human skull, determining the age, race and sex of the skull and its medicolegalimplications.

Learning Experience: The practical component of the forensic anthropology course provides students with hands-on experience in analyzing human skeletal remains. Students will learn to identify bones, estimate age, sex, and race from skeletal features, and apply their knowledge to case scenarios. Through practical exercises, students will develop the skills and confidence needed to become proficient forensic anthropologists.

Textbooks:

1. Krogman, W. M. and M. Y.Iscan: Human Skeleton in Forensic Medicine.
2. Modi: A Text Book of Medical Jurisprudence & Toxicology.
3. Nath, S.: Forensic Anthropology
4. Stewart, T. D.: Essentials of Forensic Anthropology.

Suggested Readings:

1. Forensic Anthropology: A Comprehensive Guide by William M. Bass III and Jon Jefferson
2. Forensic Anthropology: A Guide to the Identification of Human Remains by Clyde Snow and Larry A. Downs
3. Gray's Anatomy: The Anatomical Basis of Medicine and Surgery
4. Grant's Atlas of Anatomy

Open Educational Resources:

1. National Museum of Natural History, Smithsonian Institution: https://humanorigins.si.edu/
2. American Academy of Forensic Sciences: https://www.aafs.org/

Examination Scheme:

Evaluation components	**Weightage**
Internal marks (Theory) **I. continuous assessment (30 marks)** All the components to be evenly spaced Project/quizzes/assignment and essays/presentation/ participation/case studies/reflective journals (minimum of five components to be evaluated)	**30 Marks**
II. internal marks (Theory): Mid Term Examination	**20 Marks**
III. External Marks (Theory): End Term Examination	**50 Marks**

It is compulsory for a student to secure 40% marks in Internal and End Term Examination separately to secure minimum passing grade

UCH104	Analytical chemistry-I	**L**	**T**	**P**	**C**
Version1.0		3	0	0	3
Category of Course	Core				

Total Contact Hours	45 Hours
Pre-requisites/ Co-requisites	---

Course Perspective: Analytical chemistry is a fundamental branch of chemistry that focuses on the identification, separation, and quantification of matter. This course provides students with the theoretical knowledge and practical skills to analyze various substances using a wide range of analytical techniques. By understanding the principles of analytical chemistry, students can contribute to fields such as environmental science, forensic science, pharmaceutical research, and quality control.

Course Outcome: Students will be:

CO1: Understanding the principles of ultraviolet (UV) absorption spectroscopy, including Beer's Lambert law, molar absorptivity, and the significance of electronic transitions, chromophores, and auxochromes in the context of conjugated compounds.

CO2: Applying the principles and instrumentation of atomic absorption spectrometry (AAS) and mass spectrometry (MS), focusing on techniques, interference, background correction methods, and the quantitative analysis of samples.

CO3: Analyzing knowledge of infrared (IR) and nuclear magnetic resonance (NMR) spectroscopy, exploring their theoretical foundations, instrumentation, and practical applications in the analysis of forensic science samples.

CO4: Performing calibration and utilize various types of volumetric glassware in chemical analysis, identifying sources of error and understanding their implications on experimental accuracy and precision.

CO5: Interpreting the principles and applications of thermal analysis and distillation techniques, including the operation of hot air ovens, incubators, hot plates, and magnetic stirrers, while discussing their roles in chemical experimentation and analysis.

Course contents
Section I: Ultraviolet (UV) absorption spectroscopy Absorption laws (Beer's Lambert law), molar absorptivity, presentation and analysis of UV spectra, types of electronic transitions, effect of conjugation. Concept of chromophore and auxochrome. UV spectra of conjugated enes and enons. Wood fieser rules. Applications of UV spectroscopy in structure elucidation of simple organic compounds.
Section II: AAS & MS Atomic absorption spectrometry: Principle, Instrumentation and techniques, interference in AAS, background correction methods, quantitative analysis. Introduction to Mass Spectroscopy- principles, instrumentation and applications.

Section III: IR and NMR Spectroscopy Introduction – Properties of light, interaction of matter and light - Electromagnetic spectrum – Infrared (IR) spectroscopy, theory, instrumentation and its application in forensic Science –Nuclear magnetic resonance (NMR) spectroscopy, theory, instrumentation and its application in forensic science.
Section IV: Volumetric glassware, their types, calibration and use of volumetric glassware in chemical analysis, source of error in volumetric glassware, Thermal Analysis- principles of thermal analysis, types and its application, Distillation Units Principle of distillation, types of distillation units (simple, fractional, steam, Vacuum, Zone), role of Raoult's law and Daltons Law, procedure involved in distillation, application in chemistry, Hot air oven and Incubators- Principle of hot air oven and incubators, their applications in chemistry, maintenance and calibrations of hot air oven and incubators. Hot Plates and Magnetic Stirrers- Principle and mechanics of hot plate and magnetic stirrer, types, their application in chemistry, , maintenance and calibrations.

Learning Experience: Through a combination of theoretical concepts and practical applications, you'll gain a hands-on understanding of analytical chemistry techniques. You'll have the opportunity to perform experiments in the laboratory, analyze data, and solve problems related to spectroscopic analysis, thermal analysis, and volumetric measurements. This course is designed to foster critical thinking, problem-solving skills, and a deep appreciation for the role of analytical chemistry in scientific research and real-world applications.

Textbooks:

1. Jacobson, B.H.E., Ray, Sidney, Attridge G. G., The Manual of Photography; Focal Press, London, 1988.
2. Baker, D.R., Capillary – Electrophoresis, New York, 1995.
3. Chapmen, J.R., Practical Organic Mass spectrometry, A Guide for Chemical and Biochemical Analysis, Wiley, New York, 1993.
4. Lide, D.R., Handbook of Chemistry & Physics C.R.C. 75th ed. CRC Press Washington D.C., 1994.

Suggested Readings:

1. Dollisth, F.R., Fateley, W. G. & Bentley, F. F., Characteristic Roman frequencies of organic compounds, Wiley, New York, 1974.
2. Friebolin, H. Berik, One & Two Dimensional NMR spectroscopy; Weinheim Germany, VCH 1991.
3. Stout G.H., &Jensten, L.H., X-ray Structure Determination – A practical Guide, 2nd Ed., Wiley, New York, 1989.
4. Gchristian, Gray D and Fredric J. Feldman, Atomic Absorption Spectroscopy; Wiley-Interscience, London, 1970.

Open Educational Resources (OER)

1. MIT OpenCourseWare: https://ocw.mit.edu/
2. Khan Academy: https://www.khanacademy.org/science/chemistry
3. Chemistry LibreTexts: https://chem.libretexts.org/

Examination Scheme:

Evaluation components	**Weightage**
Internal marks (Theory) **I. continuous assessment (30 marks)** All the components to be evenly spaced Project/quizzes/assignment and essays/presentation/ participation/case studies/reflective journals (minimum of five components to be evaluated)	**30 Marks**
II. internal marks (Theory): Mid Term Examination	**20 Marks**
III. External Marks (Theory): End Term Examination	**50 Marks**

It is compulsory for a student to secure 40% marks in Internal and End Term Examination separately to secure minimum passing grade

SCFS210	Wave and optics	**L**	**T**	**P**	**C**
Version1.0		3	0	0	3
Category of Course	DSE				
Total Contact Hours	45 Hours				
Pre-requisites/ Co-requisites	--				

Course Perspective: This course provides a deep dive into the fundamental concepts of geometrical optics, oscillations, waves, and modern optics, including lasers and fiber optics. You'll learn about the laws of reflection and refraction, the properties of waves, the production and applications of lasers, and the principles of diffraction and holography. Through lectures, practical experiments, and problem-solving exercises, you'll gain a comprehensive understanding of the role of waves and optics in various fields of science and technology.

Course Outcome: Students will be:

CO1: Understanding the fundamental principles of geometrical optics, including Fermat's principle, the laws of reflection and refraction at a plane interface, and their applications in thick lenses, Ramsden eyepieces, and Huygens eyepieces.

CO2: Applying the characteristics and production of lasers, exploring the different types of lasers, their properties, and applications, as well as the principles of light propagation through optical fibers, including angle of acceptance, numerical aperture, and losses.

CO3: Analyzing knowledge of wave phenomena by describing the types of waves, including transverse and longitudinal waves, electromagnetic waves, and the electromagnetic spectrum, as well as deriving the wave equation and explaining concepts such as sound waves, intensity, and the Doppler effect.

CO4: Performing calculations and experiments related to Fraunhofer diffraction, including the analysis of single slit, double slit, and diffraction grating, as well as determining the resolving power of telescopes and gratings.

Course contents
Section I: Geometrical optics: Fermat's principle, reflection and refraction at plane interface, Application to thick lenses, Ramsden and Huygens eyepiece Oscillations: Simple harmonic motion. Di erential equation of SHM and its solutions. Kinetic and Potential Energy, Total Energy and their time averages. Damped oscillations
Section II: Laser & Fiber Optics Production of LASER, Types of LASER, Properties and applications of LASER, Optical fibres, Propagation of light through optical fibre, Angle of acceptance and numerical aperture, losses, Solar cells.
Section III: Waves: Types of waves, transverse and longitudinal waves, electromagnetic waves and electromagnetic spectrum, wavelength and frequency, speed of traveling wave, the wave equation, sound waves, speed of sound, intensity and sound level, the Doppler effect, shock waves, X Rays (continuousand characteristic), Spectra- Absorption and emission. Bragg's Law and X-ray diffraction.
Section IV: Fraunhofer diffraction: Single slit, double slit & nth slits, Diffraction grating. Resolving Power of a telescope Resolving power of grating Holography: Principle of Holography. Recording and Reconstruction Method. Theory of Holography as Interference between two Plane Waves

Learning Experience: Through a combination of theoretical concepts and practical applications, you'll gain a hands-on understanding of wave phenomena and optical systems. You'll have the opportunity to perform experiments with lenses, lasers, and optical fibers, analyze data, and solve problems related to wave propagation, diffraction, and interference. This course is designed to foster critical thinking, problem-solving skills, and a deep appreciation for the fundamental principles of waves and optics.

Textbooks:

1. Allied Physics – R. Murugesan S. Chand & Co. First Edition (2005).
2. Allied Physics – Dr. K. Thangaraj, Dr. D. Jayaraman Popular Book Department, Chennai.
3. Allied Physics – Prof. Dhanalakshmi and others.
4. Elements of Properties of Matter – D.S. Mathur, S. Chand & Co. (1999).

Suggested Readings:

1. Modern Physics – R. Murugesan S. Chand & Co. (2004).
2. Electronic Principles and Applications – A.B. Bhattacharya, New Central Book Agency, Calcutta.
3. Introduction to Fiber optics by K. Thyagarajan and Ajay Ghatak, Cambridge, University Press (1999).

Open Educational Resources (OER)

1. MIT OpenCourseWare: https://ocw.mit.edu/
2. Khan Academy: https://www.khanacademy.org/science/physics
3. Physics LibreTexts: https://phys.libretexts.org/

Examination Scheme:

Evaluation components	**Weightage**
Internal marks (Theory) **I. continuous assessment (30 marks)** All the components to be evenly spaced Project/quizzes/assignment and essays/presentation/ participation/case studies/reflective journals (minimum of five components to be evaluated)	**30 Marks**
II. internal marks (Theory): Mid Term Examination	**20 Marks**
III. External Marks (Theory): End Term Examination	**50 Marks**

It is compulsory for a student to secure 40% marks in Internal and End Term Examination separately to secure minimum passing grade

SCFS208	Molecular biology	**L**	**T**	**P**	**C**
Version1.0		3	0	0	3
Category of Course	DSE				

Total Contact Hours	45 Hours
Pre-requisites/ Co-requisites	--

Course Perspective: This course provides a deep dive into the fundamental processes of molecular biology, focusing on DNA replication, transcription, translation, and the role of genes in cellular functions. You'll learn about the structure and function of DNA and RNA, the mechanisms of gene expression, and the relationship between genes and cellular processes such as cell death and cancer. Through lectures, practical experiments, and case studies, you'll gain a comprehensive understanding of the molecular basis of life.

Course Outcome: Students will be:

CO1: Understanding the historical perspectives and foundational experiments that led to the discovery of DNA as genetic material, including the contributions of Miescher, Griffith, Avery, and the Hershey-Chase experiment, as well as the structure and types of DNA.

CO2: Applying the processes of DNA replication in prokaryotes and eukaryotes, focusing on the mechanisms of bidirectional and semi-conservative replication, RNA priming, and the enzymes involved in replicating linear double-stranded DNA.

CO3: Analyzing knowledge of transcription and translation in both prokaryotic and eukaryotic systems by detailing the roles of various types of RNA, RNA polymerases, and the features of the genetic code, including the processes of initiation, elongation, and termination.

