



**JAYPEE UNIVERSITY OF INFORMATION
TECHNOLOGY**
WAKNAGHAT, P.O. – WAKNAGHAT,
TEHSIL – KANDAGHAT, DISTRICT – SOLAN (H.P.)
PIN – 173234 (INDIA) Phone Number- +91-1792-257999
(Established by H.P. State Legislature vide Act No. 14 of 2002)



Overview of the B.Sc. Forensic Science Program

The B.Sc. in Forensic Science is an interdisciplinary undergraduate program that integrates scientific, legal, and investigative principles to support the criminal justice system. The curriculum covers core scientific disciplines, including biology, chemistry, physics, and criminology, as well as specialized areas such as forensic analysis, evidence examination, and crime scene investigation.

The program trains students to systematically analyze physical, biological, and digital evidence, preparing them to contribute effectively to crime detection and judicial processes. Emphasis is placed on both theoretical knowledge and hands-on laboratory training, providing practical skills in fingerprint analysis, DNA profiling, forensic toxicology, forensic chemistry, digital forensics, questioned document examination, and crime scene management.

The program emphasizes precision, objectivity, and ethical responsibility. Students are introduced to essential legal frameworks and professional standards, including chain of custody, evidence-handling protocols, and the role of expert testimony in court. Graduates are prepared for careers in forensic laboratories, law enforcement agencies, research institutions, and private investigative services. The curriculum also provides a strong academic foundation for advanced studies in forensic science, criminology, biotechnology, and related fields. By combining scientific rigor with practical application, the B.Sc. in Forensic Science program contributes significantly to the pursuit of truth and justice.

Specializations are offered in Forensic Biology and DNA Analysis, Forensic Toxicology and Drug Analysis, Multimedia Forensics, and Cyber Forensics, beginning in the fourth semester.

B.Sc. Forensic Science (Three-Year Program) Total Credits: 130

B.Sc. Forensic Science with Research (Four-Year Program) Total Credits: 170

Program Outcomes (POs) – B.Sc. Forensic Science

PO1: Apply concepts from biology, chemistry, physics, and forensic science to the analysis of physical, biological, and digital evidence.

PO2: Demonstrate competence in laboratory techniques, instrumentation, evidence examination, and scientific data interpretation.

PO3: Communicate scientific findings effectively, prepare forensic reports, present evidence in court, and solve case-based problems using critical thinking.

PO4: Apply ethical principles, maintain the chain of custody, understand forensic laws, and function responsibly in investigative and legal settings.



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Curriculum – B.Sc. Forensic Science 3-year and 4-year Program

Semester I							
Sr. No.	Course Code	Subject Name	Contact Hours				Credits
			L	T	P	Total	C
1	XXXXXXX	Introduction to Forensic Science	3	0	0	3	3
2	XXXXXXX	Physics for Forensic Science-I	3	1	0	4	4
3	XXXXXXX	Physics for Forensic Science-I Lab	0	0	2	2	1
4	XXXXXXX	Chemistry for Forensic Science-I	3	1	0	4	4
5	XXXXXXX	Chemistry for Forensic Science-I Lab	0	0	2	2	1
6	XXXXXXX	Computing Fundamentals and Office Tools	3	0	0	3	3
7	XXXXXXX	Computing Fundamentals and Office Tools Lab	0	0	2	2	1
8	XXXXXXX	Fundamental Biology/ Fundamentals of Mathematics	2	1	0	3	3
9	25B11HS111	English	1	0	2	3	2
Total			15	3	8	26	22

Semester II							
Sr. No.	Course Code	Subject Name	Contact Hours				Credits
			L	T	P	Total	C
1	XXXXXXX	Crime Scene Management	2	0	0	2	2
2	XXXXXXX	Physics for Forensic Science--II	3	0	0	3	3
3	XXXXXXX	Physics for Forensic Science-II Lab	0	0	2	2	1
4	XXXXXXX	Chemistry for Forensic Science -II	3	0	0	3	3
5	XXXXXXX	Chemistry for Forensic Science-II Lab	0	0	2	2	1
6	XXXXXXX	Molecular Biology	3	1	0	4	4
7	XXXXXXX	Discrete Computational Mathematics	3	1	0	4	4
8	XXXXXXX	Introduction to Computer Programming	3	0	0	3	3
9	XXXXXXX	Computer Programming Lab	0	0	2	2	1
10	XXXXXXX	Indian Criminal Law, Criminology and Ethics	3	0	0	3	3
11	25B11HS211	Universal Human Values (UHV)	2	1	0	3	3



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		Total	22	2	6	30	28
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Semester III							
Sr. No.	Course Code	Subject Name	Contact Hours				Credits
			L	T	P	Total	
1	XXXXXXX	Python Programming for Forensic data	3	0	0	3	3
2	XXXXXXX	Python Programming Lab	0	0	2	2	1
3	XXXXXXX	Finger Print Science and Impression Evidence	2	1	0	3	3
4	XXXXXXX	Physics for Forensic Science -III	3	0	0	3	3
5	XXXXXXX	Physics for Forensic Science -III Lab	0	0	2	2	1
6	XXXXXXX	Chemistry for Forensic Science -III	3	0	0	3	3
7	XXXXXXX	Chemistry for Forensic Science -III Lab	0	0	2	2	1
8	XXXXXXX	Probability and Statistics	3	1	0	4	4
9	XXXXXXX	Probability and Statistics through R Lab	0	0	2	2	1
10	25B11GE311	Environmental Studies	3	0	0	3	Qualifying
		Total	17	2	8	27	20

Semester IV							
Sr. No.	Course Code	Subject Name	Contact Hours				Credits
			L	T	P	total	
1	XXXXXXX	Analytical Technique-I	3	1	0	4	4
2	XXXXXXX	Analytical Techniques-I lab	0	0	2	2	1
4	XXXXXXX	Financial Forensic & Questioned Document Analyses	3	0	0	3	3
5	XXXXXXX	Financial Forensic Lab	0	0	2	2	1
6	XXXXXXX	Forensic Psychology	3	0	0	3	3
7	XXXXXXX	Specialization Course-I	3	1	0	4	4
8	XXXXXXX	Specialization Course-II	3	0	2	5	4

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		Total	15	2	6	23	20
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Semester V							
Sr. No.	Course Code	Subject Name	Contact Hours				Credits
			L	T	P	Total	
1	XXXXXXXX	Forensic Chemistry: Fire, explosives, and trace evidence	3	0	0	3	3
2	XXXXXXXX	Advanced Analytical Techniques-II	3	1	0	4	4
3	XXXXXXXX	Forensic QA & Accreditation	3	0	0	3	3
4	XXXXXXXX	Specialization Course-III	3	1	0	4	4
5	XXXXXXXX	Specialization Course-IV	3	0	2	5	4
6	XXXXXXXX	Ethics, Law and Policy in AI Driven forensics	2	0	0	2	2
		Total	17	2	2	21	20

Semester VI							
Sr. No.	Course Code	Subject Name	Contact Hours				Credits
			L	T	P	Total	
1	XXXXXXXX	Forensic Ballistics and impact Analysis	3	0	0	3	3
2	XXXXXXXX	Forensic Anthropology	3	0	0	3	3
3	XXXXXXXX	Quality Assurance and Laboratory Management	3	0	0	3	3
4	XXXXXXXX	Specialization Course-V	3	1	0	4	4
5	XXXXXXXX	Specialization Course-VI	3	0	2	5	4
6	XXXXXXXX	Information Security, Audit and Compliances	3	0	0	3	3
		Total	18	1	2	21	20



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Cyber Forensics						
		Contact Hours				Credits C
		L	T	P	Total	
Semester IV						
Specialization Course-I	Linear Algebra and Differential Equation	3	1	0	4	4
Specialization Course-II	Cyber Forensic	3	0	2	5	4
Semester V						
Specialization Course-III	Cyber Crime Investigation and Digital Evidence	3	1	0	4	4
Specialization Course-IV	Machine Learning Fundamentals for Forensic Data	3	0	2	5	4
Semester VI						
Specialization Course-V	AI & ML in Cyber-Forensic	3	1	0	4	4
Specialization Course-VI	Forensic intelligence & Crime Analytics	3	0	0	3	3

Multimedia Forensics						
		Contact Hours				Credits C
		L	T	P	Total	
Semester IV						
Specialization Course-I	Digital Forensic with Lab	3	1	0	4	4
Specialization Course-II	Forensic Physics-1: Physical Evidence and Reconstruction	3	0	2	5	4
Semester V						
Specialization Course-III	Audio and Video Forensic	3	1	0	4	4
Specialization Course-IV	Machine Learning Fundamental for Forensic Data	3	0	2	5	4
Semester VI						
Specialization Course-V	Artificial Intelligence in Multimedia Forensics	3	1	0	4	4
Specialization Course-VI	Forensic Photography and Videography	3	0	0	3	3

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Forensic Biology and DNA Analysis						
		Contact Hours				Credits
		L	T	P	Total	C
Semester IV						
Specialization Course-I	DNA Profiling	3	1	0	4	4
Specialization Course-II	Human Anatomy and Physiology	3	0	2	5	4
Semester V						
Specialization Course-III	Forensic Genomics and Molecular Forensics	3	1	0	4	4
Specialization Course-IV	Microbiology and Immunology for Forensics	3	0	2	5	4
Semester VI						
Specialization Course-V	Forensic Serology and Biological Evidence Examination	3	1	0	4	4
Specialization Course-VI	Wildlife Forensic Biology	3	0	0	3	3

Forensic Toxicology and Drug Analysis						
		Contact Hours				Credits
		L	T	P	Total	C
Semester IV						
Specialization Course-I	Forensic Toxicology-I	3	1	0	4	4
Specialization Course-II	Medicinal Chemistry of Drugs	3	0	2	5	4
Semester V						
Specialization Course-III	Forensic Toxicology-II & Drug of Abuse	3	1	0	4	4
Specialization Course-IV	Forensic Pharmacology	3	0	2	5	4
Semester VI						
Specialization Course-V	Food and Beverage Toxicology	3	1	0	4	4
Specialization Course-VI	Clinical Forensic Toxicology	3	0	0	3	3



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B.Sc. Forensic Science (3 Years Program)

Credit Summary	
Semester	Credits
I	22
II	28
III	20
IV	20
V	20
VI	20
Total	130



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Semester VII							
Sr. No.	Category Code	Subject Name	Contact Hours			C	
			L	T	P		Total
1	XXXXXXXX	Research Methodology and Scientific Communication	2	1	0	3	3
2	XXXXXXXX	Project Part I	0	0	34	34	17
		Total Credit & Total Credit Hours	2	1	34	37	20
Semester VIII							
Sr. No.	Category Code	Subject Name	Contact Hours			C	
			L	T	P		Total
1	XXXXXXXX	Human Genetics for Forensic Applications	3	1	0	4	4
2	XXXXXXXX	Project Part II	0	0	32	32	16
		Total Credit & Total Credit Hours	3	0	32	36	20

B.Sc. (Hons) Forensic Science with Research (4 Years Program)

Credit Summary	
Semester	Credits
I-VI	130
VII	20
VIII	20

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Total	170
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DETAILED SYLLABI OF COURSES OF B.Sc. (FORENSIC SCIENCE) – 2026-27

Introduction to Forensic Science

COURSE CODE: XXXXXXXX

COURSE CREDITS: 3

CORE/ELECTIVE: Core

L-T-P: 3-0-0

Pre-requisite: XIITH

Course Objectives:

This course covers the full breadth of forensic science, from its historical roots and Indian contributions to its modern practice. Students will learn core principles of forensic science, alongside the scope and limitations of key forensic disciplines, the Indian institutional and legal framework, and practical crime scene management and expert report writing. The course also develops critical thinking by examining cognitive biases, evaluating which disciplines rest on strong empirical foundations, and assessing the growing role of AI and digital technologies in forensic work. Throughout, the ethical obligations of the forensic scientist viz. impartiality, honesty, transparency about uncertainty, and a primary duty to the court, are emphasised as the foundation of the profession.

