B.Sc. PROGRAM CURRICULUM - 2025

(Applicable for the batches admitted from A.Y. 2025-26)

Version 2.0

B.Sc. (Cyber Security & Digital Forensics)

Version 1.0–Approved in the BoS meeting on 16-04-2025 & Academic Council meeting on 14-06-2025

Version 2.0–Approved in the BoS meeting on 02-06-2025 & Academic Council meeting on 20-06-2026

Aditya Nagar, ADB Road, Surampalem - 533 437

ADITYA UNIVERSITY

Vision

- To be a globally recognized university through excellence in Education, Innovation and Sustainable growth.

Mission

Deliver collaborative education to prepare students for global challenges through

- Transformative learning
- Vibrant research ecosystem
- Sustainable and inclusive community

DEPARTMENT OF FORENSIC SCIENCE

Vision

- To be a leading center of forensic science education and research, advancing justice through scientific excellence, innovation, and interdisciplinary collaboration.

Mission

M1: Transformative, hands-on forensic education fostering critical thinking, ethics and rigor.

M2: Interdisciplinary research ecosystem supporting justice and global challenges.

M3: Sustainable and inclusive community of globally competent professionals.

PROGRAMME EDUCATIONAL OBJECTIVES (PEO)

Graduates of the Program will

PEO1: Career Success and Leadership

Graduates will establish successful careers and demonstrate professional competence and leadership in their respective domains of forensic science, cyber security, digital forensics, and related fields.

PEO2: Higher Studies, Research, and Entrepreneurship

Graduates will pursue higher studies, research opportunities, or entrepreneurial pathways to contribute to advancements in their chosen discipline and allied areas.

PEO3: Lifelong Learning and Ethical Responsibility

Graduates will engage in lifelong learning, adapt to emerging global challenges, and uphold ethical responsibility in their professional and personal endeavors.

PROGRAMME SPECIFIC OUTCOMES (PSO)

After successful completion of the program, the graduates will be able to

PSO1: Scientific and Technical Skills

Apply knowledge from physical, biological, computational, and digital sciences to examine forensic or digital evidence. Use appropriate laboratory and digital tools and follow proper investigative protocols.

PSO2: Ethics and Professional Practice

Conduct forensic or digital investigations with integrity. Follow ethical standards and legal rules and ensure accurate handling and documentation of evidence for judicial or professional use.

PROGRAMME OUTCOMES (PO)

After successful completion of the program, the graduates will be able to

PO1: Integrated Forensic and Digital Competence
Apply foundational and advanced concepts from life sciences, physical sciences, computer sciences, and legal studies to investigate, analyze, and interpret physical, biological, and digital evidence in crime investigations.

PO2: Evidence Collection and Scene Management
Demonstrate proficiency in identifying, securing, documenting, and managing both physical and digital crime scenes, ensuring the integrity, continuity, and admissibility of collected evidence.

PO3: Analytical and Instrumental Proficiency
Operate laboratory instruments and digital forensic tools to accurately examine, process, and interpret chemical, biological, physical, and electronic evidence using validated analytical techniques.

PO4: Multidisciplinary and Technological Insight
Integrate knowledge from forensic pathology, toxicology, cyber forensics, network security, psychology, and data analytics to address complex challenges in modern forensic investigations.

PO5: Legal Awareness and Ethical Responsibility
Exhibit awareness of national laws, cyber regulations, and ethical standards governing forensic practice, maintaining integrity, confidentiality, impartiality, and adherence to justice in all professional actions.

PO6: Technical Documentation and Forensic Reporting
Develop competence in preparing comprehensive laboratory records, forensic reports, and digital documentation that meet scientific and legal standards, ensuring clarity, accuracy, and traceability.

PO7: Courtroom and Professional Communication Skills
Demonstrate the ability to present technical findings effectively in judicial proceedings and communicate professionally with law enforcement, legal experts, and multidisciplinary teams.

PO8: Evidence-Based and Critical Decision-Making
Employ scientific reasoning, statistical analysis, and critical thinking to evaluate data, validate findings, and make informed decisions in forensic and digital investigations.

PO9: Innovation, Research, and Lifelong Learning
Engage in research, innovation, and continuous learning to stay updated with evolving forensic methodologies, analytical technologies, cybersecurity threats, and global standards.

PO10: Collaboration, Leadership, and Professionalism

Work effectively as part of multidisciplinary forensic and investigative teams, demonstrating leadership, accountability, adaptability, and professionalism in diverse work environments.

PO11: Societal Impact and Public Awareness
Communicate forensic and cybersecurity knowledge responsibly to promote public awareness, contribute to crime prevention, and support the ethical use of science and technology in justice delivery.

Department of Forensic Science

B.Sc. (Cyber Security & Digital forensics) Program Curriculum – 2025-26

(Applicable for the students submitted from the A.Y. 2025-26)

UG Programs Offered

- B.Sc. Cyber Security & Digital forensics
- B.Sc. Forensic Science

Minor Stream Courses offered in B.Sc. (Cyber Security & Digital forensics)

- Minor Stream Course in Computer Science
- Minor Stream Course in Physics
- Minor Stream Course in Mathematics
- Minor Stream Course in Forensic Science

Credit Division Category-wise

Sr. No.	Broad Category of Course	UGC	Credits
1	Major Core Courses (MCC)	60	60
2	Minor Stream Courses (MSC)	24	24
3	Multidisciplinary Courses (MDC)	09	06
4	Ability Enhancement Courses (AEC)	08	10
5	Skill Enhancement Courses (SEC)	09	08
6	Value Added Courses (VAC)	06-08	06
7	Summer Internships (SI)	02-04	02
8	Project (PROJ)	-	04
9	Mandatory Courses (MC)	-	-
Total Credits to be earned for B.Sc. Degree		**120**	**120**

Foundation Courses – FC

Intermediate-level Courses - IC

Advanced Courses – AC

Major Core Courses (MCC)

Course Code	Sem	Course Name	Level	L	T	P	C	CIE	SEE	Total	Pre-requisite
2510FS46	I	Computer Essentials	FC	3		1	4	50	50	100	-
2510FS22		Introduction to Cyber Security	FC	2		2	4	50	50	100	-
2510FS23		Introduction to Digital Forensics	FC	2		2	4	50	50	100	-
2510FS24	II	Operating System Forensics	FC	3		1	4	50	50	100	IDF
2510FS25		Mobile Forensics	FC	2		2	4	50	50	100	IDF
2510FS26		Forensic Computing	FC	2		2	4	50	50	100	IDF
2510FS40	III	Cryptography	IC	3		1	4	50	50	100	-
2510FS41		Steganography	IC	2		2	4	50	50	100	-
2510FS42		Digital Media Forensics	IC	2		2	4	50	50	100	-
2510FS43	IV	Network Security	IC	3		1	4	50	50	100	-
2510FS44		Malware Analysis	IC	2		2	4	50	50	100	-
2510FS45		Vulnerability Assessment & Penetration Testing	IC	2		2	4	50	50	100	-
2510FS01	V	E- Governance	AC	3		1	4	50	50	100	-
2510FS02		Technology Law & Digital Rights	AC	2		2	4	50	50	100	-
2510FS03		Business Intelligence	AC	2		2	4	50	50	100	-
Total				**35**		**25**	**60**				

Multidisciplinary Courses (MDC)

Course Code	Sem	Course Name	Level	L	T	P	C	CIE	SEE	Total	Pre-requisite
2510FS27	II	Fundamentals of Forensic Science	FC	**2**			**2**	50	50	100	-
2510FS04	V	Cyber Law	AC	**2**			**2**	50	50	100	-
2510FS05	VI	Cyber Criminology	AC	**2**			**2**	50	50	100	-
Total				**6**			**6**				

Ability Enhancement Courses (AEC)

Course Code	Sem	Course Name	Level	L	T	P	C	CIE	SEE	Total	Pre-requisite
2510FS28	I	Essential Cognitive Skills for Graduates	FC			1	1	100	-	100	-
2510FS29	II	Advanced Cognitive Skills for Graduates	FC			1	1	100	-	100	-
2510FS30	II	Human Values and Professional Ethics	FC	2			2	50	50	100	-
2510FS47	IV	Forensic Report Writing	IC	2			2	50	50	100	-
2510FS06	V	Intellectual Property Right & Patents	AC	2			2	50	50	100	-
2510FS07	VI	Student Activity-Based Learning	AC				2				-
Total				**6**		**2**	**10**				

Skill Enhancement Courses (SEC)

Course Code	Sem	Course Name	Level	L	T	P	C	CIE	SEE	Total	Pre-requisite
2510FS31	I	Forensic Accounting and Fraud Investigation	FC	2			2	50	50	100	-
2510FS48	III	IT Skills	IC			2	2	50	50	100	-
2510FS49	IV	Court Testimony	IC	2			2	50	50	100	-
2510FS08	VI	Research Methodology & Scientific Writing	AC	2			2	50	50	100	-
Total				**6**		**2**	**8**				

Value Added Courses (VAC)

Course Code	Sem	Course Name	Level	L	T	P	C	CIE	SEE	Total	Pre-requisite
2510FS50	III	Entrepreneurship Development	IC	2			2	50	50	100	-
2510FS09	V	Environmental Science	AC	2			2	50	50	100	-
2510FS10	VI	Forensic Journalism & Investigative Reporting	AC	2			2	50	50	100	-
Total				**6**			**6**				

Summer Internships (SI)

Course Code	Sem	Course Name	Level	L	T	P	C	CIE	SEE	Total	Pre-requisite
2510FS12	V	Summer Internship	AC			2	2	100	-	100	-
Total						**2**	**2**				

Project (PROJ)

Course Code	Sem	Course Name	Level	L	T	P	C	CIE	SEE	Total	Pre-requisite
2510FS13	VI	Project	AC			4	4	50	50	100	-
	Total					**4**	**4**				

Mandatory Courses (MC)

Course Code	Sem	Course Name	Level	L	T	P	C	CIE	SEE	Total	Pre-requisite
2510AC01	I	Constitution of India	FC	2				100	-	100	-
2510AC02	II	Indian Science & Technology	FC	2				100	-	100	-
2510AC03	III	Health & Wellness, Yoga Education, Sports, and Fitness	FC	2				100	-	100	-
2510AC04	IV	Indian History & Culture	FC	2				100	-	100	-
2510AC05	V	Indian Philosophy & Ethics	FC	2				100	-	100	-
		Total		**10**							

Minor Stream: Computer Science

Course Code	Sem	Course Name	Level	L	T	P	C	CIE	SEE	Total	Pre-requisite
2510FS32	I	Introduction to Operating System	FC	2		2	4	50	50	100	-
2510FS33	II	Computer Network	FC	2		2	4	50	50	100	-
2510FS51	III	Data Structure & Algorithms	IC	2		2	4	50	50	100	CN
2510FS52	IV	Database Management Systems	IC	2		2	4	50	50	100	-
2510FS14	V	Programming Languages	AC	2		2	4	50	50	100	IOS, DS & A
2510FS15	VI	Artificial Intelligence/ Machine Learning	AC	2		2	4	50	50	100	DBMS
Total				**12**		**12**	**24**				

Minor Stream: Physics

Course Code	Sem	Course Name	Level	L	T	P	C	CIE	SEE	Total	Pre-requisite
2510FS34	I	Mathematical Physics	FC	2		2	4	50	50	100	-
2510FS35	II	Mechanics and Properties of Matter	FC	2		2	4	50	50	100	-
2510FS53	III	Waves & Optics	IC	2		2	4	50	50	100	MTP
2510FS54	IV	Electricity and Magnetism	IC	2		2	4	50	50	100	MPM
2510FS16	V	Modern Physics	AC	2		2	4	50	50	100	EM
2510FS17	VI	Applications of Electricity & Electronics	AC	2		2	4	50	50	100	EM
Total				**12**		**12**	**24**				