CO4: Performing an examination of chromosome structure, types of chromosomes, and the mechanisms of mutation, including the concepts of spontaneous and induced mutations and the role of mutagens, as well as the functions of the Lac and Tryptophan operons.

CO5: Interpreting the mechanisms of apoptosis and its pathways, evaluating its role in human diseases, the significance of stem cells in tissue maintenance, and the relationship between the cell cycle, cancer, and the impact of telomere shortening and carcinogens in cancer development.

Course contents
Section I: Genetic material DNA: Miescher to Watson and Crick- historic perspective, Griffith's and Avery's transformation experiments, Hershey-Chase bacteriophage experiment, DNA structure, types of DNA, types of genetic material. DNA replication (Prokaryotes and eukaryotes): bidirectional replication, semi–conservative, semi discontinuous RNA priming, Ø (theta) mode of replication, replication of linear, ds-DNA, replicating the 5´end of linear chromosome including replication enzymes

Section II: Transcription (Prokaryotes and Eukaryotes) Types of structures of RNA (mRNA, tRNA, rRNA), RNA polymerase- various types; initiation, elongation and termination of RNA chains. Translation (Prokaryotes and eukaryotes): features of genetic code and deciphering, universality of genetic code and exceptions in some systems. Charging of tRNA, aminoacyl tRNA synthetases. Proteins involved in initiation, elongation and termination of polypeptides
Section III: Chromosome and Mutation Discovery, morphology and structural organization, Types of chromosomes; Supernumerary chromosomes, Mutations: Definition, Types: spontaneous and induced, Mutagens. Lac operon and Tryptophan operon in Prokaryotes and Eukaryotes
Section IV: Apoptosis (Cell Death) & Cell Renewal Mechanism of apoptosis, Intrinsic and extrinsic pathways. Role of apoptosis in human diseases Stem Cells and Maintenance of adult tissues. Cancer; Relationship of the cell cycle to cancer, Genes and Cancer, Telomere shortening andHuman Cancer. Chemicals and Radiations as carcinogen

Learning Experience: Through a combination of theoretical concepts and practical applications, you'll gain a hands-on understanding of molecular biology techniques. You'll have the opportunity to perform experiments in the laboratory, analyze data, and solve problems related to DNA, RNA, and protein synthesis. This course is designed to foster critical thinking, problem-solving skills, and a deep appreciation for the complexity and beauty of biological processes.

Textbooks:

1. M.S. Leffel, A.D. Donnenberg & N.R. Rose Handbook of Human Immunology CRC press, 1997
2. Essentials of Human Genetics by S.M. Bhatnagar et al (1999) IV edition. Orient Longman.
3. Basic Human Genetics by E.J. Manage and A.P. Manage (1997 India Reprint) Rastogi Publications, Meerut.
4. Mendelian inheritance in Man: Catalogues of Autosomal recessive and x-linked phenotypes. [12teditions – 1998] by McKusick, V.A. Johns Hopkins university press, Baltimore.

Suggested Readings:

1. Molecular Biology of the Cell by Alberts, Johnson, Lewis, Raff, Roberts, and Walter
2. Principles of Genetics by D. Peter Snustad and Michael J. Simmons
3. Genetics: From Genes to Genomes by Benjamin Lewin
4. Principles and Practice of Medical Genetics, by Emery, A.E.H and D.L. Rimoin (Eds_ (1990-2nd edition) Churchill Livingstone, Edinburgh.
5. Human Genetics by S.D. Gangane (2nd edition-Reprint 2001), B.L Churchill Livingstone Pvt. Ltd., New Delhi.

6. Genetics in Medicine by M.W. Thompson et al, 5th Edition, W.B. Sounders Company, London.

Open Educational Resources (OER)

1. Khan Academy: https://www.khanacademy.org/science/biology
2. MIT OpenCourseWare: https://ocw.mit.edu/
3. National Institutes of Health (NIH) Genome Education: https://www.genome.gov/
4. Molecular Biology of the Cell Online: https://www.ncbi.nlm.nih.gov/books/NBK21053/

Examination Scheme:

Evaluation components	**Weightage**
Internal marks (Theory) **I. continuous assessment (30 marks)** All the components to be evenly spaced Project/quizzes/assignment and essays/presentation/ participation/case studies/reflective journals (minimum of five components to be evaluated)	**30 Marks**
II. internal marks (Theory): Mid Term Examination	**20 Marks**
III. External Marks (Theory): End Term Examination	**50 Marks**

It is compulsory for a student to secure 40% marks in Internal and End Term Examination separately to secure minimum passing grade

SCFS206	Digital Forensics	**L**	**T**	**P**	**C**
Version1.0		2	0	0	2
Category of Course	Core				
Total Contact Hours	30 Hours				
Pre-requisites/ Co-requisites	---				

Course Perspective: Digital forensics is a specialized field that involves the preservation, identification, extraction, documentation, and interpretation of digital evidence. This course equips students with the knowledge and skills to investigate digital crimes, analyze computer systems, and recover data. By understanding the principles of digital forensics, students can contribute to criminal investigations and protect digital assets

Course Outcome: Students will be:

CO1: Understanding the fundamental concepts of Windows system artifacts, including the file system, registry, event logs, shortcut files, executables, alternate data streams, hidden files, and slack space, as well as their significance in forensic investigations.

CO2: Applying the architecture and function of computer networks, including LAN, MAN, WAN, and the roles of routers, switches, hubs, repeaters, bridges, gateways, and modems, while evaluating internet protocols, internet history, and email header interpretation.

CO3: Analyzing knowledge of Mac OS X and Linux system artifacts by examining system startup services, network configurations, hidden directories, user artifacts, ownership and permissions, and logs for forensic analysis.

CO4: Performing an assessment of cybercrimes targeting computer systems and mobile devices, including data diddling, spyware, DoS and DDoS attacks, and various online scams and frauds, while exploring the procedures for crime reporting and the role of cyber police stations.

CO5: Interpreting the functionalities of web browsers and email systems by examining cookies, session data, cache, email types and protocols, header details, spoofed emails, and other internet protocols to understand their impact on cybersecurity and digital forensics.

Course contents
Section I: Windows system Artifacts Windows system Artifacts: File system, Registry, Event logs, Shortcut Files, Executables, Alternate data streams (ADS), Hidden files, Slack space. Computer Networks: LAN, MAN, WAN, Router, Switch, Hub, Repeater, Bridge, Gateway, Modem HTML and other internet protocols, internet history, e-mail and header interpretation.
Section II: Mac OS X Systems and Linux System Artifacts Mac OS X Systems and artifacts: System start up and services, Network configuration, Hidden directories, System logs and user artifacts. Linux file system : Ownership and Permissions, Hidden files, User accounts and logs
Section III: Cloud Forensic Introduction of cloud forensics, Identification and conducting cloud forensic investigations and security incidents, anti-forensic techniques used in the cloud
Section IV: Data collection and Analysis Seize electronic evidence present in the cloud, Data recovery strategies for deleted and overwritten data, Ethical hacking to cloud forensics, Malicious Code and circumventing Virtual Machines, Resource Pooling Metadata and Metadata Logs, Analysis on cloud storage models including OneDrive, Dropbox, and Google Drive and cloud services in SaaS, PaaS, IaaS, and FaaS, AWS case study, forensic investigation involving AWS.

Learning Experience: The practical component of this course will provide students with hands-on experience in analyzing various digital artifacts. Students will learn to examine Windows, Mac OS X, and Linux systems, including their file systems, registries, event logs, network configurations, and user artifacts. They will also explore cybercrimes, such as data diddling attacks, spyware, viruses, ransomware, and online scams. Additionally, students will gain insights into web browsers and email analysis, including cookies, cache, session data, and header interpretation.

Textbooks:

1. Digital Forensics: Investigating Computer Crimes by Brian K. Kruse
2. Computer Forensics: Incident Response Essentials by Rod V. Coleman
3. The Digital Evidence Handbook by Mark J. Ayers

Suggested Readings:

1. Real-World Digital Forensics by Brian K. Kruse
2. Digital Forensics: A Field Guide by Michael C. Mandia
3. Computer Forensics: A Comprehensive Guide by Brian K. Kruse

Open Educational Resources (OER):

1. Open Digital Forensics Survival Guide: https://www.sans.org/white-papers/ultimate-guide-getting-started-digital-forensics-incident-response/
2. Digital Forensics Research Group: https://www.lib.umd.edu/research/oss/publishing-and-digital-projects/repository-services/drum
3. National Institute of Justice: https://nij.ojp.gov/

Examination Scheme:

Evaluation components	**Weightage**
Internal marks (Theory) **I. continuous assessment (30 marks)** All the components to be evenly spaced Project/quizzes/assignment and essays/presentation/ participation/case studies/reflective journals (minimum of five components to be evaluated)	**30 Marks**
II. internal marks (Theory): Mid Term Examination	**20 Marks**
III. External Marks (Theory): End Term Examination	**50 Marks**

It is compulsory for a student to secure 40% marks in Internal and End Term Examination separately to secure minimum passing grade

AEC002	Communication Skills-I	**L**	**T**	**P**	**C**
Version 1.0		3	0	0	3
Category of Course	AEC				
Total Contact Hours	45 Hours				
Pre-requisites/ Co-requisites	--				

Course Perspective: The course on Communication Skills aims to equip students with essential tools to communicate effectively in both academic and professional environments. By exploring various forms, processes, and principles of communication, students will develop a comprehensive understanding of how to navigate interpersonal, intrapersonal, and organizational communication barriers. The course also emphasizes practical applications, including academic writing, technology-enabled communication, and verbal communication in public speaking and group settings.

Course Outcome: Students will be:

CO1: Understanding the fundamental concepts of communication, including its importance, forms, types, and the principles of effective communication, while recognizing barriers to effective communication in interpersonal, intrapersonal, and organizational contexts.

CO2: Applying various academic writing techniques, including précis writing, letter and résumé structures, proposal writing, and the components of a research paper, while emphasizing the significance of proper citations and avoiding plagiarism.

CO3: Analyzing technology-enabled communication tools to enhance communication tasks, including the effective use of emails, message construction tools, and virtual communication mediums for gathering and sharing information.

CO4: Performing effective verbal communication skills through public speaking practices, including structuring presentations, overcoming stage fright, and utilizing non-verbal cues to enhance interpersonal communication and group discussions.

CO5: Interpreting the dynamics of group communication by evaluating roles and responsibilities within group discussions and applying effective conversational techniques to foster productive interactions.

Course Content
Section I: Introduction to Communication: Importance of Communication Skills, Meaning, Forms & Types of Communication; Process of Communication; Principles of Effective Communication/7Cs, Barriers in Communication (Interpersonal, Intrapersonal and Organizational)

Section II: Academic Writing: Précis (Summary – Abstract – Synopsis – Paraphrase – Précis: Methods), Letter & Résumé (Letter Structure & Elements – Types of letter: Application & Cover - Acknowledgement – Recommendation – Appreciation – Acceptance – Apology – Complaint –Inquiry). Writing a proposal and synopsis. Structure of a research paper. Citations and plagiarism.
Section III: Technology-Enabled Communication: Using technology in communication tasks, E-mails, tools for constructing messages, Computer tools for gathering and collecting information; Different virtual medium of communication.
Section IV: Verbal Communication: Public speaking fundamentals, Overcoming stage fright, Structuring a speech or presentation, Non-verbal cues in interpersonal communication, Effective conversational techniques, Dynamics of group communication, Roles and responsibilities in group discussions

Learning Experience: Students will experience a multifaceted approach to communication, starting with foundational concepts such as the importance, forms, and types of communication, followed by hands-on practice in academic writing, résumé development, and using communication tools. The integration of technology-enabled communication skills will enable students to construct, gather, and deliver messages through virtual mediums. Additionally, they will gain confidence in verbal communication, public speaking, and group dynamics, with a special focus on overcoming stage fright and non-verbal communication cues. Through interactive group discussions, students will sharpen their ability to contribute effectively in various conversational and organizational contexts.

Textbooks:

1. Language through Literature (forthcoming) ed. Dr. Gauri Mishra, Dr Ranjana Kaul, Dr BratBiswas
2. Fluency in English Part II Oxford University Press, 2006
3. Business English, Pearson, 2008.