Course Outcomes:

After successful completion of the course, students will be able to:

S.No.	Course Outcomes	Level of Attainment
CO-1	Explain the fundamentals of forensic science, including its historical development (with Indian contributions), core principles, and ethical responsibilities of forensic practitioners.	Understand
CO-2	Apply foundational concepts such as the Locard Exchange Principle, scientific method, chain of custody, and Bayesian reasoning to forensic scenarios.	Apply
CO-3	Summarize and analyze the scope, methods, capabilities, and limitations of major forensic disciplines within the Indian legal and institutional framework.	Understand / Analyze
CO-4	Apply systematic crime scene management procedures and prepare structured, legally defensible forensic reports while recognizing and mitigating cognitive biases.	Understand / Analyze

CO-5	Critically evaluate the scientific validity of forensic disciplines and emerging technologies (AI/ML), considering their limitations, reliability, and ethical implications.	Evaluate
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Course Contents:

Module no	Name of module	Contents	Lectures required
1	Crime, Science and the pursuit of Truth	Evolution of crime investigation: ancient to modern systems Philosophy of forensic science – “every contact leaves a trace” Contributions of key historical figures in forensic science Indian contributions to forensic science development Transition from intuition-based justice to scientific investigation Role of forensic science in modern criminal justice systems	6
2	Foundational Principles, logic and law	Nature and classification of physical evidence, Locard Exchange Principle and its operational significance, Scientific method in forensic investigations, Logic of inference and reasoning in forensic science, Bayesian reasoning and interpretation of evidence, Legal standards: “beyond reasonable doubt”, Cognitive bias in forensic science and mitigation strategies	7
3	A tour of forensic disciplines	Overview and classification of forensic disciplines, Forensic biology and serology Forensic chemistry and toxicology, Fingerprint and impression evidence, Digital and cyber forensics, Questioned documents examination, Ballistics and firearm examination, Forensic anthropology and odontology, Capabilities and limitations of forensic disciplines (case-based learning)	9
4	The Crime Scene Science	Importance and principles of crime scene management Scene documentation techniques (photography, sketches, notes), Evidence recognition, collection, and preservation, India-specific crime scenes: dowry death, road accidents, hooch tragedies, communal violence	4

5	Forensic Science in Court; Law ethics and Communication	Structure and interpretation of forensic reports, Expert witness role and courtroom procedures, Cross-examination and communication of expert opinion, Evaluative reporting and likelihood ratios, Indian legal framework: Bharatiya Nyaya Sanhita (BNS), Bharatiya Nagarik Suraksha Sanhita (BNSS), Bharatiya Sakshya Adhinyam (BSA), Forensic ethics and case studies of misconduct	6
6	Emerging Technologies in the 21st Century	Digital transformation in forensic science, Artificial intelligence and machine learning applications, Deepfake detection and digital evidence challenges, Probabilistic genotyping and advanced DNA technologies, Drone-based and advanced crime scene documentation	5
7	Critical Perspectives and Future	Scientific validation and reliability of forensic disciplines, Wrongful convictions and forensic errors, Global forensic reforms and Indian context: Emerging challenges: climate change, migration, synthetic biology, Future of forensic science and professional responsibility	5
			Total lectures
			42

Suggested Text Book(s):

1. Saferstein, R. (2020). *Criminalistics: An Introduction to Forensic Science* (13th ed.). Pearson. — The gold-standard introductory text; comprehensive, well-illustrated, and widely used globally.
2. James, S. H., Nordby, J. J., & Bell, S. (Eds.) (2014). *Forensic Science: An Introduction to Scientific and Investigative Techniques* (4th ed.). CRC Press. — Multi-author, discipline-by-discipline coverage with strong scientific grounding.
3. Houck, M. M., & Siegel, J. A. (2015). *Fundamentals of Forensic Science* (3rd ed.). Academic Press/Elsevier. — Rigorous and scientifically detailed; excellent for students with a strong science background.
4. Jackson, A. R. W., & Jackson, J. M. (2011). *Forensic Science* (3rd ed.). Pearson. — Accessible and well-structured; good for introductory courses.
5. Reddy, K. S. N., & Murty, O. P. (2014). *The Essentials of Forensic Medicine and Toxicology* (34th ed.). Jaypee Brothers Medical Publishers. — The definitive Indian forensic medicine textbook; essential for Indian medico-legal context.
6. Pillay, V. V. (2013). *Modern Medical Toxicology* (4th ed.). Jaypee Brothers Medical Publishers. — Standard Indian toxicology reference for forensic contexts.

7. Mathiharan, K., & Patnaik, A. K. (2005). *Modi's Medical Jurisprudence and Toxicology* (23rd ed.). LexisNexis. — The classic Indian medico-legal text; comprehensive legal and forensic medicine coverage.
8. Nagpal, B. N., & Nagpal, R. (2022). *Cyber Law and Information Technology* (5th ed.). Excel Books. — Covers IT Act 2000, amended provisions, DPDP Act, and digital evidence under Indian law.
9. *Bharatiya Nyaya Sanhita (BNS) 2023; BharatiyaNagarik Suraksha Sanhita (BNSS) 2023; BharatiyaSakshyaAdhiniyam (BSA) 2023*. — Government of India. Primary legislative texts; available at indiacode.nic.in.

Suggested Reference Book(s):

1. Lee, H. C., & Gaensslen, R. E. (Eds.) (2001). *Advances in Fingerprint Technology* (2nd ed.). CRC Press. — Comprehensive scientific treatment of fingerprint science.
2. Butler, J. M. (2015). *Advanced Topics in Forensic DNA Typing: Interpretation*. Academic Press. — The definitive reference on DNA mixture interpretation and probabilistic genotyping.
3. Casper, J. K. (2014). *Forensic Science: An Introduction to Scientific and Investigative Techniques*. Infobase Publishing. — Accessible supplementary reading for introductory students.
4. Swaminathan, S. (2009). *Forensic Science in India: A Vision for the Twenty-First Century*. Ministry of Home Affairs, Government of India. — Policy document outlining India's forensic development agenda.
5. Chisum, W. J., & Turvey, B. E. (2011). *Crime Reconstruction* (2nd ed.). Academic Press. — Standard reference on crime scene reconstruction methodology.
6. Casey, E. (2019). *Digital Evidence and Computer Crime: Forensic Science, Computers and the Internet* (3rd ed.). Academic Press. — Definitive reference for digital forensics; covers evidence, law, and investigation.
7. Tilstone, W. J., Savage, K. A., & Clark, L. A. (2006). *Forensic Science: An Encyclopedia of History, Methods, and Techniques*. ABC-CLIO. — Encyclopaedic reference for broad coverage of forensic disciplines.
8. Robertson, B., Vignaux, G. A., & Berger, C. E. H. (2016). *Interpreting Evidence: Evaluating Forensic Science in the Courtroom* (2nd ed.). Wiley. — The standard text on Bayesian reasoning and likelihood ratios in forensic science.
9. Saks, M. J., & Koehler, J. J. (2005). The coming paradigm shift in forensic identification science. *Science*, 309(5736), 892–895. — Seminal paper on the scientific crisis in pattern evidence disciplines.
10. National Academy of Sciences (2009). *Strengthening Forensic Science in the United States: A Path Forward*. National Academies Press. [Free PDF: nap.edu] — Landmark report that transformed the field; essential background reading.

Evaluation Scheme:

Assessment	Max. marks	Duration	Course Covered
T1 Test	15	1 hr.	Syllabus covered upto T-1
T2 Test	25	1.5 hrs.	Syllabus covered upto T-2
End Term Test	35	2 hrs.	Entire Syllabus
Teacher Assessment	25	Entire Sem	Based on Assignments, quizzes etc.

Physics for Forensic Science -1

COURSE CODE:XXXXXXXX

COURSE CREDITS: 04

CORE/ELECTIVE: CORE

L-T-P: 3-1-0

Pre-requisite: Students should have a basic understanding of **elementary physics and Basic mathematics**, including fundamental concepts of motion, force, energy, waves, and basic algebra and trigonometry.

Course Objectives:

1. To develop an understanding of the fundamental principles of classical physics including mechanics, energy, fluids, oscillations, and waves.
2. To explain how physical laws govern motion, forces, and energy transfer in real-world forensic situations.
3. To introduce the application of physics concepts in crime scene investigation such as blood spatter analysis, projectile motion, accident reconstruction, and firearm analysis.
4. To familiarize students with the role of fluid mechanics, oscillations, and wave phenomena in forensic investigations including drowning analysis, vibration patterns, and audio forensics.
5. To enable students to apply principles of optics and acoustics in forensic techniques such as fingerprint examination, document authentication, and audio recording analysis.

Course Outcomes:

S. No.	COURSEOUTCOMES	Level of Attainment
CO 1	Explain the principles of vectors, motion, Newton's laws, momentum, and rotational dynamics and apply them to forensic investigations such as blood spatter analysis, projectile motion, and crime scene reconstruction.	Application Level
CO 2	Apply the concepts of work, energy, and power to analyze energy transfer and impact severity in forensic cases including assaults, explosions, and tool mark examinations.	Application Level
CO 3	Interpret the principles of fluid mechanics to understand forensic phenomena such as blood flow patterns, drowning investigations, and movement of toxic liquids.	Understanding Level
CO 4	Describe the concepts of oscillations and simple harmonic motion and evaluate their applications in vibration analysis and physiological measurements used in forensic instruments.	Familiarity Level

CO 5	Analyze the principles of wave motion, acoustics, and wave optics for applications in audio forensics, gunshot analysis, fingerprint examination, fiber analysis, and document authentication.	Analysis Level
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Course Content:

Module No.	Title of the Module	Topics in the Module	Hours
1	Mechanics and Motion in Forensic Investigations	<p>Scalars and vectors; Vector addition and resolution; Motion in one, two and three dimensions; Projectile motion; Circular motion; <i>Applications:</i> Blood Spatter Analysis, Height of victim or attacker; Direction of weapon movement; Position of crime participants</p> <p>Newton's laws of motion; Friction; Impulse; Conservation of momentum; Collisions (elastic and inelastic); <i>Applications:</i> Bullet Trajectory Reconstruction, Accident Reconstruction; Firearm and Ballistics Analysis; Bullet impact studies; Gunshot wound analysis; Hit and Run Investigation; Slip, Fall and Assault Investigations</p> <p>Rotational Motion: Torque; Moment of inertia; Angular momentum; Rotational kinetic energy; <i>Applications:</i> Weapon Motion Analysis; Vehicle Rollover Analysis;; Tool Mark Rotation Patterns</p>	14
2	Work, Energy and Power	<p>Work-energy theorem; Potential and kinetic energy; Conservation of energy; Spring forces; <i>Applications:</i> Injury Severity Estimation: Severity of blows; Explosive and Blast Investigation; Tool Mark Examination: Energy transferred from tool to surface</p>	5
3	Fluid Mechanics	<p>Pressure; Pascal's law; Buoyancy and Archimedes' principle; Bernoulli's theorem; Flow of liquids; <i>Applications:</i> Blood Flow and Blood Pattern Analysis; Drowning Investigations; Poison and Toxic Liquid Movement</p>	5
4	Oscillations (SHM)	<p>Simple harmonic motion; Pendulum motion; Energy in oscillations; Superposition and beats; <i>Applications:</i> Vibration Pattern Analysis; Lie Detection Instruments: Physiological oscillations</p>	4

5	Wave Motion	Wave equation; Longitudinal and transverse; Wave velocity; Energy and intensity of waves Sound and Acoustics: Sound intensity and loudness; Doppler Effect; Reverberation; Ultrasonic waves; <i>Applications:</i> Audio Forensics; Seismic Forensics; Gunshot Analysis; Audio Recording Authentication; Ultrasonic Forensic Testing Wave Optics: Interference; Diffraction; Polarization; <i>Applications:</i> Fingerprint and Document Examination; Fiber and Hair Analysis; Counterfeit Currency Detection	14
		Total number of Lectures	42

Suggested Text Book(s):

- [1] H. C. Verma, *Concepts of Physics, Vol. 1*, 1st ed. Patna, India: Bharati Bhawan Publishers, 1992.
- [2] H. C. Verma, *Concepts of Physics, Vol. 2*, 1st ed. Patna, India: Bharati Bhawan Publishers, 1992.
- [3] M. N. Avadhanulu and P. G. Kshirsagar, *Engineering Physics*, 12th ed. New Delhi, India: S. Chand Publishing, 2019.
- [4] D. K. Bhattacharya and P. Tandon, *Engineering Physics*, 2nd ed. New Delhi, India: Oxford University Press, 2015.
- [5] D. S. Mathur, *Mechanics*, 2nd ed. New Delhi, India: S. Chand Publishing, 2016.
- [6] D. S. Mathur, *Properties of Matter*, 6th ed. New Delhi, India: S. Chand Publishing, 2014.
- [7] A. Ghatak, *Optics*, 5th ed. New Delhi, India: McGraw Hill Education India, 2012.
- [8] V. K. Mehta and R. Mehta, *Fundamentals of Physics*, 11th ed. New Delhi, India: S. Chand Publishing, 2018.
- [9] Physics for Scientists and Engineers, R. A. Serway and J. W. Jewett, 9th ed. Boston, MA, USA: Cengage Learning, 2014.
- [10] Physics, D. C. Giancoli, 4th ed. Boston, MA, USA: Pearson Education, 2008.