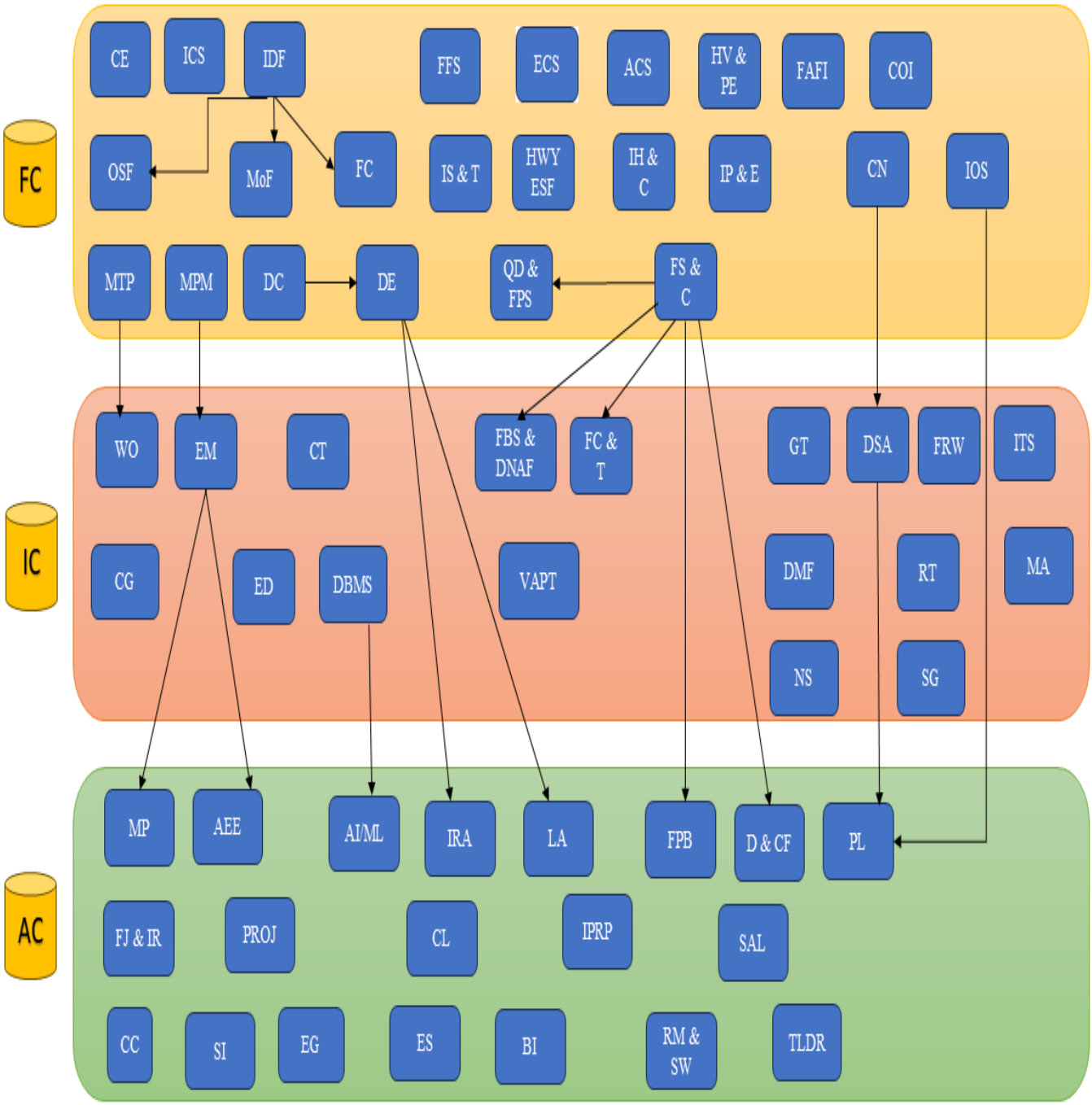
Minor Stream: Mathematics

Course Code	Sem	Course Name	Level	L	T	P	C	CIE	SEE	Total	Pre-requisite
2510FS36	I	Differential Calculus	FC	2		2	4	50	50	100	-
2510FS37	II	Differential Equations & Problem-Solving Sessions	FC	2		2	4	50	50	100	DC
2510FS55	III	Group Theory &Problem-Solving Sessions	IC	2		2	4	50	50	100	-
2510FS56	IV	Ring Theory & Problem-Solving Sessions	IC	2		2	4	50	50	100	-
2510FS18	V	Introduction to Real Analysis & Problem-Solving Sessions	AC	2		2	4	50	50	100	DE
2510FS19	VI	Linear Algebra &Problem-Solving Sessions	AC	2		2	4	50	50	100	DE
Total				**12**		**12**	24				

Minor Stream: Forensic Science

Course Code	Sem	Course Name	Level	L	T	P	C	CIE	SEE	Total	Pre-requisite
2510FS38	I	Forensic Science & Criminalistics	FC	2		2	4	50	50	100	FS&C
2510FS39	II	Questioned Document & Fingerprint Science	FC	2		2	4	50	50	100	FS&C
2510FS57	III	Forensic Biology, Serology & DNA Fingerprinting	IC	2		2	4	50	50	100	FS&C
2510FS11	IV	Forensic Chemistry & Toxicology	IC	2		2	4	50	50	100	FS&C
2510FS20	V	Forensic Physics & Ballistics	AC	2		2	4	50	50	100	FS&C, FC & T
2510FS21	VI	Digital & Cyber Forensics	AC	2		2	4	50	50	100	FS&C
Total				**12**		**12**	**24**				

2025-26 B.Sc. (CS & DF) CURRICULUM PREREQUISITE FLOW CHART



CE	Computer Essentials	CG	Cryptography	EG	E-Governance
ICS	Introduction to Cyber Security	SG	Steganography	TLDR	Technology Law & Digital Rights
IDF	Introduction to Digital Forensics	DMF	Digital Media Forensics	BI	Business Intelligence
OSF	Operating Systems Forensics	NS	Network Security		
MoF	Mobile Forensics	MA	Malware Analysis		
FC	Forensic Computing	VAPT	Vulnerability Assessment & Penetration Testing		
FFS	Fundamentals of Forensic Science	FRW	Forensic Report Writing	CL	Cyber Law
ECS	Essential Cognitive Skills for Graduates	ITS	IT Skills	CC	Cyber Criminology
ACS	Advanced Cognitive Skills for Graduates	CT	Court Testimony	IPRP	Intellectual Property Right & Patents
HV & PE	Human Values and Professional Ethics	ED	Entrepreneurship Development	SABL	Student Activity Based Learning
FAFI	Forensic Accounting and Fraud Investigation	DSA	Data Structure & Algorithms	RM &SW	Research Methodology & Scientific Writing
COI	Constitution of India	DBMS	Database Management Systems	ES	Environmental Science
IS & T	Indian Science & Technology	WO	Waves & Optics	FJ & IR	Forensic Journalism & Investigative Reporting
HWYESF	Health & Wellness, Yoga Education, Sports, and	EM	Electricity and Magnetism		

	Fitness				
IH & C	Indian History & Culture	GT	Group Theory &Problem-Solving Sessions	SI	Summer Internship
IP & E	Indian Philosophy & Ethics	RT	Ring Theory & Problem-Solving Sessions	PROJ	Project
IOS	Introduction to Operating System	FBS & DNAFP	Forensic Biology, Serology & DNA Fingerprinting	PL	Programming Languages
CN	Computer Network	FC & T	Forensic Chemistry & Toxicology	AI/ML	Artificial Intelligence/ Machine Learning
MTP	Mathematical Physics			MP	Modern Physics
MPM	Mechanics and Properties of Matter			AEE	Applications of Electricity & Electronics
DC	Differential Calculus			IRA	Introduction to Real Analysis
DE	Differential Equations			LA	Linear Algebra
FS & C	Forensic Science & Criminalistics			FPB	Forensic Physics & Ballistics
QD & FS	Questioned Document & Fingerprint Science			D&CF	Digital & Cyber Forensics

Semester-wise Curriculum

I SEMESTER

Course code	Course Title	Course		Credits				Total Hours
		Category	Level	L	T	P	Total	
2510FS46	Computer Essentials	MCC	FC	3		1	4	5
2510FS22	Introduction to Cyber Security	MCC	FC	2		2	4	6
2510FS23	Introduction to Digital Forensics	MCC	FC	2		2	4	6
	Minor Stream Course - 1	MSC	FC	2		2	4	6
2510FS28	Essential Cognitive Skills for Graduates	AEC	FC			1	1	2
2510FS31	Forensic Accounting and Fraud Investigation	SEC	FC	2			2	2
2510AC01	Constitution of India	MC	FC	2				2
	Total			**13**		**8**	**19**	**29**

II SEMESTER

Course code	Course Title	Course		Credits				Total Hours
		Category	Level	L	T	P	Total	
2510FS24	Operating Systems Forensics	MCC	FC	3		1	4	5
2510FS25	Mobile Forensics	MCC	FC	2		2	4	6
2510FS26	Forensic Computing	MCC	FC	2		2	4	6
	Minor Stream Course - 2	MSC	FC	2		2	4	6
2510FS27	Fundamentals of Forensic Science	MDC	FC	2			2	2
2510FS29	Advanced Cognitive	AEC	FC			1	1	2

	Skills for Science							
2510FS30	Human Values and Professional Ethics	AEC	FC	2			2	2
2510AC02	Indian Science & Technology	MC	FC	2				2
	Total			**15**		**8**	**21**	**31**

III SEMESTER

Course code	**Course Title**	**Course**		**Credits**				**Total Hours**
		Category	**Level**	**L**	**T**	**P**	**Total**	
2510FS40	Cryptography	MCC	IC	3		1	4	5
2510FS41	Steganography	MCC	IC	2		2	4	6
2510FS42	Digital Media Forensics	MCC	IC	2		2	4	6
	Minor Stream Course - 3	MSC	IC	2		2	4	6
2510FS48	IT Skills	SEC	IC			2	2	4
2510FS50	Entrepreneur ship Development	VAC	IC	2			2	2
2510AC03	Health & Wellness, Yoga Education, Sports, and Fitness	MC	FC	2				2
	Total			**13**		**9**	**20**	**33**

IV SEMESTER

Course code	Course Title	Course		Credits				Total Hours
		Category	Level	L	T	P	Total	
2510FS43	Network Security	MCC	IC	3		1	4	5
2510FS44	Malware Analysis	MCC	IC	2		2	4	6
2510FS45	Vulnerability Assessment & Penetration Testing	MCC	IC	2		2	4	6
	Minor Stream Course - 4	MSC	IC	2		2	4	2
2510FS47	Forensic Report Writing	AEC	IC	2			2	2
2510FS49	Court Testimony	SEC	IC	2			2	2
2510AC04	Indian History & Culture	MC	FC	2				2
	Total			**15**		**7**	**20**	**29**

V SEMESTER

Course code	Course Title	Course		Credits				Total Hours
		Category	Level	L	T	P	Total	
2510FS01	E- Governance	MCC	AC	3		1	4	5
2510FS02	Technology Law & Digital Rights	MCC	AC	2		2	4	6
2510FS03	Business Intelligence	MCC	AC	2		2	4	6
	Minor Stream Course - 5	MSC	AC	2		2	4	6
2510FS04	Cyber Law	MDC	AC	2			2	2
2510FS06	Intellectual Property Right & Patents	AEC	AC	2			2	2
2510FS09	Environmental Science	VAC	AC	2			2	2
2510FS12	Summer Internship	SI	AC			2	2	2
2510AC05	Indian Philosophy & Ethics	MC	FC	2				2
Total				**17**		**8**	**24**	**33**