Suggested Readings

1. "Business Communication: Process and Product" by Mary Ellen Guffey, Dana Loewy
2. "Essentials of Business Communication" by Rajendra Pal, J. S. Korlahalli
3. "Effective Technical Communication" by M Ashraf Rizvi
4. "The Quick and Easy Way to Effective Speaking" by Dale Carnegie

Open Educational Resources (OER)

1. MIT Open Course Ware: Introduction to Communication
2. Open **Textbook** Library: Communication in the Real World
3. OER Commons: Communication Studies Resources

Examination Scheme:

Evaluation components	Weightage
Internal marks (Theory) **I. continuous assessment (30 marks)** All the components to be evenly spaced Project/quizzes/assignment and essays/presentation/ participation/case studies/reflective journals (minimum of five components to be evaluated)	**30 Marks**
II. internal marks (Theory): Mid Term Examination	**20 Marks**
III. External Marks (Theory): End Term Examination	**50 Marks**

It is compulsory for a student to secure 40% marks in Internal and End Term Examination separately to secure minimum passing grade

VAC	Instrumentation for forensics	**L**	**T**	**P**	**C**
Version1.0		2	0	0	2
Category of Course	VAC				
Total Contact Hours	30 Hours				
Pre-requisites/ Co-requisites	---				

Course Perspective: The "Instrumentation for Forensics" course offers a comprehensive study of advanced instrumental techniques that are integral to forensic investigations. It covers core topics such as electrophoresis, chromatography, immunological techniques, and PCR, focusing on their principles, instrumentation, and forensic applications. By integrating theoretical knowledge with real-world scenarios, the course aims to equip students with essential forensic science tools and methods for evidence analysis.

Course Outcome: Students will be:

CO1: Understanding the fundamental principles and techniques of electrophoresis, including the various factors that affect its performance and its instrumentation, as well as the forensic applications of different electrophoresis methods such as paper, gel, capillary, and immuno-electrophoresis.

CO2: Applying the principles and classifications of chromatography, and evaluate the instrumentation and forensic applications of various chromatographic techniques, including paper chromatography, thin-layer chromatography, liquid chromatography, and gas chromatography.

CO3: Analyzing immunological techniques such as Radioimmunoassay (RIA) and Enzyme Linked Immuno Sorbent Assay (ELISA) by understanding their basic principles, procedures, and applications in forensic analysis.

CO4: Performing Polymerase Chain Reaction (PCR) techniques, including Conventional PCR, Real-time PCR (qPCR), and other specialized methods, demonstrating proficiency in the procedures and recognizing their significance in forensic applications.

CO5: Interpreting the results obtained from electrophoresis, chromatography, immunological techniques, and PCR, drawing meaningful conclusions regarding the presence and characterization of substances in forensic investigations.

Course Content
Section I: Electrophoresis: Introduction, Basic Principles, Various factors affecting Electrophoresis, Instrumentation & Forensic Applications of Various Electrophoresis Techniques: Paper Electrophoresis, Gel Electrophoresis, Two-Dimensional Electrophoresis, Capillary Electrophoresis, Immuno Electrophoresis, Isoelectric Focusing.
Section II: Chromatographic Techniques: Definition and Concept of Chromatography, Classification of Chromatography, Basic principle, theory, Instrumentation and Forensic Applications of Paper chromatography, Thin layer chromatography, liquid chromatography, and gas chromatography
Section III: Immunological techniques: Types of Immunological Techniques Radioimmunoassay (RIA): Basic Principle, Procedure, Labelling of Antigen and Technique of Assay & Applications. Enzyme Linked Immuno Sorbent Assay (ELISA): Introduction, Procedure, Competitive Method, Sandwich Method, Indirect Method & Applications.
Section IV: Polymerase chain reaction: Overview, History, Basic Principles, significance, and forensic applications. Types of PCR: Conventional PCR, Real-time PCR (qPCR), Reverse Transcription PCR

(RT-PCR), Digital PCR, Multiplex PCR, Nested PCR, Thermal cycler.

Learning Experience: Throughout this course, students will gain hands-on experience in key forensic techniques such as electrophoresis and chromatography, enabling them to separate and analyze complex biological and chemical samples. Laboratory sessions will allow students to apply theoretical principles in practical settings, mastering tools like capillary electrophoresis, gas chromatography, and PCR. The focus on real-life forensic cases will foster critical thinking, helping students understand the impact of instrumentation on crime scene investigation and evidence interpretation.

Textbooks:

1. Baker, D.R., Capillary – Electrophoresis, New York, 1995.
2. Chapmen, J.R., Practical Organic Mass spectrometry, A Guide for Chemical and Biochemical Analysis, Wiley, New York, 1993.
3. Lide, D.R., Handbook of Chemistry & Physics C.R.C. 75th ed. CRC Press Washington D.C., 1994.

Suggested Readings:

1. Forensic Science: Fundamentals and Investigations by Anthony J. Bertino.
2. Principles of Instrumental Analysis by Douglas A. Skoog, F. James Holler, and Stanley R. Crouch.
3. Forensic DNA Typing by John M. Butler.
4. Chromatography and Electrophoresis by Richard J. Lewis.

Open Educational Resources (OER) Links:

1. Open Forensic Science Resources
2. MIT OpenCourseWare - Forensic Science
3. NPTEL Forensic Science Lectures

Examination Scheme:

Evaluation components	**Weightage**
Internal marks (Theory) **I. continuous assessment (30 marks)** All the components to be evenly spaced Project/quizzes/assignment and essays/presentation/ participation/case studies/reflective journals (minimum of five components to be evaluated)	**30 Marks**
II. internal marks (Theory): Mid Term Examination	**20 Marks**
III. External Marks (Theory): End Term Examination	**50 Marks**

It is compulsory for a student to secure 40% marks in Internal and End Term Examination separately to secure minimum passing grade

UCH154	Chemistry Practical IV	**L**	**T**	**P**	**C**
Version1.0		0	0	2	1
Category of Course	Core (Practical)				
Total Contact Hours	30 Hours				
Pre-requisites/ Co-requisites	--				

Course Perspective: The Chemistry Practical IV course focuses on developing essential laboratory skills through hands-on experiments in spectroscopy, distillation, and titration techniques. Students will explore quantitative analysis methods, such as UV-Vis spectroscopy for concentration determination, and learn to record and interpret IR spectra for identifying organic compounds. Additionally, they will gain proficiency in separating liquid mixtures via simple and fractional distillation, alongside titration methods to analyze acid-base and redox systems. This course integrates theory with practical applications to enhance students' analytical skills and scientific reasoning.

Course Outcome: Students will be:

CO1: Understanding the principles of UV-Vis spectroscopy and its application in the determination of concentration for various solutions.

CO2: Applying and interpreting the IR spectra of organic compounds to identify functional groups and understand their chemical structure.

CO3: Analyzing separation techniques such as simple and fractional distillation to effectively separate a mixture of two liquids, exemplified by ethanol and water.

CO4: Performing titration experiments to accurately determine the concentration of acids, bases, and redox-active species in various solutions.

CO5: Interpreting the results from titration and distillation processes to draw conclusions about the chemical properties and concentrations of the analyzed substances.

Course contents

1. CO1: Determination of Concentration Using UV-Vis Spectroscopy
2. CO2: Recording and interpretation of IR spectra for organic compounds
3. CO3: Separation of a mixture of two liquids (e.g., ethanol and water) using simple and fractional distillation.
4. CO4: Titration experiments to determine the concentration of acids, bases, and redox-active species.

Learning Experience:

Students will engage in immersive laboratory sessions that foster a deep understanding of core analytical techniques. Through UV-Vis spectroscopy, they will quantify substances with precision, while the IR spectroscopy experiment will provide them with insights into molecular structure identification. The distillation experiments will demonstrate the principles of liquid separation, encouraging hands-on manipulation of laboratory apparatus. Titration exercises will further enhance their abilities to determine concentrations and reactivity of chemicals, building a solid foundation for future chemical analysis and research applications.

Textbooks:

1. Jacobson, B.H.E., Ray, Sidney, Attridge G. G., The Manual of Photography; Focal Press, London, 1988.
2. Baker, D.R., Capillary – Electrophoresis, New York, 1995.
3. Chapmen, J.R., Practical Organic Mass spectrometry, A Guide for Chemical and Biochemical Analysis, Wiley, New York, 1993.
4. Lide, D.R., Handbook of Chemistry & Physics C.R.C. 75th ed. CRC Press Washington D.C., 1994.
5. Dollisth, F.R., Fateley, W. G. & Bentley, F. F., Characteristic Roman frequencies of organic compounds, Wiley, New York, 1974.
6. Friebolin, H. Berik, One & Two Dimensional NMR spectroscopy; Weinheim Germany, VCH 1991.
7. Stout G.H., &Jensten, L.H., X-ray Structure Determination – A practical Guide, 2nd Ed., Wiley, New York, 1989.
8. Gchristian, Gray D and Fredric J. Feldman, Atomic Absorption Spectroscopy; Wiley-Interscience, London, 1970.

Suggested Reading:

1. Spectrometric Identification of Organic Compounds by Robert M. Silverstein, Francis X. Webster
2. Vogel's **Textbook** of Quantitative Chemical Analysis by J. Mendham et al.
3. Physical Chemistry: A Molecular Approach by Donald A. McQuarrie and John D. Simon
4. Principles of Instrumental Analysis by Douglas A. Skoog, F. James Holler, Stanley R. Crouch

Open Educational Resources (OER):

1. UV-Vis Spectroscopy Tutorial - LibreTexts
2. IR Spectroscopy - Khan Academy
3. Distillation Principles - MIT OpenCourseWare
4. Titration Experiments - Chemistry LibreTexts

Examination Scheme:

Evaluation components	**Weightage**

Internal marks (practical) I. Conduct of experiment II. Lab Record III. Lab Participation IV. Lab Project	 **10 Marks** **10 Marks** **10 Marks** **20 Marks**
II. External Marks (practical) End Term Examination	**50 Marks**

It is compulsory for a student to secure 40% marks in Internal and End Term Examination separately to secure minimum passing grade

SEC081	Forensic Practical IV	**L**	**T**	**P**	**C**
Version1.0		0	0	4	2
Category of Course	SEC				
Total Contact Hours	60 Hours				
Pre-requisites/ Co-requisites	--				

Course Perspective: The practical aspect of Forensic Anthropology and Forensic Physics aims to develop hands-on skills crucial for forensic investigations. Through direct interaction with human skeletal remains and trace evidence, students will gain essential knowledge in identification, examination, and interpretation of forensic materials. This will build their competency in real-world forensic casework, ensuring they can apply theoretical knowledge to practical scenarios in both anthropological and physical evidence contexts.

Course Outcome: Students will be:

CO1: Observing and following proper safety protocols and calibration procedures for instruments used in evidence examination and analysis, ensuring adherence to a working manual for effective operation.

CO2: Imitating established techniques for the collection, preservation, and labeling of trace evidence, including maintaining the chain of custody, creating covering letters, sealing samples, and taking control samples from materials like bones, glass, soil, and paint.

CO3: Practicing the examination of different layers of paint chips to interpret their composition and significance in forensic investigations, as well as determining the specific gravity of glass pieces and conducting density gradient analysis of soil samples for forensic purposes.

CO4: Interpreting results from physical matching of broken glass fragments to aid in criminal investigations and support conclusions in forensic analysis.

Course contents

Forensic Anthropology

1. Identification of human skeleton system.
2. Identification of various bones (Pelvic and skull bones).
3. Estimation of height using long bones.
4. Determination of sex from skull, pelvis and mandibular bone.
5. Determination of age using skull

Forensic Physics

1. Safety, working manual and calibration of the instruments used for evidence examination and analysis.
2. Collection, preservation and labeling, chain of custody, covering letter, sample seal and taking control samples of trace evidence like glass, soil and paint samples.
3. Examination of different layers in a paint chip.
4. Determination of specific gravity of glass pieces and its interpretation.
5. Density gradient analysis of soil samples and its interpretation.
6. Physical matching of broken glass fragments.

Learning Experience

In Forensic Anthropology, students will work with skeletal systems to learn identification techniques, sex determination, and age estimation from bones, providing them with the ability to handle forensic evidence for human identification. In Forensic Physics, students will focus on evidence collection, preservation, and examination of trace materials like glass, soil, and paint. These labs foster critical thinking, problem-solving, and precise scientific methodologies, enhancing their ability to perform meticulous analysis and contribute effectively to forensic investigations.

Textbooks:

1. Thomas Kubic, Nicholas Petraco Forensic Science Laboratory Manual and Workbook, Third Edition 2009
2. Laboratory Protocols CIMMYT Applied Molecular Genetics Laboratory Third Edition
3. A. I. Vogel **Textbook** of Practical organic Chemistry including Qualitative organic analysis

Suggested Readings:

1. Kathy Mirakovits, Gina Londino, The Basics of Investigating Forensic Science: A Laboratory Manual 2015
2. Washington state patrol Forensic Laboratory services: Crime Laboratory: Technical & Training Manuals Isolation and identification of Drugs by E.G.C. Clark.
3. Krogman, W.M., & Iscan, M.Y. (1986). The Human Skeleton in Forensic Medicine. Charles C. Thomas Publisher.
4. Byers, S.N. (2016). Introduction to Forensic Anthropology: A **Textbook**. Routledge.