Evaluation Scheme:

S. No	Exam	Marks	Duration	Coverage / Scope of Examination
1	T-1	15	1 Hour.	Syllabus covered upto T-1
2	T-2	25	1.5 Hours	Syllabus covered upto T-2
3.	T-3	35	2 Hours	Entire Syllabus
4.	Teaching Assessment	25	Entire Semester	Assignment, Quizzes & Attendance

Physics for Forensic Science Lab -I

COURSE CODE:XXXXXXXX

COURSE CREDITS: 01

CORE/ELECTIVE: CORE

L-T-P: 0-0-2

Pre-requisite: Students should have a basic understanding of **elementary physics concepts at the 10+2 level**, including fundamental ideas of mechanics, energy, fluids, oscillations, and waves, along with **basic mathematical skills and familiarity with laboratory measurements and error analysis.**

Course Objectives:

1. To understand fundamental physical principles through laboratory experiments.
2. To develop practical skills in handling scientific instruments and conducting measurements.
3. To analyze experimental data, perform calculations, and interpret results scientifically.
4. To relate theoretical concepts of physics with real-world phenomena and understand sources of experimental error.

Course Outcomes:

SN o	COURSE OUT COMES	Level of Attainment
CO 1	Demonstrate familiarity with basic laboratory instruments and perform experiments related to vectors, motion, forces, and momentum in mechanics.	Familiarity with laboratory instruments and experimental procedures related to mechanics
CO 2	Apply experimental methods to verify fundamental physical principles such as the Work-Energy Theorem, Hooke's law, and conservation of energy.	Understanding and application of experimental methods to verify physical principles
CO 3	Analyze experimental data from experiments on fluid mechanics and oscillatory motion to determine physical parameters such as viscosity, buoyant force, and acceleration due to gravity.	Analysis of experimental observations and calculation of physical parameters
CO 4	Interpret experimental observations related to wave phenomena including interference, diffraction, and sound waves.	Understanding and Interpretation

Course Content:

Module No.	Title of the Module	List of Experiments	Hours
1	Laws of Motion and Momentum	Determination of coefficient of friction using inclined plane	2

2	Work, Energy and Power	To determine the spring constant of a helical spring and study energy storage in elastic systems using Hook's law.	2
3	Oscillations	To study oscillatory motion and determine acceleration due to gravity using Simple Pendulum	2
4	Fluid Mechanics	To determine the coefficient of viscosity of a liquid and study fluid flow behavior.	2
5	Fluid Mechanics	To determine the buoyant force acting on a body immersed in a liquid and verify Archimedes' Principle.	2
6	Interference	To find the wavelength of sodium light using Fresnel's biprism.	2
7	Diffraction	To measure the wavelengths of certain lines in the spectrum of the mercury lamp using plane transmission grating.	2
8	Polarization	To find the specific rotation of sugar solution by using a half shade/ biquartz polarimeter.	2
Total Lab hours			

Suggested Text Books:

1. S. P. Singh, Advanced Practical Physics, Pragati Prakashan, Vol. 1, 2016.
2. C. L. Arora, Practical Physics, S. Chand Company Limited, 21st edition, 2015.
3. N. Subrahmanayam, Brij Lal and M.N. Avadhanulu, A Text Book of Optics, S. Chand (2015)
4. Ajoy Ghatak, Optics, Tata McGraw Hill, 7th addition, (2020)
5. F.A. Jenkins and H.E. White, Fundamentals of Optics, McGraw-Hill (2001).

Evaluation Scheme:

1	Mid Sem. Evaluation (P1)	20 Marks
2	End Sem. Evaluation (P2)	20 Marks
3	Day to Day Lab Assessment (P3)	60 Marks
	Total	100 marks

Chemistry for Forensic Science -1

COURSE CODE:-XXXXXXX

COURSE CREDITS: 4

CORE/ELECTIVE: Core

L-T-P: 3-1-0

Pre-requisite: XIITH Standard Chemistry

Course Objectives:

1. To develop the chemistry foundation required for understanding the various processes involved in forensic science
2. To provide an insight into chemical phenomenon.

Course Outcomes:

S.No.	Course Outcomes	Level of Attainment
CO-1	Able to understand the fundamental chemistry of various functional group	Familiarity
CO-2	Able to understand the principles of stereochemistry	Familiarity
CO-3	Able to understand organic reaction mechanisms that impact on biochemical processes.	Assessment
CO-4	Able to recall the characteristics of important bio-molecules and be able to discuss the relationships between structure properties and functions	Usage
CO-5	Able to design experiments and interpret numerical, chemical and general scientific information	Usage

Course Contents:

Module no.	Unit	Contents	Lect ures requ ired
1	Fundamentals Of Chemistry	Mole calculations, Stoichiometry, Volumetric Calculations, Acid-base chemistry & resonance, pH, buffer solution	5

2	Structure and Bonding	<p>Atomic Wave mechanics: de Broglie equation, Heisenberg's Uncertainty Principle and its significance, Schrodinger wave equation; H atom; Radial and angular wave functions. Quantum numbers and their significance, Pauli's Exclusion Principle, Hund's rule of maximum multiplicity, Aufbau's principle and its limitations, Variation of orbital energy with atomic number, Molecular orbital theory and shapes of s, p, d and f Orbitals.</p> <p>Chemical Bonding: Chemical bonding, molecular shape and structures VB and MO approach of H₂ molecule; MO treatment of homonuclear and heteronuclear (CO & NO) diatomic molecules; Concept of HOMO and LUMO. VSEPR theory; Structure of simple molecules and ions of main group elements</p> <p>Ionic Solids: Close packing, Radius ratio rule and crystal coordination number. Examples of MX and MX₂ type ionic solids (NaCl and TiO₂)</p> <p>Metallic Bonding: theories of bonding in metals; Free electron, VB and Band theories.</p> <p>Weak Interactions: Hydrogen bonding and van der Waal's interactions</p> <p>Periodic trends and properties: Size, Ionization Energy, Electron Affinity, Electronegativity, Lattice and Hydration Energies, Use of redox potential and reaction feasibility.</p>	14
3	Stereochemistry	<p>Stereochemistry of organic compounds, optical activity; stereoisomerism; specifications of configurations. Bayers strain theory, Cyclo hexane and its confirmation, chemical resolution, importance of stereochemistry in biological system. Optical Isomerism: Optical Activity, Specific Rotation, Chirality/Asymmetry, Enantiomers, Racemic mixture and resolution. Aromaticity and Huckel</p>	8
4	States of Matter	<p>Gaseous State: Kinetic theory of gases, ideal gas laws based on kinetic theory. Collision in a gas- mean free path, collision diameter, collision number. Behaviour of real gases - the Vander Waal's equation.</p> <p>Liquid State: Surface tension of liquids - capillary action, experimental determination of surface tension, temperature effect on surface tension. Viscosity of liquids, experimental determination of viscosity coefficient, its variation with temperature.</p> <p>SOLID STATE Fundamentals of Solid State, Structure and Defects in Solids, Electrical and Magnetic Properties of Solids</p>	9

5	Electrochemistry	Conductivity of electrolytes, Specific conductivity, measurement of conductance, Electrochemistry: electrochemical cells, reference electrodes, Electrochemical series, REVISION and Problem solving	5
Total lectures			42

Suggested Text Book(s):

- Jonathan Clayden, Nick Greeves, Stuart Warren, "Organic Chemistry" 2nd ed., Oxford University Press,
- Raymond Chang, "Chemistry" Edition: latest
- J. D. LEE, "Concise Inorganic Chemistry" 6th ed., Wiley-Blackwell,
- T. W. Graham solomons, Craig B. Fryhle and Scott A. Synder Organic chemistry, 11th ed., Wiley india pvt. Ltd.

Suggested Reference Book(s):

- Peter Atkins, Loretta Jones, Leroy Laverman, "Chemical Principles: The Quest for Insight" Edition: 7th
- Shriver & Atkins, " Inorganic Chemistry" Edition: 6th or later
- E.L. Eliel, "Stereochemistry of carbon compounds" 1st ed., Mcgraw-Hill Education, 2001

Evaluation Scheme:

Assessment	Max. marks	Duration	Course Covered
T1 Test	15	1 hr.	Syllabus covered upto T-1
T2 Test	25	1.5 hrs.	Syllabus covered upto T-2
End Term Test	35	2 hrs.	Entire Syllabus
Teacher Assessment	25	Entire Sem	Based on Assignments, quizzes etc.

Chemistry for Forensic Science -1 Lab

COURSE CODE:XXXXXXXX

COURSE CREDITS: 1

CORE/ELECTIVE: CORE

L-T-P: 0-0-2

Pre-requisite: XIIth Standard Chemistry

Course Objectives:

1. To learn lab safety techniques, importance of personnel protective equipment and Enable students to link the theoretical knowledge of chemistry with the experiments.
2. To learn identification of unknown organic compounds and their purification at small scale using chromatography and crystallization techniques.
3. To learn practical chemical laboratory skills essential for forensic sciences.

Course Outcomes:

S.No.	Course Outcomes	Level of Attainment
CO1	Able to understand proper procedures and regulations for safe handling and use of chemicals	Familiarity
CO2	Able to apply knowledge of functional groups in identification of unknown compounds	Assessment
CO3	Able to do small scale organic compound synthesis	Usage
CO4	Able to do purification using chromatography and crystallization techniques.	Assessment
CO5	Able to do titrations for various analytical purposes	Usage

List of Experiments

S.No.	Description	Hours
1	Familiarization with Lab safety protocols, laboratory equipment, and basic techniques like pipetting, measuring pH, and making dilutions (chemical calculations) To determine melting point of given organic compound To prepare 250 ml of N/10 NaOH and H ₂ SO ₄ respectively.	2
2	Separation of mixtures by Chromatography: Measure the R _f value in each case (combination of two compounds to be given) a) Identify and separate the components of a given mixture of compound by thin Layer Chromatography chromatography	2
3	Purification of organic compounds by recrystallization using appropriate solvent.	2

4	To chemical identify following organic functional groups in given organic compounds a. Test for aldehydes, ketones, carboxylic acids and phenol b. Test for carbohydrates and amino acids c. Test for esters, nitro and amines (Primary amines, Secondary amines and tertiary amines)	4
5	To identify functional group present in given unknown organic compounds	4
6	Isolation of caffeine from tea leaves.	2
7	A. To prepare standard solution of 1 M HCl B. To prepare standard solution of 1 M NaOH Estimation of acid/base present in given unknown solutions.	4
8	To Synthesize and characterize aspirin/Acetylation Reaction	2
9	To prepare Oxime of 2,4 dinitrophenylhydrazone of aldehyde/ketone	2
10	To analyze iron tablets to find out whether they contain the correct amount of iron. To separate Organic compounds with the help of Column Chromatographic technique.	4
Total Lab hours		28

Suggested/Resources:

1. A.I Vogel, "Elementary practical organic chemistry" 2nd ed., Prentice Hall 2006
2. D.L. Pavia G. Lampman and G.D. kriz, "Introduction to organic laboratory techniques" 2nd ed., Brooks Cole 2004

Evaluation Scheme:

1	Mid Sem. Evaluation	20 Marks
2	End Sem. Evaluation	20 Marks
3	Lab Assessment	60 Marks
	Total	100 marks

Computing Fundamentals and Office Tools

COURSE CODE:XXXXXXXX

COURSE CREDITS: 3

CORE/ELECTIVE: CORE

L-T-P: 3-0-0

Pre-requisite: Basic knowledge of computers and familiarity with using a keyboard, mouse, and basic computer operations.