VI SEMESTER

Course code	Course Title	Course		Credits				Total Hours
		Category	Level	L	T	P	Total	
	Minor Stream Course - 6	MSC	AC	2		2	4	6
2510FS05	Cyber Criminology	MDC	AC	2			2	2
2510FS08	Research Methodology & Scientific Writing	SEC	AC	2			2	2
2510FS10	Forensic Journalism & Investigative Reporting	VAC	AC	2			2	2
2510FS13	Project	PROJ	AC			4	4	8
2510FS07	Student Activity Based Learning	AEC	AC				2	-
Total				**8**		**6**	**16**	**20**

Total Credits: 120

Major Core Courses (MCC)

Course Code	Sem	Course Name	Level	L	T	P	C	CIE	SEE	Total	Pre-requisite
2510FS46	I	Computer Essentials	FC	3		1	4	50	50	100	
2510FS22		Introduction to Cyber Security	FC	2		2	4	50	50	100	
2510FS23		Introduction to Digital Forensics	FC	2		2	4	50	50	100	
2510FS24	II	Operating System Forensics	FC	3		1	4	50	50	100	
2510FS25		Mobile Forensics	FC	2		2	4	50	50	100	
2510FS26		Forensic Computing	FC	2		2	4	50	50	100	
2510FS40	III	Cryptography	IC	3		1	4	50	50	100	
2510FS41		Steganography	IC	2		2	4	50	50	100	
2510FS42		Digital Media Forensics	IC	2		2	4	50	50	100	
2510FS43	IV	Network Security	IC	3		1	4	50	50	100	
2510FS44		Malware Analysis	IC	2		2	4	50	50	100	
2510FS45		Vulnerability Assessment & Penetration Testing	IC	2		2	4	50	50	100	
2510FS01	V	E- Governance	AC	3		1	4	50	50	100	
2510FS02		Technology Law & Digital Rights	AC	2		2	4	50	50	100	
2510FS03		Business Intelligence	AC	2		2	4	50	50	100	
Total				**35**		**25**	**60**				

Computers Essentials

L	T	P	C
3	0	1	4

Course Code: 2510FS46

Semester -I

Course Outcomes:

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

CO1: Explain the fundamental principles and scope of forensic science
CO2: Demonstrate knowledge of various types of physical evidence and their forensic significance
CO3: Understand the role of forensic experts and legal frameworks in the criminal justice system
CO4: Apply forensic techniques in crime scene investigation and evidence collection,
CO5: Analyze forensic examination procedures for different types of evidence.

Mapping of Course Outcomes with Program Outcomes:

CO/PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11
CO1	3	2	2	3	3	2	2	2	2	1	1
CO2	3	3	3	2	2	2	1	3	2	1	1
CO3	2	1	1	2	3	2	3	2	1	2	2
CO4	2	3	3	2	2	3	2	3	2	2	1
CO5	2	2	3	3	2	2	2	3	3	2	1

Mapping of course outcomes with program outcomes:

CO/PSO	PSO1	PSO2
CO1	2	1
CO2	1	1
CO3	2	1
CO4	2	1
CO5	1	3

Unit-Wise Syllabus:

UNIT – I: Computer

Basics, History, Characteristics, Applications, Types, Components; Input/ Output Devices, Storage Devices, Peripheral Devices; Central Processing Unit- Input/Output Unit, Arithmetic Logical Unit, Control Unit, Memory Unit. Number systems: binary, octal, decimal, hexadecimal. Operating System & Types; Desktop icons and Control panel objects; Files and Folders.

Practice - Study of Input Devices & Output Devices

UNIT – II: Networks

Computer Networks- Introduction, Characteristics, Types and Topologies; Types of Network Devices; IP addressing, DNS, DHCP, MAC address, Introduction to the internet, web browsers, search engines, and web technologies, firewalls, VPNs.

Practice - Network Configuration and Internet Setup

UNIT – III: Components of Computer & Printers

Computer Hardware-Power Supplies, Motherboards, Internal PC Components, External Ports and Cables; Selection of Computer Components; Lab safety Procedures; Procedures to Protect Equipment and Data; Proper use of tools- Software Tools, Antistatic Wrist Strap. Printers- Installing and configuring printers, Configuring Options and Default Settings, Maintenance and Troubleshooting of Printers, Troubleshooting Printer Issues, Common Problems and Solution.

Practice - Disassembling & Assembling computer.

UNIT – IV: Assembling and Disassembling of Computer

Computer Assembling- Installation of Motherboard, Drives, Cables and Adapter Cards; Disassembling the Computer- Cables, RAM, Motherboard, Heatsink, Hard drives; BIOS Beep Codes and Setup, BIOS and UEFI Configuration, Upgradation and Configuration of a computer.

Practice - Troubleshooting and Preventive Maintenance

UNIT – V: Preventive Maintenance and Troubleshooting

Preventive Maintenance and the Troubleshooting Process, Benefits, Tasks; Inspection of Internal Components; Problem in the Computer: Identification, Root Cause; Plan of Action, Resolution of the problem and implementation.

Practice - Create, rename, and manage files and folders.

Textbooks:

1. Introduction to IT essentials Version 6 by CISCO
2. Fundamentals of Computers by Balagurusamy.

Reference Books:

1. Fundamentals of computers by Rajaraman
2. Computer Fundamentals Course by Anita Goel

Web Links:

1. https://www.cisco.com/c/en/us/solutions/enterprise-networks/what-is-computer-networking.html
2. https://www.kaspersky.com/resource-center/definitions/what-is-cyber-security
3. https://www.computerhistory.org/
4. https://www.geeksforgeeks.org/introduction-of-operating-system-set-1/
5. https://www.tutorialspoint.com/computer_fundamentals/

Introduction to Cyber Security

L	T	P	C
2	0	2	4

Course Code: 2510FS22

Semester -I

Course Outcomes:

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

CO1: Explain the fundamental concepts, threats, and domains of cybersecurity.
CO2: Apply ethical hacking principles and cybersecurity safeguards to secure information systems.
CO3: Apply data protection, encryption, and privacy techniques to secure digital information.
CO4: Analyze cybercrime categories and their impact on digital systems.
CO5: Analyze information gathering techniques for cybersecurity assessment

Mapping of Course Outcomes with Program Outcomes:

CO/PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11
CO1	3	2	3	3	2	2	1	3	2	2	1
CO2	2	1	1	2	3	2	3	2	1	1	2
CO3	3	2	3	3	2	2	1	3	2	1	1
CO4	2	1	1	2	3	2	3	2	2	3	3
CO5	3	3	3	3	2	3	2	3	3	2	2

Mapping of course outcomes with program outcomes:

CO/PSO	PSO1	PSO2
CO1	3	2
CO2	1	3
CO3	3	2
CO4	2	3
CO5	3	2

Unit-Wise Syllabus:

UNIT – I: Introduction to Cybersecurity

Overview of cybersecurity: Need for cybersecurity, security vulnerabilities, attack trends, and cyber threats. Cybersecurity domains: Overview of cyber domains, role of cybersecurity professionals

Practice - Footprinting & Reconnaissance – Use tools like whois, nslookup.

UNIT – II: Ethical Hacking & Cybersecurity Principles

Ethical Hacking fundamental and Stages, vulnerability research, steganography. Cybersecurity cube: Three dimensions of cybersecurity (confidentiality, integrity, availability - CIA Triad). Implementing security safeguards and countermeasures to prevent unauthorized access.

Practice - Network Traffic Analysis – Capture and analyze packets using Wireshark.

UNIT – III: Understanding of Data

Type of data: Data at rest, in transit, and in process. Challenges of data protection, encryption techniques, data privacy.

Practice - Password Cracking Techniques – Perform brute-force and dictionary attacks

UNIT – IV: Cybercrime Categories

What is cybercrime? Cybercrime categories. Types of cybercrimes: Email-based crimes, phishing, intellectual property violations, web defacement, financial frauds, social media threats (cyberstalking, fake news, propaganda), and malware-related attacks.

Practice - File System Analysis & Digital Forensics – Analyze NTFS and UNIX file structures using Autopsy & FTK Imager.

UNIT – V: Information Gathering Methodologies

Footprinting - Passive and Active, social engineering, DNS enumeration, Understanding on Surface web, Dark web & Deep web.

Practice - Web Security Testing – Perform vulnerability scanning.

Textbooks:

1. **William Stallings** – *Cryptography and Network Security*
2. **Charles P. Pfleeger** – *Security in Computing*

Reference Books:

1. Kevin Mitnick – *The Art of Invisibility*
2. Bruce Schneier – *Secrets & Lies: Digital Security in a Networked World*

Web Links:

1. Cybersecurity Basics - Cybrary
2. Kali Linux Penetration Testing - Offensive Security
3. OWASP Security Resources
4. NIST Cybersecurity Framework
5. https://www.cisco.com/site/in/en/learn/topics/security/what-is-cybersecurity.html

Introduction to Digital Forensics

L	T	P	C
2	0	2	4

Course Code: 2510FS23

Semester -I

Course Outcomes:

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

CO1: Explain the fundamental concepts and investigation process of digital forensics.
CO2: Analyze computer, network, and email artifacts using digital forensic techniques
CO3: Apply digital evidence acquisition and integrity verification techniques.
CO4: Analyze mobile and memory forensic data using standard forensic techniques.
CO5: Analyze the legal and ethical aspects of digital forensic investigations.

Mapping of Course Outcomes with Program Outcomes:

CO/PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11
CO1	3	2	2	3	2	2	1	2	2	1	1
CO2	3	3	3	3	2	2	1	3	2	1	1
CO3	3	3	3	2	2	3	2	3	2	2	1
CO4	3	3	3	3	2	3	1	3	2	2	1
CO5	2	1	1	2	3	3	3	2	2	2	2

Mapping of course outcomes with program outcomes:

CO/PSO	PSO1	PSO2
CO1	3	2
CO2	3	2
CO3	3	3
CO4	3	2
CO5	2	3

6

Unit-Wise Syllabus:

UNIT – I: Fundamentals of Digital Forensics

Definition, scope, and evolution of cyber forensics. Digital forensic investigation process: identification, collection, analysis, preservation, and presentation of digital evidence. Challenges in cyber forensics and ethical responsibilities of forensic investigators.

Practice – Forensic imaging using FTK

UNIT – II: Computer and Network Forensics

File system forensics: FAT, NTFS, EXT file structures and metadata analysis. Techniques for recovering deleted and hidden data. Windows and Linux artifact analysis: logs, registry entries, system files. Network forensics: packet sniffing, intrusion detection, log analysis. Email forensics: header analysis, tracking email origins, identifying phishing attempts. Tools for forensic analysis of networks and systems.

Practice - File system acquisition techniques

UNIT – III: Digital Evidence and Data Acquisition

Types of digital data: volatile and non-volatile data. Importance of evidence collection, preservation, and integrity verification. Chain of custody and forensic best practices. Understanding of Forensic imaging and disk cloning techniques. Hashing algorithms (MD5, SHA) for integrity verification. Data acquisition methods: live and dead forensics.

Practice - Email header analysis

UNIT – IV: Mobile and Memory Forensics

Mobile forensics methodologies for Android and iOS. Memory forensics: RAM analysis, identifying malicious processes. Anti-forensic techniques and challenges in mobile investigations.

Practice - Basic - Mobile forensic data analysis

UNIT – V: Legal and Ethical Aspects of Cyber Forensics

Cyber laws and regulations: Information Technology (IT) Act 2000 (Digital India Act, 2023). Admissibility of digital evidence in court. Ethical practices for forensic investigations and reporting. Privacy issues, data protection laws.