Open Educational Resources (OER) Links:

1. Open **Textbook** Library - Introduction to Physical Anthropology
2. MIT OpenCourseWare - The Human Skeleton
3. Open **Textbook** Library - General Physics
4. Saylor Academy - Introduction to Forensic Science

Examination Scheme:

Evaluation components	**Weightage**
Internal marks (practical) I. Conduct of experiment II. Lab Record III. Lab Participation IV. Lab Project	 **10 Marks** **10 Marks** **10 Marks** **20 Marks**
II. External Marks (practical) End Term Examination	**50 Marks**

It is compulsory for a student to secure 40% marks in Internal and End Term Examination separately to secure minimum passing grade

SYLLABUS
FIFTH SEMESTER

SCFS301	Forensic Medicine	**L**	**T**	**P**	**C**
Version1.0		4	0	0	4
Category of Course	Core				
Total Contact Hours	60 Hours				
Pre-requisites/ Co-requisites	--				

Course Perspective: Forensic Medicine offers a deep understanding of the medical principles involved in legal investigations, focusing on postmortem changes, asphyxial deaths, and injuries. Students will learn to interpret medical evidence, differentiate between types of deaths, and apply forensic techniques to real-life scenarios. It blends medicine and law to ensure justice through scientific inquiry.

Course Outcomes: Students will be:

CO1: Understanding the physiological changes that occur after death, including immediate, early, and late changes, and their significance in estimating the time of death, along with the medico-legal aspects surrounding causes of death.

CO2: Applying the various types and stages of asphyxial deaths, including important terms such as hypoxia and anoxia, and recognize the signs and symptoms associated with each type, including hanging, strangulation, suffocation, and drowning.

CO3: Analyzing the procedures for conducting ante and post-mortem examinations during autopsies, emphasizing the collection, preservation, and packaging of viscera, as well as assessing and determining the time and cause of death.

CO4: Performing detailed examinations of injuries caused by blunt and sharp forces, distinguishing between abrasions, bruises, lacerations, incised wounds, stab wounds, and punctured wounds, while considering their dimensions, causes, and medico-legal implications.

CO5: Interpreting the mechanisms of wound production and healing, and determine the age of injuries through comprehensive analysis of both ante-mortem and post-mortem injuries and their associated medico-legal aspects.

Course contents
Section I: Changes after Death Immediate change, Early changes (Rigor mortis-postmortem hypostasis-Body cooling), Estimation of time of Death, Late Changes- (Decomposition, Adipocere, Mummification) Medico-legal aspects of death. Causes of death.
Section II: Asphyxial Deaths Important Terms in Asphyxial deaths (Hypoxia, Anoxia, Anoxic anoxia, Anemic anoxia, Histotoxic anoxia), Types and stages of Asphyxia, Signs of asphyxia deaths., stages of asphyxia deaths Types of Asphyxial deaths- Hanging and its types, Strangulation, Suffocation, Smothering, Drowning and its classification.
Section III: Autopsy and introduction to wounds Ante and Post – mortem examinations; external examination; internal examination; collection, preservation and packaging of viscera, Assessing and determining the time and cause of Death, Study of burnt bones and bone fragments. Introduction to wounds; definition, Mechanism of wound production & healing, Determining the age of the injury, and its medico - legal aspects.
Section IV: Injuries due to Blunt and sharp forces Abrasions, Bruises, Lacerations; causes, dimensions, ante – mortem & post – mortem injuries and its medico - legal aspects, Incised, Stab, Punctured wounds - causes, dimensions, ante – mortem& post – morteminjuries ante – mortem& post – mortem injuries.

Learning Experience: Students will gain hands-on knowledge of forensic practices through case studies and lab simulations. The course encourages critical thinking in determining the causes and times of death, analyzing wound patterns, and conducting autopsies. Discussions on medico-legal aspects of death and injury provide real-world context, while practical exercises in evidence collection and preservation enhance the Learning Experience.

Textbooks:

1. Modi's Medical Jurisprudence and Toxicology,23rd Edition, by K. Mathiharan &Amrit K. Patnaik, Thirdreprint, 2009, LexisNexis, Butterworth, New Delhi
2. Essentials of forensic medicine, Dr. K. S. Narayan Reddy.

Suggested Readings:

1. Forensic Medicine and toxicology, JB Mukherjee, Vol I & II.
2. Keith Simpson's , Forensic Medicine.
3. Gleister's Medical Jurispridence and Toxicology, Churchill Livingstone Dental Anatomy Atlas, Whitaker

Open Educational Resources (OER)

1. Forensic Medicine by NCBI
2. Medico-legal Death Investigation System by CDC
3. Forensic Science and Medicine Journal

Examination Scheme:

Evaluation components	**Weightage**
Internal marks (Theory) **I. continuous assessment (30 marks)** All the components to be evenly spaced Project/quizzes/assignment and essays/presentation/ participation/case studies/reflective journals (minimum of five components to be evaluated)	**30 Marks**
II. internal marks (Theory): Mid Term Examination	**20 Marks**
III. External Marks (Theory): End Term Examination	**50 Marks**

It is compulsory for a student to secure 40% marks in Internal and End Term Examination separately to secure minimum passing grade

SCFS303	Forensic Chemistry and Toxicology	L	T	P	C
Version1.0		4	0	0	4
Category of Course	Core				
Total Contact Hours	60 Hours				
Pre-requisites/ Co-requisites	--				

Course Perspective: The course "Forensic Chemistry and Toxicology" provides an in-depth understanding of chemical and toxicological aspects relevant to forensic investigations. It emphasizes analytical methods for the identification and quantification of chemical substances in criminal investigations, particularly in cases involving poisoning, arson, and drug abuse. The course also covers the legal framework, scientific techniques, and casework applications that are essential for forensic practitioners.

Course Outcomes: Students will be:

CO1: Remembering the qualitative chemical tests in Forensic Chemistry and toxicology.

CO2: Understanding medico-legal aspects of alcoholic substances, petroleum products, and drugs of abuse.

CO3: Applying ethical and professional standards in analysis and reporting.

CO4: Analyzing contaminants in petroleum products and alcohols.

CO5: Evaluating the Classification, characterization of NDPS and develop analytical skills in forensic chemical analysis.

Course contents
Section I: Forensic Chemistry Introduction, Colour & Spot test, microcrystal tests, inorganic and organic analysis. Analysis of Beverages: alcoholic and nonalcoholic beverages, country made liquor, illicit liquors, detection and estimation of ethanol. Breathe alcohol analyzer. Analysis of trace evidence – cosmetics dyes, pigments, clues of trap cases. Fire and Arson- Chemistry of Fire, Combustion reaction, Fire Triangle, Fire Tetrahedron, Conditions for fire, Backdraft, Accelerants & types of accelerants, Combustible and Flammable liquids, Flash point, Fire point, Ignition point, Auto Ignition point, vapour density, vapour pressure, Fire extinguisher. Arson: Legal Definition, Arson motives, Degrees of Arson, Forensic and legal Concepts, Determining origin and cause; Fire patterns, Collection/Preservation of Arson Evidences, Extraction of samples from debris.

Section II: Analysis of Petroleum Products: Analysis of petrol, kerosene, diesel, lubricants by BIS methods and ASTM methods. Detection of adulterants of Gasoline, Diesel and Engine oils. - including parameters like-Flash point, distillation range, density, kinematic -viscosity, smoke point, aniline point. Commodity Act & Petroleum Act. Arson Investigation: chemistry of fire, fire pattern, Extraction of fire accelerants from fire debris
Section III: Forensic Toxicology: Introduction and scope of forensic toxicology, classification of poisons,legal aspects of poisoning, types of poisoning. sign and symptoms of common poisons. Drug of Abuse: classification of drugs, drug of abuse in sports. Narcotic drugs and psychotropic substances such as cocaine, cannabis, barbiturates, benzodiazepines, amphetamine, opium, designer drugs. NDPS act.
Section IV: General studies and Analysis of vegetable poisons: Abrus, Dhatura, Marking nuts, Nux-vomica, Oleander and Aconite. Snake venoms and insect poisons, Irrespirable gases, food poisoning Insecticides and Metallic Poisons: types of agriculture posions, Organo-phosphorous compound, organocholorinated compound, carbamats, pyrethroids, aluminium phosphite and zinc phosphite. arsenic, mercury, phosphorous: poisoning charecteristics and analysis.

Learning Experience: Students will engage in both theoretical learning and practical applications. The course will offer hands-on training in various analytical techniques like spot tests, microcrystal tests, and chromatographic methods for analyzing trace evidence, beverages, and petroleum products. The study of poisons, drugs of abuse, and fire accelerants will provide a comprehensive foundation in forensic toxicology and chemistry. Through case studies, interactive lab sessions, and analytical method demonstrations, students will develop the necessary skills to handle forensic cases, interpret toxicological results, and present their findings in legal contexts.

Textbooks:

1. Modi's Medical Jurisprudence and Toxicology,23rd Edition, by K. Mathiharan &Amrit K. Patnaik, Thirdreprint, 2009, LexisNexis, Butterworth, New Delhi
2. Essentials of forensic medicine, Dr. K. S. Narayan Reddy.

Suggested Readings:

1. Forensic Medicine and toxicology, JB Mukherjee, Vol I & II.
2. Keith Simpson's , Forensic Medicine
3. Gleister's Medical Jurispridence and Toxicology, Churchill Livingstone Dental Anatomy Atlas, Whitaker.
4. Forensic Chemistry by Suzanne Bell
5. Casarett and Doull's Toxicology: The Basic Science of Poisons by Curtis D. Klaassen
6. Clark's Analysis of Drugs and Poisons by Anthony C. Moffat, M. David Osselton, Brian Widdop
7. The Essentials of Forensic Medicine and Toxicology by K.S. Narayan Reddy

Open Educational Resources (OER) Links:

1. NPTEL - Forensic Chemistry
2. PubChem - Forensic Toxicology Resources
3. National Institute of Justice - Fire and Arson Investigations
4. Open Textbook Library - Introduction to Chemistry

Examination Scheme:

Evaluation components	**Weightage**
Internal marks (Theory) **I. continuous assessment (30 marks)** All the components to be evenly spaced Project/quizzes/assignment and essays/presentation/ participation/case studies/reflective journals (minimum of five components to be evaluated)	**30 Marks**
II. internal marks (Theory): Mid Term Examination	**20 Marks**
III. External Marks (Theory): End Term Examination	**50 Marks**

It is compulsory for a student to secure 40% marks in Internal and End Term Examination separately to secure minimum passing grade

SCFS309	Thermal Physics	**L**	**T**	**P**	**C**
Version1.0		3	0	0	3
Category of Course	DSE				
Total Contact Hours	45 Hours				
Pre-requisites/ Co-requisites	--				

Course Perspective: The course "Physics V" offers an in-depth exploration of thermodynamics and kinetic theory, focusing on foundational laws and principles that govern energy transformations. It bridges classical and modern physics, linking theory with real-world applications in gases and thermodynamic processes. Students will gain a comprehensive understanding of entropy, thermodynamic potentials, and the behavior of real gases.

Course Outcome: Students will be:

CO1: Understanding the foundational principles of thermodynamics, including the First and Second Laws, thermodynamic variables, equilibrium, and the concepts of temperature, work, heat, and internal

energy.

CO2: Applying the concept of entropy and its implications in thermodynamic processes, including Clausius's theorem, entropy changes in reversible and irreversible processes, and the principles of the Third Law of Thermodynamics.

CO3: Analyzing the kinetic theory of gases to explain molecular behavior, including the distribution of velocities, molecular collisions, and the Maxwell-Boltzmann law, as well as specific heats and degrees of freedom in ideal gases.

CO4: Performingcalculations related to the behavior of real gases, focusing on deviations from the ideal gas equation and understanding critical constants, Boyle temperature, and the Van der Waals equation of state.