Course Objectives:

1. To understand fundamental concepts of computers, hardware, software, and operating systems.
2. To introduce basic computer networking, internet technologies, and cyber security awareness.
3. To develop practical skills in using office productivity tools for documents, spreadsheets, presentations, and digital communication.

Course Outcomes:

S No.	COURSE OUTCOMES	Level of Attainment
CO 1	Understand fundamental concepts of basic computer operations.	Usage Level
CO 2	Demonstrate knowledge of computer hardware, software, storage devices, and operating systems.	Familiarity Level
CO 3	Basic concepts of computer networking and internet technologies.	Familiarity Level
CO 4	Recognize cyber security issues and different types of computer and network-related crimes.	Familiarity Level
CO 5	Use office productivity tools for preparing documents, spreadsheets, presentations, and digital communication.	Application Level

Course Content:

No	Title	Topics in the Module	Hour
1	Computer Fundamentals and Storage Systems	Definition of computer; history and evolution of computers; hardware and software components; input and output devices; CPU; types of software; primary storage (RAM, ROM, cache); secondary storage devices (HDD, SSD, optical disks, pen drives); data representation (bits, bytes, number systems).	8

2	Operating Systems and File Management	Basics of operating systems; functions and types of operating systems; file systems; files and directories; file operations; overview of Windows and Linux architectures; basic Linux commands; computer security basics; malware (virus, worm, Trojan); computer-related crimes.	8
3	Computer Networking and Internet	Definition and components of computer networks; types of networks (LAN, MAN, WAN); network topologies; OSI model; TCP/IP protocol suite; IP and MAC addresses; networking devices (router, switch, hub, modem); Internet concepts; websites and webpages; DNS basics; firewall; IDS and IPS; network and internet-related crimes.	8
4	Word Processing and Presentation Tools	Word processing tools (document creation, editing, formatting, fonts, paragraphs, styles); tables; headers and footers; page layout; mail merge; presentation tools (slide creation, layouts, themes and templates); insertion of images, graphics, and multimedia; animations and transitions; slide show and presentation settings.	9
5	Spreadsheet and Online Collaboration Tools	Spreadsheet tools (worksheets, data entry, cell referencing, formulas and functions such as SUM, AVERAGE, IF); sorting and filtering; charts and graphs; data formatting; basic data analysis; email basics (compose, send, attachments, inbox management); online collaboration tools (shared documents, Google Docs/Sheets); cloud storage and file sharing.	9
		Total number of Lectures	4 2

Suggested Text Book(s):

1. **Computer Fundamentals: Concepts, Systems & Applications** – Pradeep K. Sinha and Priti Sinha, BPB Publications.
2. **Fundamentals of Computers** – Reema Thareja, Oxford University Press.
3. **Computer Networks - A Top - Down Approach** by FOROUZAN
4. **TCP/IP Protocol Suite - E/4** by Behrouz A. Forouzan
5. **Computer Fundamentals and Office Tools** – C. Divya, E. Murali Mohan Reddy, K. V. V. Murali Someswara Rao, Neelima Ramireddi, Himalaya Publishing House.

Evaluation Scheme:

S. No	Exam	Marks	Duration	Coverage / Scope of Examination
1	T-1	15	1 Hour.	Syllabus covered upto T-1
2	T-2	25	1.5 Hours	Syllabus covered upto T-2
3.	T-3	35	2 Hours	Entire Syllabus
4.	Teaching Assessment	25	Entire Semester	Assignment, Quizzes & Attendance

Computing Fundamentals and Office Tools Lab

COURSE CODE: XXXXXXXX

COURSE CREDITS: 1

CORE/ELECTIVE: CORE

L-T-P: 0-0-2

Course Objectives:

1. To develop practical skills in using office productivity tools for creating professional documents, spreadsheets, and presentations.
2. To enable students to perform data analysis, reporting, and visualization using advanced spreadsheet functions and features.
3. To familiarize students with modern digital collaboration tools, email communication, and cloud-based file management systems.

Course Outcomes:

S No.	COURSE OUTCOMES	Level of Attainment
CO 1	Create well-structured and professionally formatted documents using advanced word processing features.	Usage Level
CO 2	Design effective and interactive presentations incorporating multimedia and animation techniques.	Usage Level
CO 3	Apply spreadsheet tools for data analysis using formulas, functions, pivot tables, and charts.	Application Level
CO 4	Manage and share data efficiently using email, cloud storage, and online collaboration platforms.	Usage Level
CO 5	Develop integrated solutions (reports, dashboards, presentations) for real-world problem-solving.	Application Level

Course Content:

S.No.	Description	Hours
1	To create a new document, save it, edit and formatting the document in MS-Word.	2
2	To enhance the document using header, footer, page up, border, page number, water mark, orientation and print preview n MS-Word.	2
3	To create a document and insert a table and picture in MS-Word.	2
4	To create mail merge, send an invitation notice for opening a new branch inauguration function and informing about new scheme in MS-Word.	2
5	To create a worksheet, moving, copying, inserting, deleting rows and columns and formatting worksheet Bold, Italic, font size changing, Auto fill, date, format, currency format in MS-Excel.	2
6	To enter the details of 10 students name, marks, total average using formula and to enter the column, chart using MS-Excel	2

7	Perform advanced data analysis in spreadsheets using pivot tables, sorting, filtering, and lookup functions.	2
8	Create and customize various charts and graphs (bar, pie, line, combo) to visualize data effectively.	2
9	To create a Presentation with apply background themes, custom animation on text, insert image, word Art with effects in MS-PowerPoint	2
10	Develop a presentation using slide master, themes, animations, transitions, and embedded multimedia content.	2

Suggested Text Book(s):

1. Computer Fundamentals and Office Automation – Detailed book covering hardware, software, and office tools for multiple courses.
2. Word Processing Fundamentals – Useful for understanding document processing and office workflows.
3. Computer Fundamentals and Office Automation – Includes computer basics along with MS Word, Excel, PowerPoint, and database concepts.

Evaluation Scheme:

S. No	Exam	Marks
1	P-1	20
2	P-2	20
3.	P-3	60
	Total	100

Fundamentals of Mathematics

COURSE CODE: 25B11MA111

COURSE CREDITS: 3

CORE/ELECTIVE: MDE

L-T-P: 2-1-0

Prerequisite: Basic computer literacy, familiarity with web browsing, foundational logic and problem-solving skills, and an interest in web development.

Course Objectives

1. To introduce the basic principles of set theory and foundational mathematical logic.
2. To develop an understanding of relations, functions, and their properties, including the basics of calculus for single-variable functions.
3. To provide knowledge of matrices, determinants, and eigen concepts essential for linear algebra applications.
4. To equip students with the skills to apply differential and integral calculus to solve real-world mathematical problems.
5. To enable the application of matrix theory for solving systems of linear equations.

Course Outcomes

S. No.	Course Outcomes	Level of Attainment
CO-1	Recall the basics of set theory.	Remembering Level (C1)
CO-2	Explain the concepts of relations and functions, calculus of functions of one variable, matrices and determinants, eigenvalues and eigenvectors.	Understanding Level (C2)
CO-3	Solve problems related to differential and integral calculus.	Applying Level (C3)
CO-4	Apply the theory of matrices and determinants to solve a system of linear equations.	Applying Level (C3)

Course Contents

Module no.	Contents	Lectures required
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1.	Sets, Relations and Functions: Sets and their representation. Union, intersection and complement. Mapping or function. One-one, onto mappings, Inverse and composite mappings. Relation and their representation, types of relations, equivalence relation.	10
2.	Differential Calculus: Basic concept of limit and continuity. Derivative. Rules of differentiation. Tangent to a curve. Taylor's series. Maxima and minima.	10
3.	Basics of Integral Calculus: Fundamental theorem of calculus (statement only). Integrals of elementary functions. Definite integral as a limit of sum. Properties of definite integrals.	10
4.	Matrices: Algebra of matrices. Determinant of a square matrix. Row echelon form. Linear dependence and independence. Rank of a matrix, solution of system of equations, Gauss elimination method. Eigenvalues and eigenvectors.	12
Total Lectures		42

Suggested Textbook(s)

1. E. Kreyszig, Advanced Engineering Mathematics, 10th Ed., John Wiley, 2015.
2. Mathematics Textbooks for Class XI, XII, NCERT, 2019.

Suggested Reference Book(s)

1. J. Hass, C. Heil, M.D. Weir, Thomas Calculus, 14th Ed., Pearson Education, 2018.
2. R.K. Jain, S.R.K. Iyenger, Advanced Engineering Mathematics, 5th edition, Alpha Science International, 2016.
3. International, 2016.
4. H. Anton and C. Rorres, Elementary Linear Algebra, 11th Ed., Wiley, 2016.

Online Resources

1. <https://www.youtube.com/watch?v=4QFsiXfgbzM&list=PLbRMhDVUMngeVrxtbBz-n8HvP8KAWBpl5>
2. <https://www.youtube.com/watch?v=zhKu0IQW0a8&list=PLFW6IRTa1g83LYdhDkUQfkXs7EbMBwYuF>

Evaluation Scheme

S. No	Exam	Marks	Duration	Coverage / Scope of Examination
1.	T-1	15	1 Hour	Syllabus covered up to T-1
2.	T-2	25	1.5 Hours	Syllabus covered up to T-2
3.	T-3	35	2 Hours	Entire Syllabus

4.	Teaching Assessment	25	Entire Semester	Assignment (2) - 10 Quizzes (2) -10 Attendance – 5
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Fundamental Biology

Course Code: 18B1WBT111
Course Credits: 3
Core / Elective: Elective
L-T-P: 2-1-0

Pre-requisite: Xth Class Biology

Course Objectives:

- This is basic foundation biology course for the students having mathematics background.
- The objectives are to familiarize students with basics of biology.
- Learn about various living organism.
- Learn about different biological at molecular or cellular level.

Course Outcomes

S. No.	Course Outcomes	Level of Attainment
CO I	Overview of living system, different life forms and Maintenance of Life.	Familiarity
CO II	Fundamental understanding of Bio-molecules: Building blocks of living system	Assessment
CO III	Understanding of structure and function of cell: Prokaryotic and Eukaryotic cells system.	Assessment
CO IV	Understanding the Basic of cellular transport system and cellular inheritance.	Assessment
CO V	Flow of information in biological system- Central Dogma, DNA replication, Transcription, and Translation	Usage

Course Contents:

Module No.	Unit	Topics Covered	Contact Hrs.
1	General Biology:	The nature of life, Characteristics of living organisms, Concept and use of a classification system, brief of five Kingdoms and three domain classification system. Concepts of species and hierarchical taxa, biological nomenclature, classical and quantitative methods of taxonomy of plants, animals and microorganisms.	5

2	Introduction to bio-molecule: Structure and function relationship.	Structure, chemical reactions and biological functions of carbohydrate, lipid, protein and nucleotides. Stabilizing interactions (Van der Waals, electrostatic, hydrogen bonding, hydrophobic interaction, etc	8
3	Cell: Basic structure and functions	Unicellular, colonial and multicellular forms; levels of organization of tissues systems; comparative anatomy Structural and biochemical organization of cell. Prokaryotic and Eukaryotic cells. Cell organelles, their molecular composition, structure and functions.	6
4	Basic of cellular transport system	Diffusion , Osmosis, Active transport	4
5	Cellular inheritance	Cell division, cell cycle, Mitosis, Meiosis and Inheritance	6
6	Flow of genetic information	The DNA, Search for Genetic Material, RNA World, Genetic Code, Central Dogma, replication, transcription and translation, (initiation, elongation and termination).	8
7	Maintenance of Life: Adjustment and control.	Homeostasis, thermoregulation, and osmoregulation, Speciation and selection.	5
Total Number of Lectures			42

Methodology

The course will be covered through lectures. Apart from discussions on topics covered in lectures, assignments will also be given.