Practice - Legal documentation and Digital forensic report writing

Textbooks:

1. "Digital Forensics and Cyber Crime" – Springer, ISBN: 978-3319255111
2. "Guide to Computer Forensics and Investigations" – Cengage Learning, ISBN: 978-1285060033

Reference Books:

1. "Incident Response & Computer Forensics" – McGraw-Hill Education, ISBN: 978-0071798686
2. "Digital Evidence and Computer Crime" – Academic Press, ISBN: 978-0123742681

Web Links:

1. National Institute of Standards and Technology (NIST) Forensics Guide
2. Volatility Framework for Memory Forensics
3. https://www.sans.org/profiles/sans-dfir/
4. https://www.geeksforgeeks.org/cyber-forensics
5. https://www.eccouncil.org/train-certify/computer-hacking-forensic-investigator-chfi/

Operating Systems Forensics

L	T	P	C
3	0	1	4

Course Code: 2510FS24

Semester -II

Course Outcomes:

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

CO1: Understand the fundamentals of operating systems, their functions, structures, and evolution.
CO2: Analyze process management, memory management, and file systems in different operating systems.
CO3: Investigate digital forensic artifacts from Windows, Linux, and macOS operating systems.
CO4: Perform disk and memory forensics, analyze system logs, and detect unauthorized access.
CO5: Develop scripts for automating forensic investigations using shell scripting and command-line utilities.

Mapping of Course Outcomes with Program Outcomes:

CO/PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11
CO1	3	2	2	3	2	2	1	2	2	1	1
CO2	3	2	3	3	2	2	1	3	2	2	1
CO3	3	3	3	3	2	3	2	3	2	2	1
CO4	3	3	3	3	2	3	1	3	2	2	1
CO5	3	2	3	3	2	2	1	3	3	2	1

Mapping of course outcomes with program outcomes:

CO/PSO	PSO1	PSO2
CO1	2	1
CO2	3	1
CO3	3	2
CO4	3	2
CO5	3	1

Unit-Wise Syllabus:

UNIT – I: Fundamentals of Operating Systems

Operating system: Introduction, Goals, Functions, Evolution, Future; Concept of Virtual Machine (Virtualization, hypervisors, guest OS vs. host OS, forensic implications).

Practice - Windows Registry Forensics – Extract and analyze Windows registry

UNIT – II: OS Structure

OS Components: Process Management, Memory Management - Main & Secondary, File Systems Management, Input/Output Management, Networking, Protection System, Command-Interpreter System. System Structure: Introduction, MS DOS System Structure, UNIX System Structure, Layered Structure.

Practice - Linux Log Analysis – Investigate syslogs

UNIT – III: File System Forensics

Windows File Systems: FAT, NTFS, ExFAT – metadata structures, timestamps, forensic analysis techniques. Linux File Systems: ext, ext2, ext3, ext4 – inode structure, journal analysis, forensic recovery. Apple File System (APFS): Structure, snapshots, metadata, and forensic importance. File System Metadata & Timestamps: MFT (Master File Table), deleted file recovery, forensic implications of different file system structures. Live System Forensics: Investigating running processes, open files, network connections.

Practice - Memory Forensics using Volatility – Analyze a memory dump to detect malicious activities.

UNIT – IV: Process & Memory Management

Fundamentals of processes and memory in operating systems. Process concepts: Process states, transitions, control blocks and context switching. Basics of threads, multithreading. Concepts of memory management: logical Vs physical addresses, types of memory allocation, fragmentation, paging.

Practice - File System Analysis – Compare NTFS and ext4

UNIT – V: Shell Scripting & OS Log Analysis

Introduction to Shell scripting, writing a script, shell commands, decision making, arithmetic operation, loop, conditional execution and executing a shell script in Linux environment. Windows Event Logs: Log types (Application, Security, System), event ID analysis. Linux System Logs: Syslog, authentication logs, system monitoring commands (dmesg, journalctl).

Practice - Create a Timeline of user activity using log files and prefetch data.

Textbooks:

1. Brian Carrier – File System Forensic Analysis
2. Michael Hale Ligh et al. – The Art of Memory Forensics

Reference Books:

1. Operating Systems: Principles and Practice, by Thomas Anderson, Michael Dahlin, Recursive Books, 2012.
2. Operating System Concepts by Abraham Silberschatz & Peter Galvin.

Web Links:

1. https://www.sans.org/digital-forensics-incident-response/
2. https://www.volatilityfoundation.org/
3. https://forensicswiki.xyz/
4. https://www.hackthebox.com/blog/windows-event-log-analysis-tools#:~:text=Windows%20event%20log%20analysis%20is,happened%2C%20when%2C%20and%20why.
5. https://www.osforensics.com/

Mobile Forensics

L	T	P	C
2	0	2	4

Course Code: 2510FS25

Semester -II

Course Outcomes:

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

CO1: Understand mobile device architecture, security mechanisms, and vulnerabilities.
CO2: Perform mobile forensic investigations using industry-standard tools and methodologies.
CO3: Extract, analyze, and interpret mobile data, including encrypted and deleted files.
CO4: Utilize forensic methodologies for Android, iOS, and other mobile platforms.
CO5: Apply legal and ethical principles in handling mobile forensic evidence and ensuring its admissibility in court.

Mapping of Course Outcomes with Program Outcomes:

CO/PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11
CO1	3	2	2	3	2	2	1	2	2	1	1
CO2	3	3	3	3	2	3	1	3	2	2	1
CO3	3	3	3	3	2	3	1	3	2	2	1
CO4	3	3	3	3	2	3	1	3	2	2	1
CO5	2	2	2	2	3	3	3	2	2	2	2

Mapping of course outcomes with program outcomes:

CO/PSO	PSO1	PSO2
CO1	3	2
CO2	3	2
CO3	3	2
CO4	3	2
CO5	2	3

Unit-Wise Syllabus:

UNIT – I: Fundamentals of Mobile Forensics

Introduction to mobile forensics: definition, importance, and challenges. Mobile device components: hardware and software architecture, file systems, and storage mechanisms. Mobile

forensic challenges: encryption, anti-forensic techniques, and cloud-based storage. Mobile forensic evidence extraction process and best practices for securing, preserving, and documenting mobile evidence.

Practice - Mobile device forensic imaging using Autopsy

UNIT – II: Android Forensics

Android OS architecture: Linux kernel, libraries, application framework and app layer. Android security mechanisms: sandboxing, application permissions, secure inter-process communication, and encryption. Android file system structure: EXT, YAFFS, F2FS. Android forensic setup and pre-data extraction techniques. Screen lock bypassing methods and gaining root access. Data extraction techniques: manual, logical, physical, and file system acquisition.

Practice - Data recovery and forensic analysis of deleted files

UNIT – III: iOS Forensics

Internals of iOS Devices, File system, The HFS Plus file system, Disk Layout, iPhone operating system, Data Acquisition via a custom ram disk, Data Acquisition from iOS backups, iCloud backup.

Practice - Investigation of mobile malware.

UNIT – IV: Mobile Data Recovery and Analysis

Potential evidence stored in mobile devices: call logs, messages, browsing history, multimedia files, GPS data, and cached data. Mobile malware analysis: detecting and analyzing malicious applications, Data recovery techniques: forensic imaging, file carving, and deleted data recovery. Forensic tools for mobile data extraction and analysis: MOBILedit, and Autopsy.

Practice - Extract and Analyze App Data from Android

UNIT – V: Legal and Ethical Aspects of Mobile Forensics

Rules of evidence: admissibility, authenticity, integrity, and reliability. Chain of custody and forensic documentation best practices. Privacy concerns and ethical challenges in mobile forensics investigations. Case studies of mobile forensic investigations.

Practice - Acquire Logical Image of an Android phone using MOBILedit

Textbooks:

1. Eoghan Casey, *Handbook of Digital Forensics and Investigation*, Academic Press, ISBN: 978-0123742674

2. Andrew Hoog, *Android Forensics: Investigation, Analysis, and Mobile Security for Google Android*, Syngress, ISBN: 978-1597496513

Reference Books:

1. Rohas Nagpal, *Mobile Device Forensics: A Guide to Evidence Collection, Analysis, and Presentation*, Springer, ISBN: 978-3030873276
2. Satish Bommisetty, *Learning Android Forensics*, Packt Publishing, ISBN: 978-1783288983

Web Links:

1. https://csrc.nist.gov/publications/detail/sp/800-101/rev-1/final
2. https://www.sans.org/cyber-security-courses/mobile-device-forensics/
3. https://www.magnetforensics.com/mobile-forensics/
4. https://www.cellebrite.com/en/mobile-forensics/
5. https://www.sans.org/cyber-security-courses/smartphone-forensic-analysis-in-depth/

Forensic Computing

L	T	P	C
2	0	2	4

Course Code: 2510FS26

Semester -II

Course Outcomes:

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

CO1: Understand fundamental concepts, principles, and methodologies of computer forensics.
CO2: Analyze and recover digital evidence from various computer systems and storage media.
CO3: Apply forensic tools to investigate cybercrimes and analyze system logs.
CO4: Understand legal, ethical, and procedural aspects of digital investigations.
CO5: Perform forensic analysis of file systems, memory, and network traffic.

Mapping of Course Outcomes with Program Outcomes:

CO/PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11
CO1	3	2	2	3	2	2	1	2	2	1	1
CO2	3	3	3	3	2	3	1	3	2	2	1
CO3	3	3	3	3	2	3	1	3	2	2	1
CO4	2	2	2	2	3	3	3	2	2	2	2
CO5	3	3	3	3	2	3	1	3	3	2	1

Mapping of course outcomes with program outcomes:

CO/PSO	PSO1	PSO2
CO1	3	2
CO2	3	2
CO3	3	2
CO4	2	3
CO5	3	2

Unit-Wise Syllabus:

UNIT – I: Introduction to Forensic Computing

Definition & Scope: Understanding digital forensics, importance, Hard drives, memory dumps, logs, network traffic, and cloud-based evidence. Operating system, Cybercrime Investigation Process: Identification, collection, examination, analysis, and reporting.

Practice - Perform logical Extractions.

UNIT – II: Memory, Email & Network Forensics

RAM Forensics: Importance of volatile data, memory dump acquisition tools. Network Forensics: Packet capturing and analysis using Wireshark, identifying suspicious traffic. Email & Web Artifacts: Analyzing headers, detecting phishing, reviewing browser history and cache.

Practice - Analyze a RAM dump using Volatility.

UNIT – III: Data Recovery & Anti-Forensics

File Recovery: Techniques for recovering deleted files, basics of forensic. Data Hiding Methods: Introduction to steganography, encryption basics, alternate data streams. Anti-Forensics Awareness: Common evasion techniques, wiping tools, and evidence tampering. Metadata & Hidden Data: Extracting EXIF data, hidden properties in documents and media files.

Practice - Metadata Analysis of images and documents.

UNIT – IV: Digital Evidence Collection & Analysis

Forensic Acquisition Techniques: Disk imaging (Bit-by-Bit Copy), live vs. dead acquisition, tools (FTK Imager, Autopsy, EnCase). Windows Forensics:Registry analysis, event logs, prefetch files, USB tracking, Analysis of Windows artifacts: Recycle Bin, LNK files, Jumplists. Linux & macOS Forensics: Log files, shell history, cron jobs, system processes.

Practice - Extract USB Usage Logs and build a timeline of USB activity on Windows.

UNIT – V: Reporting & Presentation of Digital Evidence

Forensic Report Writing: Structure of forensic reports, documentation best practices. Courtroom Testimony & Expert Witness Role: Understanding legal procedures, cross-examination preparation.

Practice - Perform File System Analysis on NTFS or FAT32.

Textbooks:

1. Eoghan Casey – *Handbook of Digital Forensics and Investigation.*

2. Brian Carrier – *File System Forensic Analysis.*

Reference Books:

1. Chris Pogue – *Unix and Linux Forensic Analysis.*
2. Niranjan Reddy – *Mastering Memory Forensics.*

Web Links:

1. https://www.dfir.training/
2. https://www.sans.org/digital-forensics-incident-response/
3. https://www.autopsy.com/
4. https://www.volatilityfoundation.org/
5. https://www.autopsy.com/

Cryptography

L	T	P	C
3	0	1	4

Course Code: 2510FS40

Semester -III

Course Outcomes:

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

CO1: Understand the fundamentals of cryptographic techniques and security principles.
CO2: Analyze different cryptographic algorithms and their applications.
CO3: Implement and evaluate symmetric and asymmetric encryption techniques.
CO4: Apply cryptographic techniques for authentication and secure communication.
CO5: Assess vulnerabilities and attacks on cryptographic systems.