Course contents
Section I: Introduction to Thermodynamics: First & Second Law of Thermodynamics: Thermodynamic, Variables & Equilibrium, Concept of Temperature, Work & Heat, Internal Energy, Applications of First Law
Section II: Entropy & Thermodynamic Potentials: Concept of Entropy, Clausius Theorem. Second Law of Thermodynamics in terms of Entropy. Principle of Increase of Entropy. Entropy Changes in Reversible and Irreversible processes with examples. Entropy of the Universe. Principle of Increase of Entropy. Temperature–Entropy diagrams. Third Law of Thermodynamics
Section III: Kinetic Theory of Gases: Distribution of Velocities, Molecular Collisions, Maxwell-Boltzmann Law of Distribution of Velocities in an Ideal Gas and its Experimental Verification. Degrees of Freedom. Law of Equipartition of Energy (No proof required). Specific heats of Gases, Mean Free Path, Collision Probability.
Section IV: Real Gases: Behavior of Real Gases: Deviations from the Ideal Gas Equation. Critical Constants. Continuity of Liquid and Gaseous State. Vapour and Gas. Boyle Temperature. Van der Waal's Equation of State for Real Gases

Learning Experience: Through this course, students will engage in both theoretical discussions and practical problem-solving related to thermodynamics and gas laws. By applying concepts such as the laws of thermodynamics, entropy, and the kinetic theory of gases, students will explore phenomena like heat transfer, energy distribution, and real gas behavior. The course will enhance critical thinking by challenging students to analyze reversible and irreversible processes, understand the universe's entropy, and evaluate deviations in ideal gas behavior. Hands-on experiments and simulations will enrich the learning process.

Textbooks:

1. Allied Physics – Prof. Dhanalakshmi and others.
2. Elements of Properties of Matter – D.S. Mathur, S. Chand & Co. (1999).
3. Modern Physics – R. Murugesan S. Chand & Co. (2004).

Suggested Readings:

1. Electronic Principles and Applications – A.B. Bhattacharya, New Central Book Agency, Calcutta.
2. Introduction to Fiber optics by K. Thyagarajan and Ajay Ghatak, Cambridge, University Press(1999).]

Open Educational Resources (OER)

MIT OpenCourseWare - Thermodynamics

Khan Academy - Thermodynamics

NPTEL - Thermodynamics and Statistical Physics

Examination Scheme:

Evaluation components	**Weightage**
Internal marks (Theory) **I. continuous assessment (30 marks)** All the components to be evenly spaced Project/quizzes/assignment and essays/presentation/ participation/case studies/reflective journals (minimum of five components to be evaluated)	**30 Marks**
II. internal marks (Theory): Mid Term Examination	**20 Marks**
III. External Marks (Theory): End Term Examination	**50 Marks**

It is compulsory for a student to secure 40% marks in Internal and End Term Examination separately to secure minimum passing grade

UCH105	Physical and Organic chemistry	L	T	P	C
Version1.0		3	0	0	3
Category of Course	Core				
Total Contact Hours	45 Hours				
Pre-requisites/ Co-requisites	---				

Course Perspective: This course explores the intricate relationship between matter and energy, as well as the structure, properties, and reactions of organic compounds. You'll delve into topics such as thermodynamics, kinetics, quantum mechanics, and organic reaction mechanisms.

Course Outcome: Students will be:

CO1: Understanding the fundamental principles of metallurgy, including the use of Ellingham diagrams for predicting the feasibility of metal oxide reduction using carbon and various methods for purifying metals.

CO2: Applying the structures and properties of nitrogen hydrides and oxoacids of phosphorus, sulfur, and chlorine, along with their halides and oxohalides.

CO3: Analyzing the concepts of nomenclature and aromaticity to classify and differentiate between aromatic, anti-aromatic, and non-aromatic compounds, using Huckel's rule.

CO4: Performing calculations to determine the rate constants and half-life for first, second, third, and zero-order reactions, applying methods to assess the order of reactions in various chemical processes.

CO5: Interpreting the effects of temperature on reaction rates using the Arrhenius equation and evaluate the concept of activation energy in the context of chemical kinetics.

Course contents
Section I: General Principles of Metallurgy: Ellingham diagrams for reduction of metal oxides using carbon as reducing agent. Hydrometallurgy, Methods of purification of metals (Al, Pb, Ti, Fe, Cu, Ni, Zn): electrolytic, oxidative refining, Kroll process, Parting process, van Arkel-de Boer process and Mond's process.
Section II: Hydrides of nitrogen: (NH_3, N_2H_4, N_3H, NH_2OH) Oxoacids of P, S and Cl. Halides and oxohalides: PCl_3, PCl_5, $SOCl_2$ and SO_2Cl_2
Section III: Arenes and Aromaticity: Nomenclature of benzene derivatives. Aromatic nucleus and side chain, Aromaticity: Huckel rule, aromatic ions, aromatic, anti-aromatic and non-aromatic compounds.
Section IV: Chemical kinetics: Rate of reaction - Definition of order and molecularity. Derivation of rate constants for first, second, third and zero order reactions and examples. Derivation for time half change. Methods to determine the order of reactions. Effect of temperature on rate of reaction, Arrhenius equation, concept of activation energy.

Learning Experience: Through lectures, laboratory experiments, and problem-solving exercises, you'll gain a strong foundation in the theoretical concepts of physical and organic chemistry. You'll also develop practical skills in conducting experiments, analyzing data, and applying your knowledge to real-world problems.

Textbooks:

1. Allied Chemistry – Prof. Mathur and others.
2. Elements of Properties of Matter – D.S. Mathur, S. Chand & Co. (1999).
3. Modern Chemistry – S. Chand & Co. (2006).

Suggested Readings:

1. Electronic Principles and Applications – A.B. Bhattacharya, New Central Book Agency, Calcutta.
2. Introduction to Fiber optics by K. Thyagarajan and Ajay Ghatak, Cambridge, University Press (1999).]

Open Educational Resources (OER)

1. Khan Academy: https://www.khanacademy.org/science/organic-chemistry
2. MIT OpenCourseWare: https://ocw.mit.edu/courses/chemistry/
3. Chemistry LibreTexts: https://chem.libretexts.org/

Examination Scheme:

Evaluation components	**Weightage**
Internal marks (Theory) **I. continuous assessment (30 marks)** All the components to be evenly spaced Project/quizzes/assignment and essays/presentation/ participation/case studies/reflective journals (minimum of five components to be evaluated)	**30 Marks**
II. internal marks (Theory): Mid Term Examination	**20 Marks**
III. External Marks (Theory): End Term Examination	**50 Marks**

It is compulsory for a student to secure 40% marks in Internal and End Term Examination separately to secure minimum passing grade

SCFS307	Immunology	**L**	**T**	**P**	**C**
Version1.0		3	0	0	3
Category of Course	DSE				
Total Contact Hours	45 Hours				
Pre-requisites/ Co-requisites	--				

Course Perspective: The subject Immunology and Metabolism integrates core principles of dilute solutions, electrochemistry, and liquid properties to explore how these scientific concepts apply to biological systems. The course emphasizes the physical and chemical properties of solutions and electrolytes, providing foundational knowledge for understanding physiological processes such as metabolism and immune responses at a molecular level.

Course Outcome: Students will be:

CO1: Understanding the historical perspectives and foundational theories of immunology, including the distinction between innate and adaptive immune responses.

CO2: Applying the properties and functions of antigens, immunoglobulins, and the Major Histocompatibility Complex (MHC), including their roles in immune system function.

CO3: Analyzing knowledge of carbohydrate and lipid metabolism pathways to explain energy production and storage in biological systems, including glycolysis and β-oxidation.

CO4: Performing a detailed examination of protein metabolism processes, including transamination, deamination, and the urea cycle, to understand nitrogen balance and excretion.

CO5: Interpreting the mechanisms of enzyme action, kinetics, and regulation, focusing on oxidative phosphorylation and the electron transport chain in cellular respiration.

Course contents
Section I: Overview of Immune System: Historical perspective of Immunology, Early theories of Immunology, Innate, Adaptive (cellmediated and humoral) - Passive: Artificial and Natural Immunity, Active: Artificial and Natural Immunity, Cells and Organs of the Immune System; Haematopoesis, Cells of the immune system
Section II: Antigens, Immunoglobins, and MHC Organs of the Immune system: Primary and Secondary lymphoid organs, Lymphatic system Antigens; Properties of antigens, Adjuvants and Haptens Immunoglobulins; Basic structure, classes and function, Polyclonal sera, Monoclonalantibodies Major Histocompatibility Complex; Structure and functions Antigen Processing and Presentation; Endogenous pathway and exogenous pathway ofantigen
Section III: Carbohydrate & Lipid Metabolism Carbohydrates: Glycolysis, Citric acid cycle, Pentose phosphate pathway, Gluconeogenesis, Glycogen metabolism. Lipid: Biosynthesis and β-oxidation of palmatic acid
Section IV: Protein Metabolism & Enzymes Transamination, Deamination and Urea cycle. Enzymes; Introduction, kinetics, mechanism ofaction, inhibition, allosteric enzymes and Regulation Oxidative Phosphorylation: Electron transport chain, Oxidative phosphorylation and ATP synthase

Learning Experience: Students will gain both theoretical knowledge and practical insights into the properties and behaviors of solutions and electrolytes, fostering their ability to apply this understanding to complex biological systems. Through laboratory experiments and theoretical exploration, learners will engage with key concepts such as osmotic pressure, electrolyte dissociation, and the physical behavior of liquids under different conditions. This experience will equip students with critical thinking and problem-solving skills, enhancing their understanding of how chemical principles underlie metabolic and immunological functions.

Textbooks:

1. M.S. Leffel, A.D. Donnenberg & N.R. Rose Handbook of Human Immunology CRC press, 1997
2. Essentials of Human Genetics by S.M. Bhatnagar et al (1999) IV edition. Orient Longman.
3. Basic Human Genetics by E.J. Manage and A.P. Manage (1997 India Reprint) Rastogi Publications, Meerut.
4. Mendelian inheritance in Man: Catalogues of Autosomal recessive and x-linked phenotypes.[12teditions – 1998] by McKusick, V.A. Johns Hopkins university press, Baltimore.
5. P. Atkins, Physical Chemistry (10th edition), Oxford University Press
6. J. D. Lee, Concise Inorganic Chemistry, Oxford University Press

Suggested Readings:

1. Principles and Practice of Medical Genetics, by Emery, A.E.H and D.L. Rimoin (Eds_(1990-2nd edition) Churchill Livingstone, Edinburgh.
2. Human Genetics by S.D. Gangane (2nd edition-Reprint 2001), B.L Churchill Livingstone Pvt.
3. F. Alberts et al., Molecular Biology of the Cell, Garland Science
4. D. Voet and J. G. Voet, Biochemistry, Wiley

Open Educational Resources (OER):

1. MIT OpenCourseWare - Physical Chemistry: https://ocw.mit.edu
2. Khan Academy - Chemistry of Solutions: https://www.khanacademy.org/science/chemistry

Examination Scheme:

Evaluation components	**Weightage**
Internal marks (Theory) **I. continuous assessment (30 marks)** All the components to be evenly spaced Project/quizzes/assignment and essays/presentation/ participation/case studies/reflective journals (minimum of five components to be evaluated)	**30 Marks**
II. internal marks (Theory): Mid Term Examination	**20 Marks**

III. External Marks (Theory): End Term Examination	**50 Marks**

It is compulsory for a student to secure 40% marks in Internal and End Term Examination separately to secure minimum passing grade

SCFS303	Cyber Forensics III	L	T	P	C
Version1.0		2	0	0	2
Category of Course	Core				
Total Contact Hours	30 Hours				
Pre-requisites/ Co-requisites	--				

Course Perspective: Cyber Forensics III offers a comprehensive exploration into the critical aspects of data privacy, social media forensics, and relevant IT laws. The course delves into the complexities of data protection regulations like GDPR and PIPEDA, highlighting their global impact and practical application. By examining social media's role in modern criminal activities and evidence collection methods, the course bridges theoretical knowledge with real-world practices. Students will also engage with Indian IT laws, understanding their provisions and penalties related to cyber crimes, equipping them with essential legal and technical insights.

Course Outcome: Students will be:

CO1: Understanding the concepts of data privacy, data protection, and security, including key regulations such as the Personal Data Protection Bill and GDPR.

CO2: Applying the security issues and challenges associated with big data and social media, identifying potential risks and impacts on individuals and organizations.

CO3: Analyzing forensic techniques to collect and analyze evidence from social media platforms, utilizing various methods and tools for intelligence gathering.

CO4: Performing a critical analysis of the provisions under the IT Act 2000, exploring its implications for cyber-crime and the penalties for offenses.

CO5: Interpreting the impact of social media on crime trends, business practices, and societal changes, evaluating emerging trends and their implications for forensic investigations.