TEXT BOOKS

1	Stryer, Lubert (2002). Biochemistry; Fifth edition. W. H. Freeman and Company.
2	Principles of Biochemistry [5th edition], Lehninger.
3	NCERT –XII class Biology

REFERENCE BOOKS

1	Neill, Campbell (1996). Biology; Fourth edition. The Benjamin/Cummings Publishing Company. p. 309,310. ISBN 0-8053-1940-9.
2	A. W. Haupt, Fundamental of Biology, 3rd ed. McGRAW-HILL

Other useful resource(s):

- <https://nptel.ac.in/courses/122103039/>
- <https://nptel.ac.in/syllabus/122103039/>

Evaluation Scheme:

S. No.	Exam	Marks	Duration	Coverage/Scope of Examination
1	T-1	15	1 Hour	Syllabus covered upto T-1
2	T-2	25	1.5 Hours	Syllabus covered upto T-2
3	T-3	35	2 Hours	Entire Syllabus
4	Teaching Assessment	25	Entire Semester	Quiz1 -10 Quiz2 -10 Attendance -5

English

COURSE CODE:-25B11HS111

COURSE CREDITS: 2

CORE/ELECTIVE: Core

L-T-P: 1-0-2

Pre-requisite: None

Course Objectives:

1. The students will develop command over their language and synchronize their thoughts into written and verbal form
2. The student will learn to deliver effective presentations in contexts that may require PowerPoint, extemporaneous or impromptu oral presentations.
3. The student will learn to write effective emails, letters and reports
4. The student will learn to develop rhetorical skills via an understanding of literature.
5. The students will be able to understand and analyze the most effective and efficient ways to communicate in different communication scenarios.

Course Outcomes:

After successful completion of the course, students will be able to:

S.No.	Course Outcomes	Level of Attainment
CO-1	Show proficiency in basic concepts of grammar and phonetics usage.	Assessment and Usage
CO-2	Demonstrate an understanding of the basic aspects of English as a communication tool.	Understanding
CO-3	Apply grammar concepts, vocabulary skills and phonetics for effective communication and also develop effective professional writing skills.	Assessment and Usage
CO-4	Analyze rhetorical devices and literature for enhancing communication skills.	Assessment
CO-5	Communicate in diverse workplace scenarios	Usage

Course Contents:

Module no	Name of module	Contents	Lectures required
1	English as a Communication Tool	<ul style="list-style-type: none"> • Basic aspects of English: LSRW: Listening, Speaking, Reading, Writing • Non-Verbal Communication: Body Language, Voice Modulation, Posture • Presentation Skills Phonetics: Transcription, Pronunciation 	6
2	Grammar & Vocabulary	<ul style="list-style-type: none"> • Tense, Aspect, Mood and Voice , Vocabulary Enrichment strategies 	1
3	Language through Literature	<ul style="list-style-type: none"> • Forms of Literature & Rhetorical Devices • One act Play • Refund by Fritz Karinthy • Famous Speeches , Swami Vivekanand's Chicago Speech 	3
4	Professional Application/Writing	<ul style="list-style-type: none"> • Textual Organization Notice • Agenda and Minutes, • Format of Report Writing 	4
		Total lectures	14

Syllabus for Practical:

S.No	Description	Hours
1	Practical for Learning Comprehension Strategies of Reading: Summarizing Inferencing Newspaper reading and comprehension Relating background knowledge Distinguishing between fact and opinion Finding the main idea, important facts, and supporting details	5
2	Practice Quick reading through Speed-Reading software.	2

3	Practical for Mastering the Skill of Listening: Listening for the Main Idea; Listening in sequence: for order following Through Ted Talks Listening for understanding personal & social connotations through News Brief, such as BBC, and Interviews. Listening for non-verbal connotations through Audio-Videos and Movie Clips Listening for Functional Language: understanding choice of words for same situation	5
4	Practice Listening through software of IIT Guwahati Listening Exercises or Podcasts	2
5	Activities for Vocabulary Enrichment and learning Public Speaking: Practice through JAM Session- Situational Dialogues – Greetings – Taking; Leave – Introducing Oneself and Others. Making Requests and Seeking Permissions. Exposure to Structured Talks - Non-verbal Communication: Practice. Practice of Phonetics, Stress and Intonation while Making a Short Speech, Extempore and Making a Presentation	5
6	Practice speaking through specialised software	2
7	Grammar Practice & Exercises: Jumbled Paragraphs for grammar learning Picking the Out of Context sentence in a Jumbled Paragraph for proper communication. Application of right grammar concepts	2
8	Cohesion in Writing Practical on Different forms of writing, like persuasive writing, expository, narrative, descriptive	2
9	Practice of Professional Writing Notice, Agenda. Minutes Memorandum and Letter Format Report Writing	3
Total Lab hours		28

Suggested Text Book(s):

1. C.L. Bovee, J.V. Thill, M. Chaturvedi, *Business Communication Today*, 9thEd, Pearson Education, Pvt. Ltd, 2021.
A. Tiwari, *Communication Skills in English*. Khanna Publishers, 2022.
2. S. Kumar and P. Lata, *Communication Skills*, 1sted.Oxford University Press, 2011.
3. F.Karinthy, "TheRefund,"Online.Available:<https://egyankosh.ac.in/bitstream/123456789/27478/1/Unit-4.pdf>.
4. Swami Vivekananda and S. Srinivasan, "Sisters & Brothers of America: Speech at

World Parliament of Religions, Chicago,
1893,"CreativeSpaceIndependentPublishingPlatform, 2015.

Suggested Reference Book(s):

1. R.K. Bansal and J.B. Harrison, *Spoken English for India*, Orient Longman, 2018.
2. M. A. Yadugiri, *The Pronunciation of English: Principles and Practice*, India: Viva Books Pvt. Ltd, 2015.
3. A.R. Rizvi, *Effective Technical Communication*, 2nd ed. Chennai, India: McGraw Hill Education Private Limited, 2018.
4. R. Murphy, *English Grammar in Use*, 5th ed. Cambridge, UK: Cambridge University Press, 2019.
5. K. Mohan and N.P. Singh, *Speaking English Effectively*, 2nd ed. Delhi: Macmillan Publishers India Ltd., 2011.
6. E. Suresh Kumar and P.A. Sreehari, *A Handbook for English Language Laboratories*, New Delhi: Foundation, 2009.
7. K. M. Quintanilla and S.T. Wahl, *Business and Professional Communication*, Sage Publications Pvt India Ltd, 2011.

Evaluation Scheme

S. No	Exam	Marks	Duration	Coverage / Scope of Examination
1	T-1	15	1 Hour.	Syllabus covered up to T-1
2	T-2	25	1.5 Hours	Syllabus covered up to T-2
3.	T-3	35	2 Hours	Entire Syllabus
4.	Practical Assessment	25	Entire Semester	Listening- 5 Reading – 5 Speaking -5 Writing – 5 Attendance- 5

Introduction to Crime Scene Management

COURSE CODE: XXXXXXXX

COURSE CREDITS: 3

CORE/ELECTIVE: Core

L-T-P: 3-0-0

Pre-requisite: Introduction to forensic Science

Course Objectives

This course develops students' practical competence in the full cycle of crime scene investigation, from securing and documenting a scene through systematic evidence search, detection, collection, and chain of custody management. It covers evidence handling protocols across all major evidence types, specialised procedures for India-specific scene categories, bloodstain pattern analysis and event reconstruction, and culminates in preparing legally defensible reports and delivering effective expert testimony in court.

Course Outcomes:

After successful completion of the course, students will be able to:

S.No.	Course Outcomes	Level of Attainment
CO-1	Secure, document, and search crime scenes systematically, producing complete and legally defensible records through photography, sketching, and contemporaneous notes.	Apply
CO-2	Detect, collect, package, and label all major evidence categories like biological, trace, fingerprint, digital, firearm, and documentary, maintaining an unbroken chain of custody from scene to laboratory	Apply
CO-3	Apply specialised scene protocols for India-specific contexts including fire, dowry death, mass casualty, road accident, poisoning, and sexual assault/POCSO scenes.	Apply
CO-4	Reconstruct the sequence of events using bloodstain pattern analysis, trajectory analysis, and staging detection principles.	Analyze
CO-5	Prepare a professionally written scene examination report and deliver competent expert testimony, including examination-in-chief, cross-examination, and re-examination, in a moot court setting.	Evaluate

Course Contents:

Module No.	Name of Module	Contents	Lectures required
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1	Foundations of Scene Science; Principles and Mindset	Nature of Physical Evidence and Evidence Fragility, Locard Exchange Principle – operational interpretation, Information transfer and persistence at crime scenes, Common crime scene management failures (Indian case perspectives), Legal implications: inadmissibility, contamination, chain of custody issues, Scientific mindset and ethics of scene examination	6
2	Securing, Cordoning and Processing the Scene	Scene security principles and objectives, Establishment of inner and outer cordons, Access control systems and entry/exit logs, Personal Protective Equipment (PPE) and contamination prevention, Scene processing workflow (perimeter → focal point), Challenges in Indian contexts: crowd control, media, resource constraints	6
3	Documentation – Creating a permanent Record	Importance and legal value of scene documentation, Forensic photography – principles and three-tier approach, Crime scene sketching: rough and final sketches, Measurement techniques: baseline and triangulation, Contemporaneous note-taking methods, Digital documentation: 3D photogrammetry, 360° imaging, Integration of multiple documentation methods	7
4	Physical Evidence Handling	Recognition and prioritisation of physical evidence, Collection and packaging of biological evidence, Trace evidence handling (hair, fibres, glass, soil), Latent fingerprints – detection and lifting, Handling of digital, firearm, and questioned document evidence, Evidence packaging materials and labelling standards, Chain of custody: documentation and legal continuity	7
5	Special Scene Types	Environmental challenges in Indian forensic settings, Fire and arson scenes, Dowry death and domestic violence scenes, Mass disaster and road traffic accident scenes, Poisoning and toxicological scenes (e.g., pesticide cases), Sexual assault and POCSO scene protocols	6
6	Scene Reconstruction and Interpretation	Principles of crime scene reconstruction. Bloodstain pattern analysis (classification and interpretation). Trajectory and impact analysis, Entry/exit wound and scene correlation, Staging detection and behavioural indicators, Limits of reconstruction and ethical considerations	6

7	Legal Presentation of Crime Scene Report	Structure of crime scene examination reports,;BharatiyaNagarik Suraksha Sanhita (BNSS) Section 293 compliance in reporting, Presentation of forensic evidence in court, Expert testimony: examination-in-chief, cross-examination, re-examination (moot court simulation)	4
		Total lectures	42

Suggested Text Book(s):

Gardner, R. M., & Bevel, T. (2009). *Practical Crime Scene Analysis and Reconstruction*. CRC Press. — The definitive text on crime scene reconstruction; comprehensive, well-structured, and scientifically rigorous.

Fisher, B. A. J., & Fisher, D. R. (2012). *Techniques of Crime Scene Investigation* (8th ed.). CRC Press. — The classic crime scene investigation manual; covers all scene types with practical depth.

Lee, H. C., Palmbach, T., & Miller, M. T. (2001). *Henry Lee's Crime Scene Handbook*. Academic Press. — Highly practical, well-illustrated; excellent for scene management protocols.

James, S. H., Kish, P. E., & Sutton, T. P. (2005). *Principles of Bloodstain Pattern Analysis: Theory and Practice*. CRC Press. — The standard text for bloodstain pattern analysis.

Chisum, W. J., & Turvey, B. E. (2011). *Crime Reconstruction* (2nd ed.). Academic Press. — Standard reference on crime scene reconstruction methodology.

Casey, E. (2019). *Digital Evidence and Computer Crime: Forensic Science, Computers and the Internet* (3rd ed.). Academic Press. — Definitive reference for digital forensics; covers evidence, law, and investigation.

Suggested Reference Book(s):

1. Mozayani, A., & Noziglia, C. (Eds.) (2006). *The Forensic Laboratory Handbook: Procedures and Practice*. Humana Press. — Covers lab interface with scene evidence; useful for understanding what happens to scene samples.
2. Horswell, J. (Ed.) (2004). *The Practice of Crime Scene Investigation*. CRC Press. — Multi-contributor; strong on documentation, search strategies, and evidence collection.
3. Pepper, I. K. (2010). *Crime Scene Investigation: Methods and Procedures* (2nd ed.). Open University Press. — Accessible, procedure-focused; good supplementary reading for practical modules.
4. Kirk, P. L. (1974). *Crime Investigation* (2nd ed., ed. Thornton, J. I.). Wiley. — The foundational text in crime scene science; historical but conceptually essential.