Mapping of Course Outcomes with Program Outcomes:

CO/PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11
CO1	3	2	2	3	2	2	1	2	2	1	1
CO2	3	2	3	3	2	2	1	3	2	2	1
CO3	3	2	3	3	2	2	1	3	2	2	1
CO4	3	2	3	3	2	2	2	3	2	2	2
CO5	3	2	3	3	2	2	1	3	3	2	1

Mapping of course outcomes with program outcomes:

CO/PSO	PSO1	PSO2
CO1	3	2
CO2	3	2
CO3	3	2
CO4	3	3
CO5	3	3

Unit-Wise Syllabus:

UNIT – I: Fundamentals of Cryptography

Introduction to Cryptography and cryptographic techniques. Concepts of plaintext, ciphertext, encryption, and decryption. Symmetric and asymmetric key cryptography. Key range, key size, and cryptanalysis techniques.

Practice - Implementing encryption and decryption

UNIT – II: Understanding on Cryptographic Algorithms

Symmetric Key Ciphers: Principles of block ciphers. DES, AES, Blowfish, RC5, IDEA. Block cipher operations and stream ciphers. RC4 stream cipher. Asymmetric Key Cryptography: Principles of RSA algorithm. Diffie-Hellman key exchange.

Practice - Generate Hashes (MD5, SHA-256) of files and compare them using HashCalc or online tools.

UNIT – III: Authentication and Key Management

Cryptographic Hash Functions:Message authentication techniques. Secure Hash Algorithm (SHA-512). Message Authentication, Key Management and Distribution: Symmetric and asymmetric key distribution. Public Key Infrastructure (PKI)

Practice - Simulate Brute Force Attack.

UNIT – IV: Cryptographic Applications and Protocols

Transport Layer Security (TLS) and Secure Sockets Layer (SSL). Cryptographic protocols for secure communication. Email Security: Pretty Good Privacy (PGP). Wireless security: WPA, WPA2, and WPA3 encryption techniques. Quantum Cryptography: Concepts and future impact on cybersecurity.

Practice - Use OpenSSL to encrypt/decrypt text and explore certificates.

UNIT – V: Attacks on Cryptographic Systems

Introduction to cryptographic attacks: Brute Force & Dictionary Attacks, Ciphertext Only, Known-Plaintext, and Chosen-Plaintext Attacks, MITM Attacks, Side Channel Attacks, Cryptanalysis Techniques, Attacks on Hash Functions, Preventive Strategies.

Practice - Create a Digital Signature using GnuPG.

Textbooks:

1. William Stallings – *Cryptography and Network Security: Principles and Practice*.
2. Bruce Schneier – *Applied Cryptography: Protocols, Algorithms, and Source Code in C*.

Reference Books:

1. Christof Paar, Jan Pelzl – *Understanding Cryptography: A Textbook for Students and Practitioners*.
2. Jonathan Katz, Yehuda Lindell – *Introduction to Modern Cryptography*.

Web Links:

1. https://csrc.nist.gov/
2. https://crypto101.io/
3. https://cheatsheetseries.owasp.org/cheatsheets/Cryptographic_Storage_Cheat_Sheet.html
4. https://eprint.iacr.org/
5. https://www.geeksforgeeks.org/difference-between-steganography-and-cryptography/

Steganography

L	T	P	C
2	0	2	4

Course Code: 2510FS41

Semester -III

Course Outcomes:

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

CO1: Understand fundamental concepts and techniques of steganography.
CO2: Analyze different steganographic methods and their security implications.
CO3: Apply digital watermarking and data hiding techniques for secure communication.
CO4: Evaluate steganalysis methods for detecting hidden data.
CO5: Implement steganographic techniques and assess their effectiveness.

Mapping of Course Outcomes with Program Outcomes:

CO/PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11
CO1	3	2	2	3	2	2	1	2	2	1	1
CO2	3	2	3	3	2	2	1	3	2	2	1
CO3	3	2	3	3	2	2	2	3	2	2	2
CO4	3	2	3	3	2	2	1	3	3	2	1
CO5	3	2	3	3	2	2	1	3	3	2	1

Mapping of course outcomes with program outcomes:

CO/PSO	PSO1	PSO2
CO1	3	2
CO2	3	3
CO3	3	3
CO4	3	2
CO5	3	2

Unit-Wise Syllabus:

UNIT – I: Fundamentals of Steganography

Introduction to Steganography: Concept, history, importance in cybersecurity. Comparison with Cryptography: Differences and complementary roles. Properties of Steganographic Systems: Security, capacity, robustness. Types of Steganography: Text steganography, Image steganography, Audio & Video steganography.

Practice - Embedding hidden messages in audio files

UNIT – II: Steganalysis - Detecting Hidden Data

Concepts and Challenges in Steganalysis. Blind vs. Targeted Steganalysis. Detection Techniques: Statistical steganalysis, Machine learning-based approaches, Signature-based detection. Countermeasures and Mitigation Strategies.

Practice - Analyzing steganographic images for detection of hidden data.

UNIT – III: Image and Audio Steganography

Image Steganography: Basics of hiding data in images using LSB (Least Significant Bit) technique. Overview of file formats (PNG, JPEG) and how they affect steganography. Audio Steganography: Techniques to hide data in audio files using LSB and echo hiding. Understanding WAV and MP3 formats for steganographic use. Tools and Demonstrations: Introduction to simple tools like OpenStego, SilentEye for image/audio hiding.

Practice - Using forensic tools to detect steganographic content in images.

UNIT – IV: Video and Network Steganography

Video Steganography: Introduction to hiding data in video streams, techniques such as LSB in frames, motion vector manipulation. Common formats (MP4, AVI) and challenges in data embedding.

Network Steganography: Concept of covert channels in network protocols. Methods of hiding data in TCP/IP headers, DNS queries, HTTP payloads. Real-world examples and detection mechanisms.

Practice - Perform Video Steganography

UNIT – V: Applications and Case Studies

Steganography in Cybercrime. Use in Secure Communications and Covert Messaging. Forensic Investigation of Hidden Data. Legal and Ethical Considerations of Data Hiding.

Practice - Compare File Size and Hex Values of original and stego images to detect hidden data.

Textbooks:

1. Neil F. Johnson – *Steganography: Techniques for Digital Data Security*.
2. Jessica Fridrich – *Steganography in Digital Media: Principles, Algorithms, and Applications*.

Reference Books:

1. Ross Anderson – *Security Engineering: A Guide to Building Dependable Distributed Systems*.
2. Peter Wayner – *Disappearing Cryptography*.

Web Links:

1. https://www.forensicfocus.com/
2. https://arxiv.org/
3. https://www.simplilearn.com/what-is-steganography-article
4. https://www.geeksforgeeks.org/difference-between-steganography-and-cryptography/
5. https://www.geeksforgeeks.org/what-is-steganography/

Digital Media Forensics

L	T	P	C
2	0	2	4

Course Code: 2510FS42

Semester -III

Course Outcomes:

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

CO1: Analyze digital images, videos, and audio for forensic investigations.
CO2: Detects and investigates forgery, tampering, and deepfake content.
CO3: Apply forensic techniques to extract and authenticate multimedia metadata.
CO4: Use forensic tools to enhance, recover, and validate multimedia evidence.
CO5: Understand legal frameworks and ethical concerns in multimedia forensics.

Mapping of Course Outcomes with Program Outcomes:

CO/PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11
CO1	3	2	3	3	2	2	1	3	2	1	1
CO2	3	2	3	3	2	2	1	3	2	2	1
CO3	3	3	3	3	2	3	2	3	2	2	1
CO4	3	3	3	3	2	3	1	3	2	2	1
CO5	2	2	2	2	3	3	3	2	2	2	2

Mapping of course outcomes with program outcomes:

CO/PSO	PSO1	PSO2
CO1	3	2
CO2	3	3
CO3	3	2
CO4	3	2
CO5	2	3

Unit-Wise Syllabus:

UNIT – I: Introduction to Digital Media Forensics

Introduction to Digital Media Forensics: Definition, importance, and applications in law enforcement, journalism, and cybercrime investigations. Types of multimedia evidence: images, videos, audio, and metadata. Basic principles of digital imaging: pixel representation, compression techniques (JPEG, PNG, MP4, MP3), and steganography. Role of metadata in forensics: EXIF data, geotagging, timestamps, and device identification. Challenges in multimedia forensics: format inconsistencies, data manipulation, and storage artifacts.

Practice - Video analysis for frame manipulation and deepfake detection.

UNIT – II: Image Forensics

Image authentication techniques: source camera identification, sensor noise analysis, and PRNU (Photo Response Non-Uniformity). Image forgery detection: copy-move forgery, splicing, resampling, and compression artifacts. Steganalysis: detecting hidden messages using statistical and deep learning techniques. Image enhancement and recovery: sharpening, denoising, contrast adjustments, and restoration of degraded images. Forensic tools for image analysis: Amped Authenticate, Ghiro.

Practice - Check Image Tampering using tools like FotoForensics or Ghiro.

UNIT – III: Video Forensics

Video evidence acquisition: sources, formats, frame rates, and encoding techniques. Video forgery detection: frame duplication, frame insertion/deletion, and inter-frame inconsistencies. Deepfake detection: AI-based manipulation techniques, facial morphing, and deep learning models for detecting synthetic content. Video enhancement techniques: stabilization, noise reduction, and motion analysis.

Practice - Inspect Audio File Integrity and metadata using Audacity or Sonic Visualizer.

UNIT – IV: Audio Forensics

Fundamentals of digital audio: sampling, bitrate, codecs, and compression techniques. Audio authentication: voice profiling, microphone forensics, and tampering detection. Noise reduction and speech enhancement techniques. Speaker identification and voice cloning detection. Deepfake audio detection and forensic speaker verification. Forensic tools for audio analysis: Adobe Audition, Praat, GoldWave, and WaveSurfer.

Practice - Perform Hash Matching for multimedia files using MD5/SHA256 to detect tampering.

UNIT – V: Speaker Identification

Speaker identification: Introduction, Need, Scope, Human Vocal Tract, Production & Description of Speech Sound, Speech Signal Processing and Pattern Recognition; Forensic phonetics and phonetic transcription, Methods of speaker identification: auditory and spectrographic analysis, Spectrographic cues for Vowels and Consonants, Automatic Speaker Identification System, Collection of voice samples: methods and challenges.

Practice - Use Hex Editor to detect steganography or abnormal image structure.

Textbooks:

1. Hany Farid, *Photo Forensics*, MIT Press, ISBN: 978-0262038936
2. Zeno Geradts & Katrin Franke, *Multimedia Forensics and Security*, Springer, ISBN: 978-3030276176
3. Alan Cooper, *Digital Evidence and Computer Crime*, Elsevier, ISBN: 978-0123742685

Reference Books:

1. Husrev Taha Sencar, *Digital Image Forensics: There is More to a Picture than Meets the Eye*, Springer, ISBN: 978-3642123363
2. Alan C. Bovik, *Handbook of Image and Video Processing*, Academic Press, ISBN: 978-0128119055

Web Links:

1. https://www.nist.gov/itl/iad/multimedia-forensics
2. https://deepware.ai/
3. https://detectdeepfakes.mit.edu/
4. https://29a.ch/photo-forensics/
5. https://www.researchgate.net/publication/366570127_IoT_with_Multimedia_Investigation_A_Secure_Process_of_Digital_Forensics_Chain-of-Custody_using_Blockchain_Hyperledger_Sawtooth

Network Security

L	T	P	C
3	0	1	4

Course Code: 2510FS43

Semester -IV

Course Outcomes:

CO1: Understand fundamental concepts and principles of network security.
CO2: Analyze various security threats, vulnerabilities, and attacks in networks.
CO3: Implement cryptographic techniques for securing network communication.
CO4: Apply security protocols and technologies for network protection.
CO5: Evaluate network security risks and implement mitigation strategies.