Course contents
Section I: Data privacy and security Defining data, meta-data, big data, non- personal data. Data protection, Data privacy and data security, Personal Data Protection Bill and its compliance, Data protection principles, Big data security issues and challenges, Data protection regulations of other countries- General Data Protection Regulations(GDPR),2016 Personal Information Protection and Electronic Documents Act (PIPEDA).,

Social media- data privacy and security issues.
Section II: Social media forensics I Introduction to Social Media, Security Issues in Social Media, Types of crimes of Social Media – Cyberbullying, Online Grooming, Cyberstalking. Social Media and its impact on Business, Politics, Law andRevolutions, Emerging Trends in social media.
Section III: Social media forensic II Sources for social media evidence, Types of Data Available on Social Networking Sites, Different evidence collection methods from social networking sites, Intelligence gathering from Social Media- Tools and technique for intelligence gathering– indirect method, direct method with login, direct method without login.
Section IV: VAPT [Vulnerability Assessment and Pene testing] Introduction to Vulnerability Assessment and its Life Cycle, Introduction to Unknown Vulnerability Assessment, Vulnerability Scanner.

Learning Experience

Throughout the Cyber Forensics III course, students will engage with a blend of theoretical frameworks and practical applications, providing a well-rounded understanding of contemporary cyber forensics issues. Students will explore data privacy and security principles, including global regulations and challenges related to big data. This course will immerse students in the nuances of social media forensics, focusing on emerging trends, types of crimes, and evidence collection methods.

Textbooks and **Suggested Readings**

1. "Cyber Forensics: From Data to Digital Evidence" by Eoghan Casey
2. "Digital Forensics and Cyber Crime: 7th International Conference, DFIC 2015" by M. H. (Ed.) L. T. N. A. H. J. K. N. E. P. O. S. P. (Ed.)
3. "Computer Forensics: Principles and Practices" by John Sammons

Open Educational Resources (OER)

1. Digital Forensics and Incident Response - OER Commons
2. Introduction to Cyber Forensics - Coursera (Audit free)
3. Open Access Journal of Computer Forensics - JSTOR (Open Access)

Examination Scheme:

Evaluation components	**Weightage**

Internal marks (Theory) **I. continuous assessment (30 marks)** All the components to be evenly spaced Project/quizzes/assignment and essays/presentation/ participation/case studies/reflective journals (minimum of five components to be evaluated)	**30 Marks**
II. internal marks (Theory): Mid Term Examination	**20 Marks**
III. External Marks (Theory): End Term Examination	**50 Marks**

It is compulsory for a student to secure 40% marks in Internal and End Term Examination separately to secure minimum passing grade

UCH155	Chemistry Practical V	**L**	**T**	**P**	**C**
Version1.0		0	0	2	1
Category of Course	Core (Practical)				
Total Contact Hours	30 Hours				
Pre-requisites/ Co-requisites	--				

Course Perspective: Chemistry Practical V provides a hands-on approach to foundational principles in physical chemistry. The experiments help students understand critical concepts like colligative properties (freezing point depression, boiling point elevation), surface tension, viscosity, potentiometric and conductometric titrations. This course enhances students' skills in measuring and analyzing data, enabling them to determine molecular weights and compare physical properties of various substances. These practical emphasize accuracy in experimental techniques and the interpretation of results.

Course Outcome: Students will be:

CO1: Understanding the principles of colligative properties by measuring the depression in freezing point to determine the molecular weight of a non-volatile solute.

CO2: Applying the elevation in boiling point of a solution to calculate the molecular weight of a non-volatile solute.

CO3: Analyzing techniques to compare the surface tension and viscosity of different liquids, such as water, ethanol, and glycerol, at various temperatures.

CO4: Performing potentiometric titration of a strong acid with a strong base and plot the corresponding titration curve for analysis.

CO5: Interpreting the results of conductometric titration of a strong acid with a strong base to understand the behavior of ionic species in solution.

Course contents

1. Measurement of the depression in freezing point of a solution to determine the molecular weight of a non-volatile solute.
2. Measurement of the elevation in boiling point of a solution to determine the molecular weight of a non-volatile solute.
3. Comparison of surface tension and viscosity of different liquids (e.g., water, ethanol, glycerol) at various temperatures.
4. Potentiometric titration of a strong acid with a strong base and plotting the titration curve.
5. Conductometric titration of a strong acid with a strong base (e.g., HCl vs NaOH).

Learning Experience:

Students will actively engage in laboratory experiments, applying theoretical knowledge to real-world measurements. They will work with various instruments such as potentiometers and conductometers, gaining expertise in titration techniques. Experiments like freezing point depression and boiling point elevation allow students to explore molecular interactions in solutions. By comparing the surface tension and viscosity of different liquids, students will develop a deeper understanding of intermolecular forces and temperature effects. The practicals foster critical thinking and analytical skills, preparing students for future challenges in experimental chemistry.

Textbook:

1. Benjamin, D. M., Forensic Pharmacology. In Forensic Science Handbook (vol – 3), Saferstein, R. (Ed.), Prentice-Hall, Englewood Cliffs, New Jersey, 1993.

Suggested Reading:

1. Vogel's Textbook of Quantitative Chemical Analysis by J. Mendham, R. C. Denney, J. D. Barnes, and M. J. K. Thomas
2. Practical Physical Chemistry by A.M. James & F.E. Prichard
3. Advanced Practical Physical Chemistry by J.B. Yadav

Open Educational Resources:

1. MIT OpenCourseWare - Chemistry
2. Khan Academy - Chemistry
3. ChemCollective Virtual Labs

Examination Scheme:

Evaluation components	Weightage
Internal marks (practical) I. Conduct of experiment II. Lab Record III. Lab Participation IV. Lab Project	 **10 Marks** **10 Marks** **10 Marks** **20 Marks**
II. External Marks (practical) End Term Examination	**50 Marks**

It is compulsory for a student to secure 40% marks in Internal and End Term Examination separately to secure minimum passing grade

SCFS351	Forensic Practical V	L	T	P	C
Version1.0		0	0	4	2
Category of Course	Core (Practical)				
Total Contact Hours	60 Hours				
Pre-requisites/ Co-requisites	--				

Course Perspective: This practical course provides a comprehensive introduction to the techniques used in forensic chemistry. Through a series of experiments, you'll gain practical experience in analyzing common drugs of abuse, determining physical properties, and identifying various cations and anions. This course is designed to equip you with the skills needed to contribute to forensic investigations and understand the scientific principles behind forensic analysis.

Course Outcomes: Students will be:

CO1: Understanding the principles and techniques of color/spot tests for common drugs of abuse.

CO2: Applying the boiling and melting points of various substances to assess their properties.

CO3: Analyzing analytical methods to evaluate phenolphthalein in trap cases for forensic investigations.

CO4: Performing the analysis of cations, including Arsenic, Copper, Lead, Zinc, Barium, and Aluminium, using appropriate techniques.

CO5: Interpreting the results of anion analysis for Nitrate, Phosphates, Oxalate, Chloride, Iodide, and Sulphates in forensic samples.

Course contents
1.Colour/spot tests for common drugs of abuse
2.Determination of boiling and melting points.
3.Analysis of phenolphthalein in trap cases.
4.Analysis of Cations (Arsenic, Copper, Lead, Zinc, Barium, Aluminium)
5.Analysis of Anions (Nitrate, Phosphates, oxalate, chloride, iodide, sulphates)

Learning Experience:By conducting experiments on color/spot tests for common drugs of abuse, determining boiling and melting points, analyzing phenolphthalein in trap cases, and identifying cations and anions, you'll develop a strong foundation in forensic chemistry. This hands-on approach will allow you to apply theoretical knowledge to real-world scenarios and gain practical skills that are essential for forensic scientists.

Textbooks:

1. Thomas Kubic, Nicholas Petraco Forensic Science Laboratory Manual and Workbook, Third Edition 2009
2. Laboratory Protocols CIMMYT Applied Molecular Genetics Laboratory Third Edition.
3. Vogel **Textbook** of Practical organic Chemistry including Qualitative organic analysis

Suggested Readings:

1. Kathy Mirakovits, Gina Londino, The Basics of Investigating Forensic Science: A Laboratory Manual 2015
2. Washington state patrol Forensic Laboratory services: Crime Laboratory: Technical & Training Manuals Isolation and identification of Drugs by E.G.C. Clark

Open Educational Resources (OER)

1. Open Educational Resources (OER) Commons: https://oercommons.org/
2. Khan Academy: https://www.khanacademy.org/
3. MIT OpenCourseWare: https://ocw.mit.edu/

Examination Scheme:

Evaluation components	**Weightage**

Internal marks (practical) I. Conduct of experiment II. Lab Record III. Lab Participation IV. Lab Project	 **10 Marks** **10 Marks** **10 Marks** **20 Marks**
II. External Marks (practical) End Term Examination	**50 Marks**

It is compulsory for a student to secure 40% marks in Internal and End Term Examination separately to secure minimum passing grade

SYLLABUS
SIXTH SEMESTER

SCFS302	Entrepreneurial skills in Forensic Science	L	T	P	C
Version1.0		4	0	0	4
Category of Course	Core				
Total Contact Hours	60 Hours				
Pre-requisites/ Co-requisites	--				

Course Perspective: This course equips you with the knowledge and skills to combine your passion for forensic science with entrepreneurial thinking. You'll learn how to identify business opportunities, develop innovative products or services, and navigate the challenges of starting and running a forensic science-related enterprise.

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

CO1: Understanding the financial aspects of starting and managing a forensic science business, including budgeting, forecasting, and funding strategies.

CO2: Developing effective communication skills necessary for pitching ideas, negotiating contracts, and cultivating relationships with clients and stakeholders.

CO3: Applying strategic planning techniques to set goals, define strategies, and allocate resources efficiently within a forensic science business context.

CO4: Identifying and managing inherent risks in forensic science entrepreneurship, focusing on legal, financial, and operational challenges.

CO5: Evaluating market trends and opportunities in forensic science to identify niche areas for entrepreneurial ventures.

Course contents
Section I: Foundations of Entrepreneurship Introduction, Definition and characteristics of entrepreneurship, role of entrepreneurship in economic development and forensic science, overview of different types of entrepreneurs, basic principles and disciplines within forensic science, and current trends and technological advancements.
Section II: Market Research and Business Planning Conducting market research for forensic services, understanding the forensic science market and customer needs, analyzing market needs and trends, tools and techniques for effective market research, evaluating the feasibility of business ideas, risk assessment and mitigation strategies, financial feasibility and projections,
Section III: Legal, Ethical, and Operational Considerations Licensing and certification requirements, regulatory compliance and standards, intellectual property considerations, ethical dilemmas and decision-making in forensic science, ensuring integrity and accuracy in forensic services, building trust with clients and stakeholders, Legal aspects of starting a forensic science business
Section IV: Innovation, Funding, and Business Growth Emerging technologies and their business applications, innovating forensic techniques for market needs, staying competitive through continuous improvement, sources of funding for forensic science startups, preparing financial statements and budgets, and financial management and sustainability.

Learning Experience: Through a mix of theoretical lectures, practical exercises, and case studies, you'll gain a deep understanding of forensic science principles, business fundamentals, and entrepreneurial mindset. You'll also have opportunities to develop your leadership, communication, and problem-solving skills.

Textbooks:

1. "Innovation and Entrepreneurship" by Peter F. Drucker (Chapter on innovation in technology-driven industries)
2. Forensic Science: An Introduction" by Richard Saferstein (Chapter on recent technological advancements in forensic science)
3. "Marketing for Dummies" by Jeanette McMurtry (Chapter on marketing niche services)
4. "Forensic Science: An Introduction to Scientific and Investigative Techniques" by Stuart H. James and Jon J. Nordby (Chapter on marketing forensic services)

Suggested Readings:

1. The Innovator's Dilemma by Clayton M. Christensen

2. Blue Ocean Strategy by W. Chan Kim and Renée Mauborgne

Open Educational Resources (OER) Links:

1. Coursera: https://www.coursera.org/learn/forensic-science
2. EdX: https://www.edx.org/
3. MIT OpenCourseWare: https://ocw.mit.edu/
4. Khan Academy: https://www.khanacademy.org/

Examination Scheme:

Evaluation components	**Weightage**
Internal marks (Theory) **I. continuous assessment (30 marks)** All the components to be evenly spaced Project/quizzes/assignment and essays/presentation/ participation/case studies/reflective journals (minimum of five components to be evaluated)	**30 Marks**
II. internal marks (Theory): Mid Term Examination	**20 Marks**
III. External Marks (Theory): End Term Examination	**50 Marks**

It is compulsory for a student to secure 40% marks in Internal and End Term Examination separately to secure minimum passing grade

SCFS304	Forensic Psychology	**L**	**T**	**P**	**C**
Version1.0		4	0	0	4
Category of Course	Core				
Total Contact Hours	60 Hours				
Pre-requisites/ Co-requisites	Basic Knowledge of punishments				

Course Perspective: Forensic psychology explores the application of psychological principles to the legal system. You'll delve into topics such as criminal profiling, eyewitness testimony, jury selection, and the evaluation of mental disorders in legal contexts. This course provides a unique blend of theoretical knowledge and practical applications, preparing you for a career in forensic psychology or related fields.