5. Chisum, W. J., & Turvey, B. E. (2011). *Crime Reconstruction* (2nd ed.). Academic Press. — Standard reference on reconstruction methodology; covers BPA, trajectory, staging analysis.

Evaluation Scheme:

Assessment	Max. marks	Duration	Course Covered
T1 Test	15	1 hr.	Syllabus covered upto T-1
T2 Test	25	1.5 hrs.	Syllabus covered upto T-2
End Term Test	35	2 hrs.	Entire Syllabus
Teacher Assessment	25	Entire Sem	Based on Assignments, quizzes etc.

Physics for Forensic Science Lab-II

COURSE CODE: XXXXXXXX

COURSE CREDITS: 01

CORE/ELECTIVE: CORE

L-T-P: 0-0-2

Pre-requisite: Students should have a basic understanding of elementary physics concepts at the 10+2 level, including fundamental ideas of mechanics, energy, fluids, oscillations, and waves, along with basic mathematical skills and familiarity with laboratory measurements and error analysis.

Course Objectives:

1. To understand fundamental principles of electricity, magnetism, and electromagnetic phenomena through experimental verification of important physical laws.
2. To develop practical skills in handling scientific instruments and experimental setups for measuring electrical, magnetic, and electromagnetic properties of materials.
3. To analyse and interpret experimental data in order to determine physical parameters such as Hall coefficient, charge-to-mass ratio, magnetic susceptibility, and electromagnetic wave characteristics.
4. To enhance scientific reasoning and experimental problem-solving abilities by verifying theoretical concepts through laboratory experiments related to electromagnetism and modern physics.

Course Outcomes:

SNo	COURSE OUTCOMES	Level of Attainment
CO1	Demonstrate familiarity with basic laboratory instruments and perform EM-related experiments.	Familiarity with laboratory instruments and experimental procedures
CO2	Apply experimental methods to verify fundamental physical principles such as Coulomb's law, Biot-Savart's law, Faraday's law, etc.	Understanding and application of experimental methods to verify physical principles
CO3	Analyse experimental observations of phenomena related to electricity and magnetism to gain deeper insights into the course concepts	Analysis of experimental observations to strengthen concepts

CO4	Interpreting data of experiments relating to phenomena resulting from electricity and magnetism, calculate the associated physical parameters	Data interpretation and calculation of relevant physical parameters of different EM phenomena
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Course Content:

Module No.	Title of the Module	List of Experiments	Hours
1	Hall Effect	Determination of Hall coefficient, mobility and carrier density of charges using Hall effect set up	2
2	e/m ratio of electrons	To determine charge to mass ratio using Thomson method	2
3	Magnetostriction	To study change in length of a ferromagnetic substance due to its magnetization	2
4	Magnetic Susceptibility of ferromagnetic liquid	To determine Magnetic Susceptibility of ferromagnetic liquid	2
5	Biot Savart's law	To verify the Biot Savart's law for magnetic field.	2
6	Faraday's law of induction	To verify Faraday's law of induction	2
7	Coloumb's law	To verify the coulomb's law of electrostatic force between charges	2
8	EM wave detection	To detect EM wave of certain frequency	2
Total Lab hours			16

Suggested Text Books:

1. S. P. Singh, Advanced Practical Physics, Pragati Prakashan, Vol. 1, 2016.
2. K. K. Tewari, Electricity And Magnetism, 3rd Edn, S Chand.
3. Electricity, Magnetism & Electromagnetic Theory, S. Mahajan and Choudhury, 2012, Tata McGraw
4. C. L. Arora, Practical Physics, S. Chand Company Limited, 21st edition, 2015.

Evaluation Scheme:

1	Mid Sem. Evaluation (P1)	20 Marks
2	End Sem. Evaluation (P2)	20 Marks
3	Day to Day Lab Assessment (P3)	60 Marks
	Total	100 marks

Physics for Forensic Science -II

COURSE CODE:XXXXXXXX

COURSE CREDITS: 04

CORE/ELECTIVE: CORE

L-T-P: 3-1-0

Pre-requisite: Basic understanding of mathematics and fundamental concepts of electricity and magnetism at the senior secondary (10+2) level.

Course Objectives:

1. To develop a strong mathematical foundation using vector calculus, including vector operations, gradient, divergence, and curl, and understand their physical significance in electromagnetic theory.
2. To understand the principles of electrostatics, including electric fields, electric flux, Gauss's law, electrostatic potential, and the governing equations such as Laplace's and Poisson's equations.
3. To study the fundamentals of magnetostatics and electromagnetic induction, including Biot–Savart law, Ampere's circuital law, Faraday's law, Lenz's law, and the concepts of self and mutual inductance.
4. To introduce Maxwell's equations and their significance in electromagnetism, and to understand their applications in areas such as spectroscopy, fingerprint and trace evidence analysis, and material characterization.

Course Outcomes:

No	COURSE OUTCOMES	Level of Attainment
CO1	Demonstrate familiarity with basic elements of electricity and magnetism, such as vector algebra, fields and potentials.	Familiarity with the basics of EM
CO2	Understand fundamental physical laws in EM, such as Gauss's law, Ampere's law, and conservation of energy.	Understanding of fundamental physical principles
CO3	Imbibe and verify the fundamental laws by solving different practical examples in EM.	Verifying and gaining insights into fundamentals with solutions to problems
CO4	Analyse and examine the solutions to problems to bring clarity to physical and Mathematical concepts involved in the course.	Interpreting solutions and applying concepts to issues at hand on one's own

Course Content:

Module No.	Subtitle of the Module	Topics	No. of Lectures
1.	Vector Algebra	Vector addition, Dot product, Cross product, Gradient, Divergence, & Curl and Physical significance, Brief idea of coordinate systems.	8
2.	Electric field and potential	Electric field lines. Electric flux. Gauss' Law with applications to charge distributions with spherical, cylindrical and planar symmetry. Conservative nature of the electrostatic field. Electrostatic Potential. Laplace's and Poisson equations. Electrostatic energy of a charged sphere.	12
3.	Magnetic Field	Biot-Savart Law and its simple applications: straight wire and circular loop. Ampere's Circuital Law and its application to a solenoid and a wire, Force on current carrying wire in an external magnetic field	12
4.	Electromagnetic Induction	Faraday's Law. Lenz's Law. Self-Inductance and Mutual Inductance. Energy stored in a Magnetic Field. Introduction to Maxwell's Equations. Charge Conservation and Displacement Current. Some Applications: Spectroscopy Techniques, Fingerprint and Trace Evidence Analysis, Material Characterisation	10
Total number of Lectures			42

Suggested Text Books:

1. Electricity and Magnetism, Edward M. Purcell, 1986 McGraw-Hill Education.
2. Electricity, Magnetism & Electromagnetic Theory, S. Mahajan and Choudhury, 2012, Tata McGraw.
3. Introduction to Electrodynamics, D.J. Griffiths, 3rd Edition, 1998, Benjamin Cummings

Evaluation Scheme:

1	Mid Sem. Evaluation (T1)	15 Marks
2	Mid Sem. Evaluation (T2)	25Marks
3	End Sem. Evaluation (T3)	35 Marks
4	Internal Assessment	25 marks
5	Total	100 marks

Chemistry for Forensic Science-II

COURSE CODE: XXXXXXXX

COURSE CREDITS: 04

CORE/ELECTIVE: CORE

L-T-P: 3-1-0

Prerequisite: Senior Secondary (10+2) Chemistry

Course Objectives

- 1) To understand the fundamental laws governing energy changes in chemical systems.
- 2) To study the factors affecting the speed of chemical reactions and their mechanisms.
- 3) To apply kinetic and thermodynamic principles to forensic investigations such as arson analysis and time-of-death estimation

Course Outcomes:

S.No	COURSE OUTCOMES	Level of Attainment
CO 1	Define and apply the Laws of Thermodynamics	Intermediate
CO 2	Calculate changes in Enthalpy, Entropy, and Free Energy for various reactions.	Mastery
CO 3	Determine reaction rates and orders using experimental data.	Mastery
CO 4	Analyze the role of temperature and catalysts in accelerating chemical processes.	Intermediate

Course Content:

Module No.	Subtitle of the Module	Topics	No. of Lectures
1.	Introduction to Thermodynamics	Introduction and fundamental concept of thermodynamic terms. Concept of open and closed systems, state and path functions, reversible and irreversible processes, equilibrium, phase rule.	11

2.	Laws and Their Applications	Different laws of Thermodynamics and their applications. Thermodynamics scale, concept of Entropy, enthalpy, Gibbs free energy. Calculation of bond energy from thermodynamical data	10
3.	Chemical Kinetics and its scope	Chemical Kinetics and its scope, rate of reaction, factors influencing the rate of reaction, classifications of reactions on the basis of molecularity and order. Different types of order of reaction. Experimental methods for the study of chemical kinetics.	10
4.	Theories of chemical kinetics	Collision Theory, Activation Energy, Arrhenius Equation, Catalysis, Introduction to Chain Reactions.	8
5	Catalysis	Characteristics of catalysed reactions, classifications and examples	3
Total number of Lectures			42

Suggested Text Book(s):

- 1) Physical Chemistry by P.W. Atkins & Julio de Paula.
- 2) Principles of Physical Chemistry by Puri, Sharma & Pathania.
- 3) Chemical Kinetics and Reaction Mechanism by B.K. Sharma.
- 4) *Essentials of Physical Chemistry* by Bahl & Tuli

Evaluation Scheme:

S. No	Exam	Marks	Duration	Coverage / Scope of Examination
1	T-1	15	1 Hour.	Syllabus covered upto T-1
2	T-2	25	1.5 Hours	Syllabus covered upto T-2
3.	T-3	35	2 Hours	Entire Syllabus
4.	Teaching Assessment	25	Entire Semester	Assignment, Quizzes & Attendance

Chemistry for Forensic Science Lab-II

COURSE CODE: XXXXXXXX

COURSE CREDITS: 01

CORE/ELECTIVE: CORE

L-T-P: 0-0-1

Prerequisite: Senior Secondary (10+2) Chemistry

Course Objectives:

To provide hands-on experience in determining thermodynamic parameters (enthalpy) and measuring the rates of chemical reactions through experimental observation.

Course Outcomes:

SNo	COURSE OUTCOMES	Level of Attainment
CO1	Determine the water equivalent of a calorimeter and enthalpy of neutralization.	Assessment
CO2	Measure the enthalpy of solution and hydration for various salts.	Assessment
CO3	Analyze the kinetics of ester hydrolysis and determine rate constants.	Assessment
CO4	Compare the strengths of acids using kinetic data.	Assessment

Course Content:

Module No.	Title of the Module	List of Experiments	Hours
1.	Thermo chemistry	1) Determination of water equivalent of a calorimeter. 2) Determination of enthalpy of neutralization of a strong acid with a strong base. 3) Determination of enthalpy of solution of 4) Determination of enthalpy of hydration of	14
2.	Chemical Kinetics	1) Study the kinetics of acid-catalyzed hydrolysis of an ester (methyl/ethyl acetate). 2) Comparison of strengths of HCl and by studying the rate of hydrolysis of ethyl acetate. 3) Determination of the rate constant of saponification of ethyl acetate. 4) Examine how the addition of a neutral salt (like KNO_3) affects the rate of this reaction.	14
Total Lab hours		28	

Suggested Text Books:

- S. P. Singh, Advanced Practical Physics, Pragati Prakashan, Vol. 1, 2016.
- K. K. Tewari, Electricity And Magnetism, 3rd Edn, S Chand.
- Electricity, Magnetism & Electromagnetic Theory, S. Mahajan and Choudhury, 2012, Tata McGraw
- C. L. Arora, Practical Physics, S. Chand Company Limited, 21st edition, 2015.

Evaluation Scheme:

1	Mid Sem. Evaluation (P1)	20 Marks
2	End Sem. Evaluation (P2)	20 Marks
3	Day to Day Lab Assessment (P3)	60 Marks
	Total	100 marks

Discrete Computational Mathematics

COURSE CODE: 25B11MAXXX

COURSE CREDITS: 3

CORE/ELECTIVE: CORE

L-T-P: 3-1-0

Pre-requisite: Mathematics-I

Course Objectives

1. To simplify and evaluate any logical expression and to express logical statements in terms of logical connectives, predicates, and quantifiers.
2. Use of various set operations, relations and functions concept to solve applied problems.
3. To solve counting problems using elementary counting techniques.
4. To learn and perform various graphs and trees terminologies, traversals & their applications.
5. Problem solving using recursion and recurrence relations, by analyzing algorithms.