Mapping of Course Outcomes with Program Outcomes:

CO/PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11
CO1	3	2	2	3	2	2	1	2	2	1	1
CO2	3	2	3	3	2	2	1	3	2	2	1
CO3	3	2	3	3	2	2	1	3	2	2	1
CO4	3	3	3	3	2	3	1	3	2	2	1
CO5	3	3	3	3	2	3	2	3	3	2	1

Mapping of course outcomes with program outcomes:

CO/PSO	PSO1	PSO2
CO1	3	2
CO2	3	2
CO3	3	3
CO4	3	2
CO5	3	3

Unit-Wise Syllabus:

UNIT – I: Introduction to Network Security

Fundamentals of network security. Security services and mechanisms. Security policies and access control. Overview of common network security tools. OSI layers, TCP/IP.

Practice - Implementing a basic firewall using iptables in Linux.

UNIT – II: Cryptographic Techniques in Network Security

Role of cryptography in network security. Symmetric key cryptography (AES, DES, Blowfish). Asymmetric key cryptography (RSA, Diffie-Hellman). Hashing techniques: MD5, SHA-256, SHA-512. Digital signatures and certificates. Key management and distribution. Public Key Infrastructure (PKI).

Practice - Securing web communication using SSL/TLS encryption.

UNIT – III: Network Security Threats and Attacks

Malware Attacks: Viruses, Worms, Trojans, Ransomware. Network-based Attacks: Man-in-the-Middle (MITM), Session Hijacking, DoS/DDoS Attacks. Web Security Attacks: SQL Injection, Cross-Site Scripting (XSS), Cross-Site Request Forgery (CSRF). Evil Twin Attacks, Eavesdropping. Insider Attacks and Social Engineering Tactics.

Practice - Setting up and configuring VPN

UNIT – IV: Network Security Protocols and Mechanisms

Overview of common network security protocols like SSL/TLS (used in HTTPS), IPSec (for secure IP communication), SSH (for secure remote access), and HTTPS. Understanding firewalls, VPNs, and Intrusion Detection/Prevention Systems (IDS/IPS). Role of authentication protocols such as RADIUS and Kerberos.

Practice - Detecting intrusions using Snort IDS.

UNIT – V: Advanced Network Security and Risk Management

Wireless Network Security: WEP, WPA, WPA2. Cloud Security: Security challenges in cloud computing, CASB, Secure Access Service Edge (SASE). IoT Security: Threats, Secure IoT Communication, Blockchain-based Security. Penetration Testing and Ethical Hacking Techniques. Security Information and Event Management (SIEM). Risk Assessment and Security Auditing. Incident Response and Disaster Recovery Planning.

Practice - Use OpenVAS to scan a system and identify security vulnerabilities.

Text Books:

1. William Stallings – *Network Security Essentials: Applications and Standards*.
2. Charlie Kaufman, Radia Perlman, Mike Speciner – *Network Security: Private Communication in a Public World*.

Reference Books:

1. Bruce Schneier – *Applied Cryptography: Protocols, Algorithms, and Source Code in C*.
2. Eric Cole – *Hacker Techniques, Tools, and Incident Handling*.

Web Links:

1. https://www.nist.gov/cyberframework
2. https://owasp.org/www-project-top-ten/
3. https://isc.sans.edu/
4. https://attack.mitre.org/
5. https://www.cisco.com/c/en_in/products/security/what-is-network-security.html

Malware Analysis

L	T	P	C
2	0	2	4

Course Code: 2510FS44

Semester -IV

Course Outcomes:

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

CO1: Understand the fundamentals and types of malwares.
CO2: Identify how malware spreads and impacts systems.
CO3: Perform basic static and dynamic analysis of malware.
CO4: Use tools to analyze, detect, and classify malware.
CO5: Recommend appropriate countermeasures for malware attacks.

Mapping of Course Outcomes with Program Outcomes:

CO/PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11
CO1	3	2	2	3	2	2	1	2	2	1	1
CO2	3	2	3	3	2	2	1	3	2	2	1
CO3	3	3	3	3	2	3	1	3	2	2	1
CO4	3	3	3	3	2	3	1	3	2	2	1
CO5	3	2	3	3	2	3	2	3	3	2	1

Mapping of course outcomes with program outcomes:

CO/PSO	PSO1	PSO2
CO1	3	2
CO2	3	2
CO3	3	2
CO4	3	2
CO5	3	3

Unit-Wise Syllabus:

UNIT – I: Introduction to Malware

Definition and purpose of malware. Types of malwares: viruses, worms, trojans, ransomware, spyware, adware, rootkits, and fileless malware. Real-world examples and trends in malware attacks.

Practice - Perform static analysis on a sample malware using PEStudio.

UNIT – II: Malware Techniques

Understanding how malware spreads through networks, emails, USBs, and downloads. Common attack vectors: phishing, drive-by downloads, malvertising, and exploit kits. Obfuscation and packing techniques.

Practice - Analyze malware network traffic using Wireshark.

UNIT – III: Static Malware Analysis

Analyzing malware without executing it. File structures: PE and ELF. Identifying strings, hashes, and metadata. Indicators of Compromise (IOC) and YARA Rules

Practice - Detects changes made by malware using RegShot.

UNIT – IV: Dynamic Malware Analysis

Executing malware in a controlled environment (sandboxing). Monitoring file system, registry, and network activity. Network Communication and Command and Control (C2).

Practice - Use VirusTotal to scan and understand malware behavior.

UNIT – V: Malware Detection and Countermeasures

Signature-based and behavior-based detection. Anti-virus vs. EDR. Analyzing logs and alerts. Basic reverse engineering. Incident response and system hardening techniques.

Practice - Execute malware in Cuckoo Sandbox and observe indicators of compromise.

Textbooks:

1. Michael Sikorski & Andrew Honig – *Practical Malware Analysis*
2. Alexey Kleymenov – *Malware Analyst's Cookbook*

Reference Books:

1. Eoghan Casey – *Digital Evidence and Computer Crime*
2. Christopher Elisan – *Advanced Malware Analysis*

Web Links:

1. https://malwareunicorn.org/
2. https://hex-rays.com/
3. https://practicalmalwareanalysis.com/
4. https://www.wireshark.org/docs/
5. https://www.e-spincorp.com/malware-analysis-techniques/

Vulnerability Assessment and Penetration Testing

L	T	P	C
2	0	2	4

Course Code: 2510FS45

Semester -IV

Course Outcomes:

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

CO1: Develop expertise in vulnerability assessment techniques and the use of security scanning tools.
CO2: Conduct network footprinting, scanning, and OS fingerprinting for cybersecurity analysis.
CO3: Identify and exploit web application vulnerabilities, including SQL injection and XSS.
CO4: Perform advanced password attacks and exploit security weaknesses using specialized tools.
CO5: Understand social engineering tactics and implement security countermeasures to mitigate human-based attacks.

Mapping of Course Outcomes with Program Outcomes:

CO/PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11
CO1	3	2	3	3	2	2	1	3	2	2	1
CO2	3	3	3	3	2	2	1	3	2	2	1
CO3	3	2	3	3	2	2	1	3	2	2	1
CO4	3	3	3	3	2	3	1	3	2	2	1
CO5	3	2	2	3	3	2	3	2	2	2	2

Mapping of course outcomes with program outcomes:

CO/PSO	PSO1	PSO2
CO1	3	2
CO2	3	2
CO3	3	2
CO4	3	1
CO5	2	2

Unit-Wise Syllabus:

UNIT I: Introduction to VAPT

Concept of vulnerabilities, threats, and exploits. Overview of VAPT process and phases. Legal and ethical aspects of penetration testing. Types of penetration testing: Black Box, White Box, and Gray Box. Introduction to ethical hacking.

Practice - Performing security scans on web applications and networks.

UNIT II: Reconnaissance and Scanning

Footprinting: Passive vs. Active Footprinting, Google Hacking database. Network scanning techniques: Ping, port scanning, service enumeration.

Practice - Network Scanning and OS Fingerprinting using Nmap – Identifying open ports, services, and network vulnerabilities.

UNIT III: Vulnerability Assessment

Introduction to vulnerability databases (CVE, NVD). Types of vulnerabilities: system, application, network, web. Vulnerability scanning tools: Nessus, OpenVAS. Interpreting scan results and prioritizing risks (CVSS Score).

Practice - SQL Injection and Cross-Site Scripting Attacks – Exploiting web applications using SQLMap and XSS vulnerabilities.

UNIT IV: Exploitation Techniques

Gaining access using exploits. Basics of buffer overflow, privilege escalation, and payloads. Web exploitation: SQL injection, XSS, CSRF.

Practice - Password Cracking using John the Ripper and Ophcrack – Recovering weak passwords using brute-force and dictionary attacks.

UNIT V: Reporting and Mitigation

Creating VAPT reports: format, risk rating, and remediation. Writing executive summaries and technical findings. Vulnerability mitigation techniques. Patch management, secure coding practices, and system hardening.

Practice - Security Posture evaluation report

Textbooks:

1. Georgia Weidman – *Penetration Testing: A Hands-On Introduction to Hacking*

2. Patrick Engebretson – *The Basics of Hacking and Penetration Testing*

Reference Books:

1. Kevin Mitnick & William L. Simon – *The Art of Deception: Controlling the Human Element of Security*
2. Stuart McClure, Joel Scambray, & George Kurtz – *Hacking Exposed: Network Security Secrets & Solutions*

Web Links:

1. https://purplesec.us/learn/vulnerability-assessment-vs-penetration-testing/
2. https://spp.org/documents/22755/vul_assess_video.pdf
3. https://www.nitttrchd.ac.in/imee/Labmanuals/Vulnerability%20Assessment.pdf
4. http://www.pentest-standard.org/
5. https://cheatsheetseries.owasp.org/cheatsheets/Vulnerability_Assessment_Cheat_Sheet.html

E- Governance

L	T	P	C
3	0	1	4

Course Code: 2510FS01

Semester -V

Course Outcomes:

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

CO1: Understand the basic concepts and models of e-Governance.
CO2: Analyze the role of ICT in improving public administration.
CO3: Evaluate e-Governance projects and digital service delivery.
CO4: Understand legal and security frameworks related to e-Governance.
CO5: Explore challenges, best practices, and global case studies.

Mapping of Course Outcomes with Program Outcomes:

CO/PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11
CO1	3	2	2	3	2	2	1	2	2	1	2
CO2	3	2	2	3	2	2	2	2	2	2	1
CO3	3	2	3	3	2	3	2	3	2	2	3
CO4	2	2	2	2	3	3	3	2	2	2	2
CO5	3	2	2	3	2	2	2	2	3	2	3

Mapping of course outcomes with program outcomes:

CO/PSO	PSO1	PSO2
CO1	1	2
CO2	2	2
CO3	2	2
CO4	2	3
CO5	1	2

Unit-Wise Syllabus:

UNIT – I: Introduction to E-Governance

Definition, objectives, and importance of e-Governance. Evolution of e-Governance in India. E-Government vs. E-Governance. Stakeholders in e-Governance. Role of ICT in public administration.

Practice - Study and report on a live e-Governance portal (e.g., DigiLocker).

UNIT – II: Models and Frameworks of E-Governance

Types of interactions: G2G, G2C, G2B, G2E. E-Governance maturity models. Phases of implementation. National e-Governance Plan (NeGP), Digital India initiative. Mission Mode Projects (MMPs). CCTNS.

Practice - Simulate a basic G2C service using a web form.

UNIT – III: Technology and Infrastructure for E-Governance

ICT infrastructure: hardware, software, and networking. Role of cloud computing, mobile technology, and open-source tools. National e-Governance Plan (NeGP). Mission Mode Projects (MMPs). Digital India initiative.

Practice - Prepare a presentation on e-Governance success story.