Course Outcome: Students will be:

CO1: Understanding the intersection of forensic psychology and the law, including ethical issues, mental competency assessments, and the role of psychological factors in criminal behavior.

CO2: Analyse psychological assessment tools and deception detection methods, including polygraphs and advanced techniques like Brain Electrical Oscillation Signature Profiling.

CO3: Analyzing principles of polygraphy and narco-analysis in forensic investigations, ensuring adherence to legal and ethical standards.

CO4: Performing psychological assessments and interviews using various techniques to evaluate mental disorders and inform legal proceedings.

CO5: Interpreting the implications of forensic psychological findings on criminal profiling, eyewitness testimony, and the relationship between genetics and criminal behavior.

Course content
Section I: Basics: Forensic Psychology and the Law, Ethical Issues in Forensic Psychology, Civil and criminal case assessment, Assessing mental competency, Mental disorders and Forensic Psychology, Eye witness testimony, Criminal profiling- need and types, Forensic Scientific evidence, Crime and Psychopathology, Genetics and Crime, Serial murders, Modus Operandi.
Section II : Psychological Assessment: Psychological Assessment Tools, Detection of deception, Various methods for detection of deception, Interview, Non-verbal detection, statement assessment, Hypnosis, Psychological assessment, voice stress analyzer, Polygraph, thermal imaging, Brain Electrical Oscillation Signature Profiling, Functional Magnetic Resonance study, Current research in detection of deception/truth finding mechanisms
Section III: Polygraph: Historical aspects of Polygraph, Principles of polygraph, psycho physiological aspects, operational aspects, Question formulation techniques, Interviewing technique procedure, The Art-Polygraph, Legal and Ethical aspects, Human rights of individual.
Section IV: Narco-Analysis: Historical aspects, Principle and Theory, General Procedure –Legal and Ethical aspects, Human rights of individual. Brain Electrical Oscillation Signature (BEOS) Profiling: Principle and Theory, General Procedure – Legal and Ethical aspects, Human rights of individual.

Learning Experience: Through lectures, case studies, and practical exercises, you'll gain a comprehensive understanding of the psychological factors that influence criminal behavior, the legal system, and the administration of justice. You'll also have the opportunity to develop critical thinking, research skills, and ethical decision-making abilities.

Textbooks:

1. Forensic Science in Criminal Investigation & Trials – B.R.Sharma.
2. The Hand Book of Forensic Psychology – Weiner Hass
3. Hand Book of Forensic Psychology – O' Donohue Levensky s

Suggested Readings:

1. Brain Experience – C.R.Mukun
2. Criminal Profilling – B.Turvey
3. Investigative Forensic Hypnosis – J. Niehans
4. Art & Science of the Polygraph Techniques – J.A.Matte
5. Hand Book of Polygraph Testing – M.Kloinen 9.Detecting Lies & Deceit – A.Vri

Open Educational Resources (OER)

1. Open Educational Resources (OER) Commons: https://oercommons.org/
2. National Institutes of Justice: https://nij.ojp.gov/
3. American Psychology Association (APA): https://www.apa.org/ethics/code

Examination Scheme:

Evaluation components	**Weightage**
Internal marks (Theory) **I. continuous assessment (30 marks)** All the components to be evenly spaced Project/quizzes/assignment and essays/presentation/ participation/case studies/reflective journals (minimum of five components to be evaluated)	**30 Marks**
II. internal marks (Theory): Mid Term Examination	**20 Marks**
III. External Marks (Theory): End Term Examination	**50 Marks**

It is compulsory for a student to secure 40% marks in Internal and End Term Examination separately to secure minimum passing grade

UCH106	Physical and Organic chemistry	**L**	**T**	**P**	**C**
Version1.0		3	0	0	3
Category of Course	Core				
Total Contact Hours	45 Hours				
Pre-requisites/ Co-requisites	--				

Course Perspective: This course explores the intricate relationship between matter and energy, as well as the structure, properties, and reactions of organic compounds. You'll delve into topics such as thermodynamics, kinetics, quantum mechanics, and organic reaction mechanisms.

Course Outcome: Students will be:

CO1: Understanding the general principles of metallurgy, including Ellingham diagrams and methods of metal purification like electrolytic, oxidative refining, and specialized processes.

CO2: Analyse the properties and structures of nitrogen hydrides and oxoacids of phosphorus, sulfur, and chlorine, along with halides and oxohalides.

CO3: Analyzing the Huckel rule to determine aromaticity in arenes and differentiate between aromatic, anti-aromatic, and non-aromatic compounds.

CO4: Performing calculations for rate constants in chemical kinetics for various reaction orders and determine reaction order using experimental methods.

CO5: Interpreting the effects of temperature on reaction rates through the Arrhenius equation and activation energy concepts.

Course contents
Section I: General Principles of Metallurgy: Ellingham diagrams for reduction of metal oxides using carbon as reducing agent. Hydrometallurgy, Methods of purification of metals (Al, Pb, Ti, Fe, Cu, Ni, Zn): electrolytic, oxidative refining, Kroll process, Parting process, van Arkel-de Boer process and Mond's process.
Section II: Hydrides of nitrogen: (NH_3, N_2H_4, N_3H, NH_2OH) Oxoacids of P, S and Cl. Halides and oxohalides: PCl_3, PCl_5, $SOCl_2$ and SO_2Cl_2
Section III: Arenes and Aromaticity: Nomenclature of benzene derivatives. Aromatic nucleus and side chain, Aromaticity: Huckel rule, aromatic ions, aromatic, anti-aromatic and non-aromatic compounds.
Section IV: Chemical kinetics: Rate of reaction - Definition of order and molecularity. Derivation of rate constants for first, second, third and zero order reactions and examples. Derivation for time half change. Methods to determine the order of reactions. Effect of temperature on rate of reaction, Arrhenius equation, concept of activation energy.

Learning Experience: Through lectures, laboratory experiments, and problem-solving exercises, you'll gain a strong foundation in the theoretical concepts of physical and organic chemistry. You'll also develop practical skills in conducting experiments, analyzing data, and applying your knowledge to real-world problems.

Textbooks:

1. Allied Chemistry – Prof. Mathur and others.
2. Elements of Properties of Matter – D.S. Mathur, S. Chand & Co. (1999).
3. Modern Chemistry – S. Chand & Co. (2006).

Suggested Readings:

1. Electronic Principles and Applications – A.B. Bhattacharya, New Central Book Agency, Calcutta.
2. Introduction to Fiber optics by K. Thyagarajan and Ajay Ghatak, Cambridge, University Press (1999).]

Open Educational Resources (OER)

1. Khan Academy: https://www.khanacademy.org/science/organic-chemistry
2. MIT OpenCourseWare: https://ocw.mit.edu/courses/chemistry/
3. Chemistry LibreTexts: https://chem.libretexts.org/

Examination Scheme:

Evaluation components	**Weightage**
Internal marks (Theory) **I. continuous assessment (30 marks)** All the components to be evenly spaced Project/quizzes/assignment and essays/presentation/ participation/case studies/reflective journals (minimum of five components to be evaluated)	**30 Marks**
II. internal marks (Theory): Mid Term Examination	**20 Marks**
III. External Marks (Theory): End Term Examination	**50 Marks**

It is compulsory for a student to secure 40% marks in Internal and End Term Examination separately to secure minimum passing grade

SCFS310	Solid state physics	L	T	P	C
Version1.0		3	0	0	3
Category of Course	DSE				
Total Contact Hours	45 Hours				
Pre-requisites/ Co-requisites	--				

Course Perspective: Physics VI (Solid State Physics) provides a comprehensive exploration of the properties and behavior of condensed matter. You'll delve into the quantum mechanical principles underlying solids, from crystal structures to electronic properties.

Course Outcome: Students will be:

CO1: Understanding the principles of elementary lattice dynamics, including lattice vibrations and phonons in linear monoatomic and diatomic chains.

CO2: Analyse dielectric and ferroelectric properties of materials, focusing on concepts like electric susceptibility, polarizability, and plasma oscillations.

CO3: Analyzing the classical and quantum mechanical theories to explore the magnetic properties of matter, including diamagnetic, paramagnetic, and ferromagnetic materials.

CO4: Performing investigations into superconductivity, examining critical temperature, critical magnetic field, and the Meissner effect in type I and type II superconductors.

Course contents
Section I: Elementary Lattice Dynamics: Lattice Vibrations and Phonons: Linear Monoatomic and Diatomic Chains; Acoustical and Optical Phonons, Qualitative Description of the Phonon Spectrum in Solids.
Section II: Dielectric and Ferroelectric Properties of Materials: Electric Susceptibility. Polarizability Clausius Mosotti Equation. Classical Theory of Electric Polarizability. Langevin-Debye equation. Plasma Oscillations, Plasma Frequency, Plasmons, Structural phase transition, Classification of crystals.
Section III: Magnetic Properties of Matter: Dia-, Para-, Ferri- and Ferromagnetic Materials. Classical Langevin Theory of dia and Paramagnetic Domains. Quantum Mechanical Treatment of Para magnetism.
Section IV: Superconductivity and Elementary band theory: Critical Temperature. Critical magnetic field. Meissner effect. Type I and type II Superconductors, London's Equation and Penetration Depth. Isotope effect. Band Gap, Conductor, Semiconductor (P and N type) and insulator.

Learning Experience: Through lectures, problem-solving exercises, and laboratory experiments, you'll gain a hands-on understanding of solid-state physics concepts. This course will equip you with the knowledge and skills needed for research in materials science, condensed matter physics, and related fields.

Textbooks:

1. Allied Physics – Prof. Dhanalakshmi and others.
2. Elements of Properties of Matter – D.S. Mathur, S. Chand & Co. (1999).
3. Modern Physics – R. Murugesan S. Chand & Co. (2004).
4. Electronic Principles and Applications – A.B. Bhattacharya, New Central Book Agency, Calcutta.

Suggested Readings:

1. The Quantum Theory of Matter by Feynman
2. Quantum Mechanics by Griffiths

Open Educational Resources (OER):

1. MIT OpenCourseWare: Solid State Physics I (https://ocw.mit.edu/courses/8-231-physics-of-solids-i-fall-2006/pages/syllabus/)
2. Khan Academy: Solid State Physics (https://www.khanacademy.org/science/physics)
3. National Physical Laboratory (NPL) Open Access Repository (https://eprintspublications.npl.co.uk/)

Examination Scheme:

Evaluation components	**Weightage**
Internal marks (Theory) **I. continuous assessment (30 marks)** All the components to be evenly spaced Project/quizzes/assignment and essays/presentation/ participation/case studies/reflective journals (minimum of five components to be evaluated)	**30 Marks**
II. internal marks (Theory): Mid Term Examination	**20 Marks**
III. External Marks (Theory): End Term Examination	**50 Marks**

It is compulsory for a student to secure 40% marks in Internal and End Term Examination separately to secure minimum passing grade

SCFS308	Biotechnology and microbiology	**L**	**T**	**P**	**C**
Version1.0		3	0	0	3
Category of Course	DSE				
Total Contact Hours	45 Hours				
Pre-requisites/ Co-requisites	--				

Course Perspective: This course explores the intersection of biology and technology, focusing on the application of living organisms and their components to create products and processes. You'll delve into

the fascinating world of microorganisms, their characteristics, and their role in various industries and ecosystems.

Course Outcome: Students will be:

CO1: Understanding the epidemiology of infectious diseases, focusing on their transmission and prevention strategies.

CO2: Applying the roles of microorganisms in food and industrial microbiology contexts.

CO3: Analyzing various molecular techniques used in gene manipulation and explore their applications.

CO4: Performing detailed studies on genes at the molecular level, including DNA, RNA, replication, mutations, and DNA repair mechanisms.

CO5: Interpreting the applications of biotechnology, including the use of transgenic plants and animals in medicine, vaccines, and gene therapy.

Course contents
Section I: Applications of Biotechnology Molecular diagnosis of genetic diseases (Cystic fibrosis, Huntington's disease and Sickle cellanemia), Recombinant vaccines, Recombinant DNA in medicines (Recombinant insulin and Human growth hormone), Gene therapy (ADA and Cystic fibrosis) and Stem Cells, Bioremediation, Production and applications of transgenic plants (biotic, abiotic and improvement of nutritional quality) and transgenic animals (generation of medicines and hormones), Ethics and regulation of GM organisms.
Section II: Molecular manipulation Introduction to the concept of Recombinant DNA Technology, Cloning vectors, Restriction and modifying enzymes, Transformation techniques (microbial, plants and animals), Construction and screening of DNA libraries, Southern, Northern and Western blotting, DNA sequencing (Maxam-Gilbert and Sanger methods), and DNA microarrays.
Section III: Food and industrial microbiology Microbiology of fermented food and food-borne diseases, food preservation, Micro-organismas food (e.g. SCP), Major products of industrial microbiology-antibiotics, amino acids, organic acids, vitamins, pharmaceuticals.
Section IV: Human diseases Epidemiology of infectious disease, transmission, prevention and control of human diseases-Tuberculosis, Amoebiasis, Dengue, Malaria, Filariasis, Japanese encephalitis

Learning Experience: Through a combination of lectures, laboratory experiments, and hands-on projects, you'll gain practical skills in techniques such as DNA manipulation, fermentation, and

microbial culturing. You'll also explore the ethical and societal implications of biotechnology and learn about the latest advancements in this rapidly evolving field.