Course Outcomes

S.No.	Course Outcomes	Level of Attainment
CO-1	Explain partial order relations, Hasse diagrams, lattices, and recursive functions.	Understanding
CO-2	Solve the difference equations using the generating function and Z transform.	Applying
CO-3	Explain the propositional and predicate calculus to check the validity of arguments.	Understanding
CO-4	Demonstrate graphs, digraphs, trees and use it to solve the different problems of graph theory.	Applying
CO-5	Illustrate various algebraic structures and their properties.	Understanding
CO-6	Explain the theory of formal languages and solve the related problems of automata.	Applying

Course Contents:

Module no.	Title of the Module	Contents	Lectures required
1.	Relations & Lattices	Relations and their composition. Pictorial representation, matrix and graphical representations. Equivalence relations and partitions. Partial ordered relations and Hasse diagrams. Lattices.	6
2.	Functions	Functions and recursively defined functions, generating functions, solution of recurrence relations by generating function. Z transforms, solution of difference equations by Z transform	6
3.	Propositional Calculus	Propositions-simple and compound. Basic logical operators. Implication. Truth tables. Tautologies and contradictions. Valid arguments and fallacy. Propositional functions and quantifiers.	6
4.	Graphs	Graphs and related definitions, subgraphs, isomorphism, paths and connectivity. Eulerian graph and Konigsberg 7 problem. Hamiltonian graph. Labelled and weighted graphs. Tree Graphs- Minimum spanning Tree (Prim's algorithm). Graph colorings. Four color problem.	6
5.	Trees & Directed Graphs	Trees, Digraphs and related definitions. Rooted trees. Algebraic expressions and Polish notation. Sequential representation. Adjacency matrix. Path matrix. Shortest path. Linked representation of directed graphs. Binary trees.	6
6.	Algebraic Structures	Groups- definitions and examples, order of elements, subgroup, condition for subgroups. Quotient groups, Lagrange theorem and applications, Rings, integral domains and Fields- definition and examples.	6
7.	Languages & Grammars	Strings (words) and languages, grammars, types of grammars, Finite state machines, finite state automata, regular languages and regular expressions.	6
Total lectures			42

Suggested Text Book(s):

1. Kenneth H. Rosen, "Discrete Mathematics and its Applications", 7th Edition, TMH
2. C.L. Liu & D.P. Mohapatra, "Elements of Discrete Mathematics: A Computer Oriented Approach", 4th Edition, TMH
4. B. Kolman, R. Busby & S.C. Ross, "Discrete Mathematical Structures", 6th Edition, Pearson Education.
5. S. Lipschutz & M. Lipson, "Discrete Mathematics", 3rd Edition, TMH.

6. J.P. Tremblay & R. S. Manohar, "Discrete Mathematical Structures with Applications to Computer Science, TMH, New York 1997.
7. Richard Hammack, "Book of Proof", 2nd Edition, VCU Mathematics Text Book Series

Other useful resource(s):

1. Link to NPTEL course contents: https://onlinecourses.nptel.ac.in/noc18_cs53/preview
2. Link to topics related to course:
 - i. <https://www.youtube.com/watch?v=xIUfKMKSB3Y>
 - ii. <https://www.youtube.com/watch?v=RMLR2JHHeWo>
 - iii. <https://www.youtube.com/watch?v=9AUCdsmBGmA>
 - iv. <https://www.youtube.com/watch?v=7cTWe9Y>

Evaluation Scheme:

S. No	Exam	Marks	Duration	Coverage / Scope of Examination
1.	T-1	15	1 Hour.	Syllabus covered upto T-1
2.	T-2	25	1.5 Hours	Syllabus covered upto T-2
3.	T-3	35	2 Hours	Entire Syllabus
4.	Teaching Assessment	25	Entire Semester	Assignment (2) - 10 Quizzes(2) -10 Attendance - 5

MOLECULAR BIOLOGY

COURSE CODE: XXXXX

COURSE CREDITS: 4

CORE/ELECTIVE: CORE

L-T-P: 3-1-0

Pre-requisite: Fundamental biology Cell biology, Biochemistry

Course Objectives:

At the end of this course, students will be able to

1. Explain the basic principles/fundamentals of molecular biology.
2. Use the knowledge of molecular biology in the context of organism identification using genomic techniques.
3. Do future research and also enhance their career prospects in the expanding life sciences sector including public-funded research laboratories or private industry.

Course Outcomes:

S.No.	Course Outcomes	Level of Attainment
CO 1	To understand the basic structures of various genetic materials of cells.	Familiarity
CO 2	To understand the structural-functional relationship of genetic material with other biomolecules of cells.	Familiarity
CO 3	To understand foundational genetic processes of molecular biology.	Familiarity
CO 4	To Understand how molecular machines within the cell are regulated so that they can accurately copy, repair, and interpret genomic information.	Assessment
CO 5	To integrate knowledge of molecular biology principles for understanding the various disorders and their rectification.	Usage

Course Contents:

Module No.	Contents	Lectures required
1.	Basics of Molecular Biology: Major events of molecular biology, application of molecular biology, Structure, function and organization of nucleic acids and proteins in cells.	6
2.	Molecular Biology Techniques and their Applications: Methods of genetic material isolation and visualization, Polymerase chain reaction, DNA sequencing, blotting techniques, protein purification techniques, Florescence in situ hybridization (FISH) for genome analysis	10

3.	DNA replication: Classical experiments for deciphering DNA replication properties (Avery Mcleod and Mccarty experiments, Hershey Chase Experiment etc., DNA polymerases, Replication process: Initiation, Extension, leading strand, lagging strand, Dynamics at the replication fork, termination, DNA replication proteins, DNA replication regulation: Eukaryotes and prokaryotes	7
4.	DNA transcription and RNA processing: RNA polymerases, Major steps in transcription: Pre-initiation, Initiation, promoter, elongation, termination, mRNA splicing mechanisms, rRNA modifications, Reverse transcription, transcription inhibitors, Post-transcription modification	8
5.	Translation Basic mechanism-Eukaryotic and Prokaryotic translations, composition of ribosomes, genetic codes, role of tRNA in translation, mRNA translation mechanisms: initiation, elongation and termination process	6
6.	Gene regulation and Post-translational modifications: Control of gene regulation, Operon (Trp Operon, Lac operon), post translational modifications, Effects of post-translational modifications, Methods used to study post-translational modifications	5
Total Hours		42

Suggested Text books:

1. Harvey Lodish, Arnold Berk , Chris Kaiser , Monty Krieger , Anthony Bretscher , HiddePloegh, Kelsey MARTIN , Michael Yaffe , Angelika Amon. *Molecular Cell Biology*. (2021), Ninth edition. W. H. Freeman and Company
2. David L. Nelson, Michael Cox, Lehninger Principles of Biochemistry: International Edition (2017) W. H. Freeman and Company

Suggested Reference books:

1. Jeremy M. Berg, LubertStryer, John Tymoczko, Gregory Gatto, "Biochemistry" (2019); Ninth edition. W. H. Freeman and Company.
2. Jocelyn E. Krebs , Elliott S. Goldstein , Stephen T. Kilpatrick, "Lewin's GENES XII" (2017). Jones & Bartlett Learning

Evaluation Scheme:

S. No	Exam	Marks	Duration	Coverage / Scope of Examination
1	T-1	15	1 Hour.	Syllabus covered upto T-1
2	T-2	25	1.5 Hours	Syllabus covered upto T-2
3.	T-3	35	2 Hours	Entire Syllabus

4.	Teaching Assessment	25	Entire Semester	Assignment, Quizzes & Attendance
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INTRODUCTION TO COMPUTER PROGRAMMING

COURSE CODE:XXXXXXXX

COURSE CREDITS: 3

CORE/ELECTIVE: CORE

L-T-P: 3-0-0

Pre-requisite: Nil

Course Objectives:

1. Introduce and explain fundamental concepts of computer systems and programming languages for computational problem solving.
2. Develop logical reasoning skills to design algorithms and implement decision-making and looping constructs.
3. Enable structured and modular program development using functions, arrays, strings, and pointers.
4. Provide hands-on understanding of file handling concepts for basic data storage and retrieval operations.
5. Introduce foundational networking and internet concepts relevant to modern computing and forensic environments.

Course Outcomes:

S. No.	COURSE OUTCOMES	Level of Attainment
CO 1	Understanding of basic programming concepts, data types, memory organization, and program structure.	Remember & Understand
CO 2	Design algorithms and write programs using conditional and looping constructs.	Apply
CO 3	Develop modular programs using functions, arrays, strings, and pointers.	Apply & Analyze
CO 4	Implement basic file handling operations for reading and writing data.	Apply
CO5	Describe basic computer networking and internet concepts and relate them to computing applications.	Understand & Analyze

Course Content:

Module No.	Title of the Module	Topics in the Module	Hours
1	Computer Fundamentals and Introduction to C Programming	Overview of computer systems and applications, Number systems and data representation, Hardware and software components, Types of programming languages, Compiler, interpreter, and linker, Program development life cycle, Introduction to C language, Structure of a C program, Character set, tokens, keywords, identifiers, Constants and variables in C, Data types (int, float, char, double, void), Storage classes (auto, static, extern, register), Input/output functions: printf(), scanf(), Header files and preprocessor directives	06
2	Problem Solving and Control Structures in C	Problem-solving techniques, Algorithms, flowcharts, and pseudo-code, Operators in C: arithmetic, relational, logical, assignment, increment/decrement, conditional operator, Type conversion and type casting, Decision-making statements: if, if-else, nested if, switch-case, Looping constructs: for, while, do-while, Nested loops, Jump Statements: break, continue and goto	10
3	Functions, Arrays, Strings, Structures, Pointers and File Handling in C	<p><i>Functions:</i> Function definition, declaration, and calling, Types of functions, Parameter passing (call by value), Recursion, Scope and lifetime of variables</p> <p><i>Arrays:</i> One-dimensional arrays, Two-dimensional arrays, Array initialization and operations</p> <p><i>Strings:</i> String declaration and initialization, String handling functions (strlen(), strcpy(), strcmp(), etc.)</p> <p><i>Structures and Unions:</i> Structure definition and access, Array of structures, Nested structures, Introduction to unions</p> <p><i>Pointers:</i> Concept and declaration, Pointer arithmetic, Pointers and arrays, Pointers and functions, Null pointers</p> <p><i>Dynamic memory allocation:</i> malloc(), calloc(), free()</p> <p><i>File handling in C:</i> File pointers, Opening and closing files, Reading and writing text files (fprintf(), fscanf(), fgets(), fputs())</p>	16

4	Basics of Computer Networking and Internet	Data communication concepts, Components of computer networks, Types of networks: LAN, MAN, WAN, Network topologies, Transmission media, Internet concepts and services, World Wide Web, web browsers, and search engines, Introduction to IP addressing and protocols (TCP/IP, HTTP, FTP), Applications of networking and internet in computing environments	10
Total number of Lectures			42

Suggested Text Book(s):

1. E. Balagurusamy, Programming in C, McGraw-Hill Education
2. Brian W. Kernighan and Dennis M. Ritchie, The C Programming Language, Prentice Hall of India
3. Paul Deitel and Harvey Deitel, "C How to Program", 9th Edition, Pearson Education, 2022, ISBN: 978-0-13-739839-3

Reference Book(s):

1. Herbert Schildt, "The Complete Reference C", 4th Edition, McGraw Hill Education, 2017, ISBN: 978-0070411838
2. Greg Perry and Dean Miller, "C Programming Absolute Beginner's Guide", 3rd Edition, Que Publishing, 2013, ISBN: 978-0789751980

Evaluation Scheme:

S. No	Exam	Marks	Duration	Coverage / Scope of Examination
1	T-1	15	1 Hour	Syllabus covered upto T-1
2	T-2	25	1.5 Hours	Syllabus covered upto T-2
3.	T-3	35	2 Hours	Entire Syllabus
4.	Teaching Assessment	25	Entire Semester	Assignment, Quizzes & Attendance

COMPUTER PROGRAMMING LAB

COURSE CODE: XXXXXXXX
COURSE CREDITS: 01
CORE/ELECTIVE: CORE
L-T-P: 0-0-2

Pre-requisite: Nil

Course Objectives:

1. **Understand and apply** basic programming concepts including syntax, data types, operators, and input/output functions in C.
2. **Develop logical solutions** using decision-making statements and looping constructs to solve computational problems.
3. **Implement modular and structured programs** using functions, recursion, arrays, and strings.
4. **Utilize advanced programming concepts** such as structures, pointers, dynamic memory allocation, and file handling in problem-solving.
5. **Design, test, debug, and document** complete C programs integrating multiple programming constructs following standard coding practices.