UNIT – IV: Legal and Security Aspects

Privacy and data protection. Cyber laws relevant to e-Governance. Digital signatures and e-authentication. Role of Certifying Authorities. Ensuring confidentiality, integrity, and availability in e-services.

Practice - Data Privacy and Data Protection (DPDP).

UNIT – V: Case Studies

Successful e-Governance projects in India: Aadhaar, UMANG, e-Hospital, CSCs, DigiLocker. Evaluation methods and impact assessment.

Practice - Develop a mini project plan for a hypothetical e-Governance service.

Textbooks:

1. Pankaj Sharma – *E-Governance: The New Age Governance*
2. Satyanarayana J. – *e-Government: The Science of the Possible*

Reference Books:

1. Subhash Bhatnagar – *Enhancing E-Governance Through ICT*
2. Richard Heeks – *Implementing and Managing e-Government*

Web Links:

1. https://digitalindia.gov.in/
2. https://egovstandards.gov.in/
3. https://www.mygov.in/
4. https://www.india.gov.in/
5. https://meity.gov.in/

Technology Law & Digital Rights

L	T	P	C
2	0	2	4

Course Code: 2510FS02

Semester -V

Course Outcomes:

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

CO1: Explain the fundamental concepts and legal framework of cyber law.
CO2: Analyze cybercrimes and the legal procedures for cybercrime investigation.
CO3: Apply intellectual property rights principles to protect digital assets in cyberspace.
CO4: Analyze copyright laws and software protection mechanisms in the digital environment.
CO5: Analyze the legal, ethical, and privacy issues related to cyberspace.

Mapping of Course Outcomes with Program Outcomes:

CO/PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11
CO1	2	1	1	2	3	2	2	2	2	1	2
CO2	2	2	2	2	3	3	3	2	2	2	2
CO3	2	1	1	2	3	3	3	2	2	2	2
CO4	3	2	2	3	3	3	3	2	2	2	2
CO5	2	1	1	2	3	3	3	2	2	2	3

Mapping of course outcomes with program outcomes:

CO/PSO	PSO1	PSO2
CO1	1	3
CO2	2	3
CO3	1	3
CO4	2	3
CO5	2	3

Unit-Wise Syllabus:

Unit I: Introduction to Cyber Law

Nature and scope of Cyber Law, Evolution of Cyber Law in India, Information Technology Act, 2000, Legal definitions: Electronic records, digital signatures, intermediaries. legal validity of digital communications.

Practice - Drafting a cybercrime FIR based on a case scenario.

Unit II: Cyber Crimes and Legal Framework

Types of cyber crimes: Hacking, data theft, identity fraud, cyberbullying, cyberstalking, phishing, cyberterrorism. Offenses and penalties under the IT Act and BNS. Role of CERT-In and cybercrime cells. Cyber investigation procedures and legal admissibility of digital evidence. Landmark Indian cyber crime cases and their legal interpretation.

Practice - Case study analysis on software piracy or domain name disputes.

Unit III: Intellectual Property Rights in the Digital World

Introduction to IPR: Copyright, Patent, Trademark, Design. Need for IPR protection in cyberspace. Infringement of IPR online: Music, video, software piracy, domain name disputes. Digital Rights Management (DRM) and licensing. Jurisdiction and cross-border IPR challenges

Practice - Comparative report on Indian IT Act vs. GDPR.

Unit IV: Copyrights and Software Protection

Copyright protection in software and digital content. Fair use and limitations in the digital environment. Software licensing: GPL, proprietary, open-source. WIPO Internet treaties and India’s compliance. Enforcement mechanisms and cyber piracy prevention

Practice - Presentation on famous copyright infringement.

Unit V: Cyberlaw, Privacy & Ethics

Right to Privacy and Data Protection laws in India. Supreme Court's Puttaswamy judgment and implications for digital privacy. GDPR overview and relevance to Indian businesses. Surveillance, monitoring, and ethical issues in cyberspace. Social media regulation, online content liability, and cyber ethics.

Practice - Creating a legal compliance checklist for a website.

Textbooks:

1. Vakul Sharma, *Information Technology Law and Practice*
2. Rodney Ryder, *Guide to Cyber Laws*

Reference Books:

1. *Justice Yatindra Singh, Cyber Laws*
2. *Nandan Kamath, Law Relating to Computers and the Internet*

Web Links:

1. https://www.meity.gov.in
2. https://www.wipo.int
3. https://www.indian Kanoon.org
4. https://www.cert-in.org.in
5. https://www.dgft.gov.in

Business Intelligence

L	T	P	C
2	0	2	4

Course Code: 2510FS03

Semester -V

Course Outcomes:

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

CO1: Understand the concepts of Business Intelligence and its role in cybersecurity.
CO2: Analyze security-related data using BI tools for decision making.
CO3: Detect and visualize cyber threats and incidents through dashboards and reports.
CO4: Apply predictive analytics and machine learning for threat forecasting.
CO5: Implement data governance, compliance, and ethical handling of sensitive data.

Mapping of Course Outcomes with Program Outcomes:

CO/PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11
CO1	3	2	2	3	2	2	1	2	2	1	2
CO2	3	2	3	3	2	2	1	3	2	2	1
CO3	3	3	3	3	2	3	2	3	2	2	1
CO4	3	2	3	3	2	2	1	3	3	2	1
CO5	2	2	2	2	3	3	3	2	2	2	2

Mapping of course outcomes with program outcomes:

CO/PSO	PSO1	PSO2
CO1	2	2
CO2	3	2
CO3	3	2
CO4	3	1
CO5	2	3

Unit-Wise Syllabus:

UNIT I: Introduction to Business Intelligence and Cybersecurity

Definition, architecture, and lifecycle of BI; Role of BI in cybersecurity: threat detection, incident analysis, fraud tracking. Use cases in cyber intelligence, SOCs, and SIEM integration.

Practice - Creating interactive dashboards using Tableau/Power BI for detected data.

UNIT II: Data Warehousing

Data warehousing concepts, extraction from log sources, transformation and loading. Data cleaning, normalization, and storage for security analysis.

Practice - Analyze a CSV Log File of firewall/IDS logs using Excel/Power BI for anomaly detection.

UNIT III: Data Visualization and Dashboards

Importance of visual analytics in cyber intelligence. Creating dashboards for attack trends, user behavior, anomalies. Using BI tools (Power BI / Tableau) for creating visual reports from security datasets.

Practice - Apply Clustering (e.g., K-Means) on cybersecurity threat data.

UNIT IV: Predictive Analytics and Machine Learning in Cybersecurity

Overview of data mining and ML for BI. Threat prediction models, anomaly detection, classification of threats. Case studies in fraud detection and phishing analysis.

Practice - Build a Basic BI Report tracking login attempts, failed logins, and user access behavior.

UNIT V: Governance, Risk, and Compliance in BI

Data privacy laws and secure data handling. Ethical use of BI in cybersecurity. Compliance frameworks: GDPR, ISO 27001, HIPAA. Auditing and logging practices using BI platforms.

Practice - Use Pivot Tables to analyze SIEM log data (sample data) and identify suspicious activity.

Textbooks:

1. R. N. Prasad, Seema Acharya – *Fundamentals of Business Analytics*.
2. Ralph Kimball – *The Data Warehouse Toolkit: The Definitive Guide to Dimensional Modeling*.

Reference Books:

1. David Loshin – *Business Intelligence: The Savvy Manager's Guide*.
2. Thomas Davenport – *Competing on Analytics: The New Science of Winning*.

Web Links:

1. https://learn.microsoft.com/en-us/power-bi/
2. https://www.oracle.com/big-data/what-is-a-data-warehouse/
3. https://www.ibm.com/think/topics/business-analytics
4. https://help.tableau.com/current/pro/desktop/en-us/gettingstarted_overview.htm
5. https://www.snowflake.com/trending/business-intelligence-tool/

Multidisciplinary Courses (MDC)

Course Code	Sem	Course Name	Level	L	T	P	C	CIE	SEE	Total	Pre-requisite
2510FS27	II	Fundamentals of Forensic Science	FC	**2**			**2**	50	50	100	-
2510FS04	V	Cyber Law	AC	**2**			**2**	50	50	100	-
2510FS05	VI	Cyber Criminology	AC	**2**			**2**	50	50	100	-
Total				**6**			**6**				

Fundamentals of Forensic Science

L	T	P	C
2	0	0	2

Course Code: 2510FS27

Semester II

Course Outcomes:
At the end of the course, students will be able to:

CO1: Explain the fundamental principles and scope of forensic science.

CO2: Demonstrate knowledge of various types of physical evidence and their forensic significance.

CO3: Understand the role of forensic experts and legal frameworks in the criminal justice system.

CO4: Apply forensic techniques in crime scene investigation and evidence collection.

CO5: Analyze forensic examination procedures for different types of evidence.

Mapping of Course Outcomes with Program Outcomes:

CO/PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11
CO1	3	2	2	3	2	2	1	2	2	1	1
CO2	3	3	3	2	2	2	1	3	2	1	1
CO3	2	1	1	2	3	2	3	2	1	2	2
CO4	3	3	2	2	3	2	3	2	2	2	1
CO5	3	2	3	3	2	2	2	3	3	2	1

Mapping of course outcomes with program outcomes:

CO/PSO	PSO1	PSO2
CO1	3	2
CO2	3	2
CO3	2	3
CO4	3	2
CO5	3	2

Unit-Wise Syllabus:

UNITt-I: Introduction to Forensic Science and Crime Scene Investigation

Definition and Scope of Forensic Science, History and Development, Principles and Ethics, Divisions of Forensic Science, Role of Forensic Experts in the Criminal Justice System, Crime Scene Management, Crime Scene Documentation (Photography, Sketching, Note-Taking), Search Methods, Collection and Preservation of Physical Evidence, Chain of Custody, Challenges in Crime Scene Investigation.

UNIT-II: Forensic Biology, Serology, and DNA Analysis

Biological Evidence in Forensic Science, Forensic Serology (Blood, Semen, Saliva, and Other Body Fluids), Bloodstain Pattern Analysis, DNA Profiling, STR Analysis, Mitochondrial DNA, Forensic Anthropology (Skeletal Identification, Age Estimation, Sex Determination), Forensic Odontology (Bite Mark Analysis, Dental Record Identification).

UNIT-III: Forensic Chemistry, Toxicology, and Ballistics

Forensic Chemistry (Glass, Paint, Fiber, Soil, Explosives, and Gunshot Residue Analysis), Forensic Toxicology (Poisons, Drugs, Alcohol, Post-Mortem Toxicology, Drug Detection Techniques), Forensic Ballistics (Types of Firearms and Ammunition, Internal, External, and Terminal Ballistics, Gunshot Residue Analysis, Shooting Reconstruction, Tool Mark Examination).

UNIT-IV: Fingerprint, Impression, and Questioned Document Examination

Fundamentals of Fingerprint Identification, Classification Systems (Henry System, AFIS), Fingerprint Development Techniques, Impression Evidence (Footprints, Tire Marks, Lip Prints, Tool Marks), Questioned Document Examination (Handwriting and Signature Analysis, Detection of Forgery, Alterations, Ink and Paper Analysis, Counterfeit Detection), Legal Aspects of Document Examination.

UNIT-V: Digital Forensics, Forensic Psychology, and Legal Framework

Cyber Crime and Digital Forensics, Types of Digital Evidence, Network and Mobile Forensics, Forensic Psychology (Criminal Behavior Analysis, Psychological Profiling, Polygraph Tests, Brain Mapping, Narco-Analysis), Forensic Science and the Legal System (Indian Penal Code, Criminal Procedure Code, Indian Evidence Act, Expert Testimony, Admissibility of Forensic Evidence, Ethics in Forensic Science).

Textbooks:

1. Houck, M. M., & Siegel, J. A. (2015). *Fundamentals of forensic science* (3rd ed.). Academic Press.
2. Saferstein, R. (2020). *Criminalistics: An introduction to forensic science* (13th ed.). Pearson.