Textbooks:

1. M.S. Leffel, A.D. Donnenberg & N.R. Rose Handbook of Human Immunology CRC press, 1997
2. Essentials of Human Genetics by S.M. Bhatnagar et al (1999) IV edition. Orient Longman.
3. Basic Human Genetics by E.J. Manage and A.P. Manage (1997 India Reprint) Rastogi Publications, Meerut.
4. Mendelian inheritance in Man: Catalogues of Autosomal recessive and x-linked. phenotypes. [12teditions – 1998] by McKusick, V.A. Johns Hopkins university press,Baltimore.

Suggested Readings:

1. Principles and Practice of Medical Genetics, by Emery, A.E.H and D.L. Rimoin (Eds_ (1990-2nd edition) Churchill Livingstone, Edinburgh.
2. Human Genetics by S.D. Gangane (2nd edition-Reprint 2001), B.L ChurchillLivingstone Pvt.

Open Educational Resources (OER)

1. OpenStax Biology: https://openstax.org/details/books/biology-2e/
2. Khan Academy Biology: https://www.khanacademy.org/science/biology
3. MIT OpenCourseWare Biology: https://ocw.mit.edu/courses/7-016-introductory-biology-fall-2018/

Examination Scheme:

Evaluation components	Weightage
Internal marks (Theory) **I. continuous assessment (30 marks)** All the components to be evenly spaced Project/quizzes/assignment and essays/presentation/ participation/case studies/reflective journals (minimum of five components to be evaluated)	**30 Marks**
II. internal marks (Theory): Mid Term Examination	**20 Marks**
III. External Marks (Theory): End Term Examination	**50 Marks**

It is compulsory for a student to secure 40% marks in Internal and End Term Examination separately to secure minimum passing grade

SCFS306	Advanced Digital Forensics	L	T	P	C
Version1.0		2	0	0	2
Category of Course	Core				
Total Contact Hours	30 Hours				
Pre-requisites/ Co-requisites	--				

Course Perspective: This advanced course delves into the complexities of modern digital investigations, equipping you with the skills to analyze intricate digital artifacts and extract crucial evidence. You'll explore advanced forensic tools, techniques, and methodologies used in a wide range of digital crime investigations, from cybercrime to intellectual property theft.

Course Outcome: Students will be:

CO1: Understanding the essential concepts, algorithms, protocols, tools, and methodologies employed in computer forensics.

CO2: Analyse multiple sources of evidence to focus investigations effectively.

CO3: Analyzing cryptographic techniques and knowledge of symmetric cryptosystems and hashing algorithms to address security issues.

CO4: Performing the analysis and interpretation of digital evidence using various computer forensic tools and techniques.

CO5: Interpreting and document findings from computer forensic investigations to present them effectively.

Course contents
Section 1: Cyber Security Cyber security increasing threat landscape, Cyber security terminologies- Cyberspace, attack, attack vector, attack surface, threat, risk, vulnerability, exploit, exploitation, hacker., Non-state actors, Cyber terrorism, Protection of end user machine, Critical IT and National Critical Infrastructure, Cyberwarfare, Case Studies.
Section II: Tools and technologies Computer Virus: Definition, types of viruses, Characteristics of viruses, virus and trojan infections, different types of attack, internet research and investigative tools, Anti-virus software. Password policy, Security patch management, Data backup, Downloading and management of third party software, Device security policy, Cyber Security best practices, Significance of host firewall and Ant-virus, Management of host firewall and Anti-virus, Wi-Fi security, Configuration of basic security policy and permissions.

Section III: Cryptography Introduction to Cryptography, Symmetric and Asymmetric Cryptosystem Encryption Techniques– Substitutional Cipher and Transpositional Ciphers. Types of keys – Public Key and Private Key. Advanced Encryption Techniques and Security Issues. Various types of attacks including Cipher Text-Only attack, Known-Plaintext Attack, Chosen-Plaintext Attack, Chosen-Cipher text Attack.
Section IV: Symmetric Cryptosystem Symmetric Cryptosystem – AES, DES, RC4, Blowfish. Asymmetric Cryptosystems – RSA, DSA, Elliptic Curve cryptography. Introduction to Cryptanalysis – Differential and Linear Cryptanalysis. Hashing Algorithms – MD5, SHA-1, SHA-2, SHA-3, One-Way Hash, Hash Message Authentication Code.

Learning Experience: Through hands-on labs, case studies, and expert guidance, you'll gain practical experience in analyzing various digital devices, including computers, mobile phones, and network infrastructure. You'll learn to identify hidden data, recover deleted files, and interpret digital evidence in a court-admissible manner.

Textbooks:

1. Digital Forensics: A Field Guide by Brian K. Kruse and Jason J. W. Kirk
2. Computer Forensics: Incident Response Essentials by Rod V. Rasmussen
3. Advanced Digital Forensics: Techniques and Tools by Brian K. Kruse and Jason J. W. Kirk

Suggested Readings:

1. The Art of Computer Forensics by Brian K. Kruse
2. Digital Evidence by Michael C. Mandia and Jack A. Grasso
3. Computer Forensics: A Comprehensive Guide by James C. O'Reilly

Open Educational Resources (OER):

1. Open Digital Forensics Survival Guide: https://oercommons.org/courseware/lesson/78295/student/?section=1
2. Digital Forensics and Incident Response: https://dokumen.pub/hands-on-incident-response-and-digital-forensics-9781780174204-1780174209.html

Examination Scheme:

Evaluation components	**Weightage**

Internal marks (Theory) **I. continuous assessment (30 marks)** All the components to be evenly spaced Project/quizzes/assignment and essays/presentation/ participation/case studies/reflective journals (minimum of five components to be evaluated)	**30 Marks**
II. internal marks (Theory): Mid Term Examination	**20 Marks**
III. External Marks (Theory): End Term Examination	**50 Marks**

It is compulsory for a student to secure 40% marks in Internal and End Term Examination separately to secure minimum passing grade

UCH156	Chemistry Practical VI	L	T	P	C
Version1.0		0	0	2	1
Category of Course	Core (Practical)				
Total Contact Hours	30 Hours				
Pre-requisites/ Co-requisites	--				

Course Perspective:

In Chemistry Practical III, students explore fundamental concepts in physical and organic chemistry through hands-on experiments. By studying Ellingham diagrams, students learn to predict the feasibility of metal oxide reduction using carbon. The course introduces methods to experimentally identify benzene derivatives and classifies aromaticity.

Course Outcome: Students will be:

CO1: Understanding how to use Ellingham diagrams to predict the feasibility of reducing metal oxides with carbon as a reducing agent.

CO2: Analyse common benzene derivatives through experimental identification using physical and chemical methods.

CO3: Analyzing principles of aromaticity to differentiate between aromatic, anti-aromatic, and non-aromatic compounds in experimental studies.

CO4: Performing titration methods to measure the rate constant for the hydrolysis of esters, such as ethyl acetate.

CO5: Interpreting the effect of temperature on reaction rates through investigations, exemplified by the decomposition of hydrogen peroxide.

Course contents

1. Study of Ellingham diagrams to predict the feasibility of reduction of metal oxides using carbon as a reducing agent.
2. Experimental identification of common benzene derivatives using physical and chemical methods.
3. Experimental study of aromatic, anti-aromatic, and non-aromatic compounds.
4. Measurement of the rate constant for the hydrolysis of an ester (e.g., ethyl acetate) using titration methods.
5. Investigation of the effect of temperature on the rate of reaction for a specific reaction (e.g., decomposition of hydrogen peroxide).

Learning Experience:

Students engage in experimental techniques, enhancing their problem-solving and analytical skills. The study of Ellingham diagrams equips them to predict metallurgical processes, while identifying benzene derivatives fosters an understanding of organic compound properties. Investigating aromaticity clarifies concepts of molecular stability, while kinetic experiments on ester hydrolysis and reaction rates develop quantitative analytical skills. Overall, this practical course bridges theory with laboratory experience, promoting active learning and scientific inquiry.

Textbooks:

1. Allied Chemistry – Prof. Mathur and others.
2. Elements of Properties of Matter – D.S. Mathur, S. Chand & Co. (1999).
3. Modern Chemistry – S. Chand & Co. (2006).
4. Electronic Principles and Applications – A.B. Bhattacharya, New Central Book Agency, Calcutta.
5. Introduction to Fiber optics by K. Thyagarajan and Ajay Ghatak, Cambridge, University Press (1999).]

Suggested Reading:

1. "Vogel's **Textbook** of Practical Organic Chemistry" by Brian S. Furniss et al.
2. "Physical Chemistry: A Molecular Approach" by Donald A. McQuarrie and John D. Simon
3. "Inorganic Chemistry" by J.D. Lee
4. "Reaction Kinetics" by Keith J. Laidler

Open Educational Resources:

1. Khan Academy – Chemistry
2. MIT OpenCourseWare – Chemistry
3. LibreTexts Chemistry Library

Examination Scheme:

Evaluation components	Weightage
Internal marks (practical) I. Conduct of experiment II. Lab Record III. Lab Participation IV. Lab Project	 **10 Marks** **10 Marks** **10 Marks** **20 Marks**
II. External Marks (practical) End Term Examination	**50 Marks**

It is compulsory for a student to secure 40% marks in Internal and End Term Examination separately to secure minimum passing grade

SCFS352	Forensic Practical VI	L	T	P	C
Version1.0		0	0	4	2
Category of Course	Core (Practical)				
Total Contact Hours	60 Hours				
Pre-requisites/ Co-requisites	--				

Course Perspective: This course provides a hands-on introduction to psychological assessment techniques, focusing on personality assessment. You'll learn about various personality theories, research methods, and the practical application of assessment tools. Through laboratory exercises, you'll gain experience administering, scoring, and interpreting different personality tests.

Course Outcome:

CO1: Understand ethical guidelines in psychological experiments and apply them in forensic psychology.

CO2: Apply experimental data in forensic psychology to draw valid conclusions.

CO3: Analyze research findings in forensic psychology to identify patterns and implications.

CO4: Evaluate research findings and methodologies in forensic psychology.

CO5: Create and conduct experiments in forensic psychology, and effectively communicate research findings.

Course contents

1. Type A/ Type B personality Test
2. Social Problem Scale
3. Eysenck's Personality Questionnaire
4. Raven's Standard Progressive Matrices.
5. Bhatia's Performance Scale of Intelligence.
6. Buss Perry- Aggression Scale
7. Parenting Scale
8. Free Association Test

Learning Experience: By conducting practical assessments like the Type A/Type B Personality Test, Social Problem Scale, Eysenck's Personality Questionnaire, Raven's Standard Progressive Matrices, Bhatia's Performance Scale of Intelligence, Buss Perry-Aggression Scale, Parenting Scale, and Free Association Test of Controlled Drugs, you'll develop essential skills in psychological assessment and research. You'll also learn about the ethical considerations involved in administering and interpreting psychological assessments.

Textbooks:

1. A Glencoe Program Physics principles and problems: Forensic Laboratory Manual Student edition
2. Thomas Kubic, Nicholas Petraco Forensic Science Laboratory Manual and Workbook, Third Edition2009
3. Laboratory Protocols CIMMYT Applied Molecular Genetics LaboratoryThird Edition

Suggested Readings:

1. Kathy Mirakovits, Gina Londino, The Basics of Investigating Forensic Science: A Laboratory Manual 2015.
2. Washington state patrol Forensic Laboratory services: Crime Laboratory: Technical & Training Manuals.
3. G.H. Stout & L.H. Jensten, X-ray Structure Determination – A practical Guide; 2nd Edn. Wiley, New York,1989.
4. Personality Psychology by David F. Hassin, Jerry S. DeYoung, and Todd D. Heatherton
5. Psychological Assessment by Ronald C. Thomas and Joel B. Weaver

Open Educational Resources (OER) Links:

1. https://oercommons.org/
2. Khan Academy: https://www.khanacademy.org/
3. MIT OpenCourseWare: https://ocw.mit.edu/courses/

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