Course Outcomes

S No	COURSE OUTCOMES	Level of Attainment
CO1	Write and execute simple programs using basic syntax, data types, and operators.	Apply
CO2	Develop programs using decision-making and looping constructs to solve given problems.	Apply
CO3	Implement modular programs using functions, recursion, arrays (1D & 2D), and strings.	Apply
CO4	Develop applications using structures, pointers, dynamic memory allocation, and file handling concepts.	Analyze
CO5	Design, debug, and document comprehensive C programs integrating multiple programming concepts for real-world problem solving.	Create

Course Content:

Module No.	Title of the Module	List of Experiments	Hours
1.	Introduction to C Programming	<ul style="list-style-type: none">• Familiarization with lab environment (compiler/IDE, execution process)• Structure of a C program• Writing and executing a simple C program• Use of printf() and scanf()	02

2.	Data Types and Operators	<input type="checkbox"/> Programs using arithmetic operators <ul style="list-style-type: none"> • Programs demonstrating relational and logical operators • Type conversion and formatted output 	02
3.	Decision-Making Statements	<input type="checkbox"/> Programs using if, if-else, nested if <ul style="list-style-type: none"> • Programs using switch-case 	02
4.	Looping Constructs	<input type="checkbox"/> Programs using for, while, and do-while loops <input type="checkbox"/> Programs for sum of series, factorial, Fibonacci	02
5.	Nested Loops and Control Statements	<input type="checkbox"/> Pattern printing using nested loops <input type="checkbox"/> Programs demonstrating break and continue	02
6.	Functions in C	<input type="checkbox"/> User-defined functions (with and without arguments) <input type="checkbox"/> Return values and scope of variables	02
7.	Recursion and Function Applications	<input type="checkbox"/> Recursive functions (factorial, Fibonacci) <input type="checkbox"/> Menu-driven programs using functions	02
8.	One-Dimensional Arrays	<input type="checkbox"/> Searching (linear search) <input type="checkbox"/> Sorting (bubble/selection sort) <input type="checkbox"/> Passing arrays to functions	02
9.	Two-Dimensional Arrays	<input type="checkbox"/> Matrix addition and subtraction <input type="checkbox"/> Matrix multiplication <input type="checkbox"/> Transpose of a matrix	02
10.	Strings	<ul style="list-style-type: none"> • String input/output • String handling functions (strlen(), strcpy(), strcmp()) • String manipulation without library functions 	02
11.	Structures	<ul style="list-style-type: none"> • Defining and accessing structures • Array of structures • Simple record management using structures 	02
12.	Pointers	<ul style="list-style-type: none"> • Pointer declaration and initialization • Pointer arithmetic • Pointers with arrays and functions 	02
13.	Dynamic Memory Allocation	<ul style="list-style-type: none"> • Use of malloc(), calloc(), and free() • Programs using dynamic arrays 	02
14.	File Handling	<ul style="list-style-type: none"> • Reading and writing text files • File copy program 	02
Total Lab hours			28

Suggested Text Book(s):

1. E. Balagurusamy, Programming in C, McGraw-Hill Education
2. Brian W. Kernighan and Dennis M. Ritchie, The C Programming Language, Prentice

Hall of India

3. Paul Deitel and Harvey Deitel, "C How to Program", 9th Edition, Pearson Education, 2022,
ISBN: 978-0-13-739839-3

Reference Book(s):

1. Herbert Schildt, "The Complete Reference C", 4th Edition, McGraw Hill Education, 2017,
ISBN: 978-0070411838
2. Greg Perry and Dean Miller, "C Programming Absolute Beginner's Guide", 3rd Edition, Que Publishing, 2013, ISBN: 978-0789751980

Evaluation Scheme:

1	Mid Sem. Evaluation (P1)	20 Marks
2	End Sem. Evaluation (P2)	20 Marks
3	Day to Day Lab Assessment (P3)	60 Marks
	Total	100 marks

Indian Criminal Law, Criminology and Ethics

COURSE CODE:XXXXXXX

COURSE CREDITS: 3

CORE/ELECTIVE: Core

L-T-P: 3-0-0

Pre-requisite: Introduction to forensic Science

Course Objectives:

This course equips students with a working knowledge of India's criminal justice system and its newly enacted legislation - BNS, BNSS, and BSA 2023 - and their direct application to forensic evidence across major offence categories. It develops the ability to assess evidence admissibility, understand how forensic reports influence sentencing, and apply criminological and psychological insights to real case contexts. Students will also examine wrongful convictions, ethical dilemmas in casework, and the growing role of forensic intelligence tools, grounding technical forensic skills within a sound legal, ethical, and institutional framework.

Course Outcomes:

After successful completion of the course, students will be able to:

S.No.	Course Outcomes	Level of Attainment
CO-1	Understand India's criminal justice system and apply BNS 2023, BNSS 2023, and BSA 2023 to forensic evidence scenarios, identifying the legal provisions directly relevant to forensic practice.	Understand/ apply
CO-2	Apply the Bharatiya Sakshya Adhinyam 2023 to determine the admissibility of forensic evidence-including electronic records, expert opinion, and documentary evidence-and explain how the forensic chemist's report directly influences sentencing under the NDPS Act.	Apply/Analyze
CO-3	Identify the forensic evidence relevant to major offence categories-homicide, sexual assault, drug offences, financial crime, and cybercrime, and apply criminological theories to prevalent Indian crime patterns.	Analyze/Evaluate
CO-4	Explain the psychological basis of eyewitness misidentification, false confessions, and cognitive bias, and analyse documented wrongful conviction cases to identify the forensic science failures that contributed to them.	Analyze

CO-5	Apply core ethical principles to complex dilemmas in forensic casework and court testimony, and describe the legal and ethical implications of forensic intelligence functions including database analysis, crime mapping, and network analysis.	Evaluate
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Course Contents:

Module No.	Name of Module	Contents	Lectures required
1	The Architecture of Indian Criminal Justice	Introduction to Criminal Justice System – Purpose, stakeholders, and forensic relevance Constitutional foundations – Fundamental rights, due process, and fair trial Overview of new criminal laws – BNS 2023, BNSS 2023, BSA 2023 (comparative perspective) Structure of Indian courts – Trial courts to Supreme Court: Key institutions – Police, Prosecution, Judiciary, Forensic Science Laboratories: Lifecycle of a criminal case – FIR to investigation, trial, and judgment	6
2	The BNS 2023 — Offences and Their Forensic Signatures	Structure of BNS and elements of crime (actus reus & men’s rea), Homicide offences – Legal provisions and forensic evidence (cause of death, autopsy), Sexual offences – Legal framework and biological evidence (DNA, serology), Drug offences – NDPS Act basics and forensic chemistry role, Property & financial crimes – Documents, fraud, forensic accounting, Cybercrime – Digital evidence, IT Act linkage, cyber forensics, Correlation of legal ingredients with forensic evidence (case-based integration)	7
3	Evidence Law — What Gets into Court and What Does Not	Concepts of relevance and admissibility under BSA 2023, Types of evidence—Oral, documentary, and real evidence, Expert opinion – Role and limitations of forensic experts Electronic evidence – Admissibility, hash values, certification: Confessions, statements, and evidentiary safeguards, Courtroom presentation – Handling exhibits and chain of custody	6

4	Criminology — Understanding Why Crime Happens	Introduction to criminology – Scope and importance, Classical and positivist theories of crime , Sociological theories – Strain, differential association, social control, psychological theories – Personality, cognition, behavioural patterns, Crime scene management – Recognition and documentation of evidence, Evidence collection & chain of custody (Indian field challenges)	6
5	Wrongful Convictions — When the System Fails	Introduction to wrongful convictions – Scope and significance, Causes – Eyewitness errors, false confessions, forensic errors, Role of forensic science in miscarriages of justice, Case studies (India & international), Preventive measures – Quality assurance, validation, protocols	5
6	Ethics in Forensic Practice — Principles, Dilemmas, and Decisions	Introduction to forensic ethics – Principles and frameworks, Professional responsibility and codes of conduct, Ethical dilemmas – Bias, pressure from investigation agencies, Misconduct in forensic science – Fabrication, contamination, reporting bias: Expert testimony – Ethics in court and cross-examination, Case-based ethical decision-making exercises	6
7	Forensic Intelligence, Crime Analytics, and Emerging Challenges	Introduction to forensic intelligence – Concept and applications, Crime data analysis –Databases, linkage analysis, Crime mapping – Spatial and temporal analysis, Network analysis in organized crime and terrorism, Emerging technologies – AI, DNA phenotyping, predictive policing, Legal& ethical challenges in emerging forensic technologies	6
Total lectures			42

Suggested Text Book(s):

1. Ratanlal and Dhirajlal (2022). The Indian Penal Code (36th ed.) / Cross-reference with BNS 2023. LexisNexis. — The standard commentary; use with BNS 2023 text for cross-reference with IPC provisions.
2. Ratanlal& Dhirajlal (2022). The Code of Criminal Procedure (22nd ed.) / Cross-reference with BNSS 2023. LexisNexis. — Standard procedural commentary; essential companion to BNSS 2023.

3. Avtar Singh (2023). Principles of the Law of Evidence (25th ed.). Central Law Publications. — Leading Indian evidence law text; updated for BSA 2023.
4. BNS 2023, BNSS 2023, BSA 2023. Government of India. [indiacode.nic.in — free access] — Primary legislative texts; mandatory reading for every lecture in Modules I–III.
5. Mathiharan, K., and Patnaik, A. K. (2005). Modi's Medical Jurisprudence and Toxicology (23rd ed.). LexisNexis. — Classic Indian medico-legal text; Chapters on expert evidence essential.
6. Siegel, L. J. (2018). Criminology: The Core (6th ed.). Cengage. — Standard introductory criminology textbook; accessible and comprehensive.
7. Hazel, D. G. (2010). Criminology (4th ed.). Oxford University Press. — Theoretically rigorous; good for Indian adaptation exercises.
8. Vidmar, N., and Hans, V. P. (2007). American Juries: The Verdict. Prometheus Books. — Useful for jury decision- making psychology applicable to bench trial understanding.
9. Loftus, E. F. (1996). Eyewitness Testimony. Harvard University Press. — The definitive text on eyewitness memory; essential for Module IV.
10. Scheck, B., Neufeld, P., & Dwyer, J. (2001). Actual Innocence. Signet. — The Innocence Project founders on wrongful convictions; accessible and powerful.
11. National Academy of Sciences (2009). Strengthening Forensic Science in the United States. National Academies
12. Robertson, B., Vignaux, G. A., & Berger, C. E. H. (2016). Interpreting Evidence (2nd ed.). Wiley. — Bayesian framework for evidence; the ethics of evaluative reporting
13. Mnookin, J. L. et al. (2011). The need for a research culture in the forensic sciences. UCLA Law Review, 58,
14. NDPS Act 1985 with Narcotic Drugs and Psychotropic Substances (Amendment) Acts. [indiacode.nic.in] — Primary text; mandatory for Module II NDPS lecture.
15. POCSO Act 2012 with Rules. [indiacode.nic.in] — Primary text for child victim forensic protocols.
16. Nagpal, B. N., and Nagpal, R. (2022). Cyber Law and Information Technology (5th ed.). Excel Books. — IT Act, DPDP Act, digital evidence under Indian law.
17. Dror, I. E. (2020). Cognitive and human factors in expert decision making: six fallacies and the eight sources of bias.

Evaluation Scheme:

Assessment	Max. marks	Duration	Course Covered
T1 Test	15	1 hr.	Syllabus covered upto T-1
T2 Test	25	1.5 hrs.	Syllabus covered upto T-2
End Term Test	35	2 hrs.	Entire Syllabus
Teacher Assessment	25	Entire Sem	Based on Assignments, quizzes etc.