References:

1. Locard, E. (1930). *The analysis of dust traces*. American Journal of Police Science, 1(3), 276-298.
2. Inman, K., & Rudin, N. (2001). *Principles and practice of criminalistics: The profession of forensic science*. CRC Press.

Web Links:

1. https://nij.ojp.gov/topics/forensic-science
2. https://www.forensicsciencesimplified.org/
3. https://forensiccoe.org/
4. https://www.nist.gov/topics/forensic-science
5. https://www.aafs.org/

Cyber Law

L	T	P	C
2	0	0	2

Course Code: 2510FS04

Semester V

Course Outcomes:

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

CO1: Understand the fundamentals of cyber law, including IT Act 2000 and its amendments.
CO2: Analyze legal frameworks for cybercrimes, digital contracts, and data protection policies.
CO3: Examine case studies on cybercrime investigations and enforcement mechanisms.
CO4: Understand intellectual property rights and copyright laws in the digital domain.
CO5: Evaluate the ethical, social, and global impact of cyber law on digital transactions and e-commerce.

Mapping of Course Outcomes with Program Outcomes:

CO/PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11
CO1	2	1	1	2	3	2	2	2	2	1	2
CO2	2	2	2	2	3	3	3	2	2	2	2
CO3	2	2	2	2	3	3	3	2	2	2	2
CO4	2	1	1	2	3	3	3	2	2	2	2
CO5	2	1	1	2	3	3	3	2	2	2	3

Mapping of course outcomes with program outcomes:

CO/PSO	PSO1	PSO2
CO1	2	3
CO2	2	3
CO3	3	3
CO4	2	3
CO5	2	3

Unit-Wise Syllabus:

UNIT – I: Introduction to Cyber Law & IT Act 2000 (Digital India Act, 2023)

Definition, Importance, and Need for Cyber Law. Evolution and History of Cyber law, Overview of the Information Technology Act 2000 (Digital India Act, 2023), Amendments, and Key Provisions. Legal Recognition of Electronic Records, Digital Signatures, and Electronic Governance. Overview of National and International Cyber Law Frameworks.

UNIT – II: Cyber Crimes & Legal Frameworks

Types of Cyber Crimes: Hacking, Identity Theft, Cyberstalking, Phishing, Ransomware, and Cyber Terrorism. Investigation of Cyber Crimes and Role of Enforcement Agencies. Laws Against Cyber Fraud, Online Defamation, and Cyber Harassment. Jurisdictional Challenges in Cyber Law enforcement. Digital Evidence and Cyber Forensic Legal Aspects.

UNIT – III: Intellectual Property Rights & Digital Content Protection

Understanding Copyrights, Patents, and Trademarks in Cyberspace. Copyright Issues in Software, Digital Piracy, and Plagiarism. Licensing Agreements and Open-Source Software Legalities. DMCA (Digital Millennium Copyright Act) and GDPR (General Data Protection Regulation). Case Studies on Intellectual Property Disputes in Cyberspace.

UNIT – IV: E-Commerce, Digital Contracts & Privacy Laws

E-Commerce Legal Frameworks and Regulations. Validity of Digital Contracts, E-Signatures, and Authentication Methods. Consumer Protection in the Digital Marketplace. Privacy Laws, Data Security Regulations, and Data Protection Acts. Cyber Law Compliance for Businesses and Organizations.

UNIT – V: Cyber Ethics, Emerging Threats & Case Studies

Ethical Issues in Cyberspace: Data Privacy, Freedom of Speech, and Censorship. Cyber Espionage, AI-Related Legal Challenges, and Ethical Hacking. Global Cyber Laws and International Cooperation. Case Studies on Real-World Cyber Law Incidents, Legal Judgments, and Landmark Cyber Crime Cases. The Future of Cyber Law in the Age of Emerging Technologies.

Textbooks:

1. Pavan Duggal – *Cyber Law: The Indian Perspective*
2. Kumar Saurabh – *Fundamentals of Cyber Law and Cyber Security*

Reference Books:

1. Anirudh Rastogi – *Cyber Law: Law of Information Technology and Internet*

2. Nandan Kamath – *Law Relating to Computers, Internet & E-Commerce*

Web Links:

1. https://www.meity.gov.in/writereaddata/files/act2000_0.pdf
2. https://www.meity.gov.in/writereaddata/files/DIA_Presentation%2009.03.2023%20Final.pdf
3. https://www.meity.gov.in/content/cyber-laws
4. https://www.meity.gov.in/cyber-security
5. https://www.meity.gov.in/writereaddata/files/Committes_D-Cyber-n-Legal-and-Ethical.pdf

Cyber Criminology

L	T	P	C
3	0	0	3

Course Code: 2510FS05

Semester VI

Course Outcomes:

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

CO1: Understand the fundamentals of cyber criminology and its relevance in modern society.
CO2: Analyze various types of cybercrimes and their impact on individuals, organizations, and nations.
CO3: Examine the psychological and sociological aspects of cybercriminal behavior.
CO4: Explore cyber laws, legal frameworks, and law enforcement strategies for cybercrime prevention.
CO5: Investigate case studies and forensic methodologies for tackling cyber offenses.

Mapping of Course Outcomes with Program Outcomes:

CO/PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11
CO1	3	1	1	3	2	2	1	2	2	1	3
CO2	3	2	2	3	2	2	1	3	2	2	3
CO3	2	1	1	3	2	2	2	2	2	2	3
CO4	2	2	2	2	3	3	3	2	2	2	2
CO5	3	3	3	3	3	3	2	3	2	2	2

Mapping of course outcomes with program outcomes:

CO/PSO	PSO1	PSO2
CO1	2	3
CO2	3	3
CO3	2	3
CO4	2	3
CO5	3	3

Unit-Wise Syllabus:

UNIT – I: Introduction to Cyber Criminology

Definition and Scope of Cyber Criminology. Evolution and History of Cyber Crime. Types of Cyber Criminals: Hackers, Fraudsters, Cyber Terrorists, Cyberstalkers, and Online Predators. Cyber Crime Statistics and Trends. Impact of Cyber Crime on Society, Businesses, and Individuals. The role of Criminology in Understanding Digital Offenses.

UNIT – II: Types of Cyber Crimes and Criminal Techniques

Classification of Cyber Crimes: Financial Fraud, Identity Theft, Cyberstalking, Cyberbullying, Child Exploitation, Cyber Terrorism, and Espionage. Dark Web and Cyber Criminal Networks. Social Engineering Attacks: Phishing, Baiting, Pretexting. Malware Attacks: Ransomware, Trojans, and Spyware. Advanced Persistent Threats (APT) and Cyber Warfare Tactics.

UNIT – III: Psychological and Sociological Aspects of Cyber Crime

Psychological Traits of Cyber Criminals: Personality Disorders, Motivations, and Online Disinhibition Effect. Theories of Cyber Criminal Behavior: Routine Activity Theory, Strain Theory, and Differential Association Theory. The Role of Anonymity and Disinhibition in Cyber Offending. Social Media and Cyber Deviance. Case Studies of High-Profile Cyber Offenders.

UNIT – IV: Cyber Laws and Law Enforcement

Overview of Cyber Laws: IT Act 2000 (Digital India Act, 2023) and Its Amendments, GDPR, Digital India Act 2023. International Frameworks: Budapest Convention, US Cyber Crime Laws, and European Union Regulations. Role of Law Enforcement Agencies in Cyber Crime Investigation. Digital Evidence Collection and Chain of Custody. Challenges in Prosecuting Cyber Criminals.

UNIT – V: Cybercrime Investigation and Forensic Analysis

Introduction to Digital Forensics in Cyber Crime Investigations. Digital Evidence Types: Logs, Metadata, and Network Packets. Investigative Techniques: Live Forensics, Network Forensics, and Mobile Forensics. Case Studies on Cyber Crime Investigations. Best Practices in Cyber Crime Prevention and Response Strategies.

Textbooks:

1. K. Jaishankar – *Cyber Criminology: Exploring Internet Crimes and Criminal Behavior*
2. Debarati Halder & K. Jaishankar – *Cyber Crime and Victimization of Women: Laws, Rights, and Regulations*

Reference Books:

1. David S. Wall – *Cybercrime: The Transformation of Crime in the Information Age*
2. George Weimann – *Cyberterrorism: How Real is the Threat?*

Web Links:

1. https://criminology.fsu.edu/current-students/undergraduate-programs/majors/cyber-criminology
2. https://criminology.fsu.edu/current-students/undergraduate-programs/majors/cyber-criminology/cyber-criminology-course-descriptions
3. https://catalog.anselm.edu/preview_program.php?catoid=11&poid=1604
4. https://online.cj.msu.edu/cyber-criminology-cyber-security-graduate-certificate
5. https://www.amity.edu/gurugram/naac/1.1.3%20employability%20courses%20documents/1.1.3%20syllabus%20for%20employability%20courses/asas%20%28syllabus-%20employability%29/computer%20forensics%20cyber%20security%20%28oe%29.pdf

Ability Enhancement Courses (AEC)

Course Code	Sem	Course Name	Level	L	T	P	C	CIE	SEE	Total	Pre-requisite
2510FS28	I	Essential Cognitive Skills for Graduates	FC			1	1	100	-	100	-
2510FS29	II	Advanced Cognitive Skills for Graduates	FC			1	1	100	-	100	-
2510FS30	II	Human Values and Professional Ethics	FC	2			2	50	50	100	-
2510FS47	IV	Forensic Report Writing	IC	2			2	50	50	100	-
2510FS06	V	Intellectual Property Right & Patents	AC	2			2	50	50	100	-
2510FS07	VI	Student Activity Based Learning	AC				2	100	-	100	-
Total				**6**		**2**	**10**				

Essential Cognitive Skills for Graduates

(Common for B.Sc. Forensic Science & B.Sc. Cyber Security and Digital Forensics)

Course Code: 2510FS28

Semester I	L	T	P	C
Course Outcomes:	0	0	1	1

At the end of the course, student will be able to:

CO1: Recognize the different aspects of the English language proficiency with emphasis on LSRW skills.

CO2: Apply communication skills through various language learning activities.

CO3: Analyze the English speech sounds, stress, intonation and syllable division for better listening and speaking comprehension.

CO4: Enable them to learn and apply fundamentals of English grammar concepts for improved language.

CO5: Make use of various types of vocabulary in different academic and professional careers.

Mapping of Course Outcomes with Program Outcomes:

CO/PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11
CO1	2	1	1	2	2	2	3	2	2	2	2
CO2	2	1	1	2	2	2	3	2	2	3	3
CO3	2	1	1	2	2	2	3	2	2	2	2
CO4	2	1	1	2	2	2	3	2	2	2	2
CO5	2	1	1	2	2	2	3	2	3	3	3

Mapping of course outcomes with program outcomes:

CO/PSO	PSO1	PSO2
CO1	1	2
CO2	1	2
CO3	1	2
CO4	2	2
CO5	2	3

UNIT I: Outstanding people A/B/C/D

Listening: Conversation about Jocelyn Bell- Burnell, Podcast: The 30-day challenge, Starting a new job, Conversation about technology

Speaking: Discussing inspiring people, Asking and answering questions about challenges, explaining a process; Checking understanding, Discussing technology.

Reading Articles: *Protector of the sea* and the woman *who reinvented children's TV, Interviews*: 30-day challenge, Article: *Tech free!*

Writing: Article Organizing an article

Grammar: Review of Tenses, Questions

Vocabulary: Character adjectives, trying and succeeding

Pronunciation: The letter *e*; Word stress, Rapid speech

UNIT II: Survival A/B/C/D

Listening: Conversation about a survival situation, Interview: The Tiger, Cooking for a friend, talking about getting lost.

Speaking Telling a survival story, giving advice; Asking questions, giving compliments and responding, Discussing the natural environment.

Reading Article: Lost at sea, Leaflet: *How to survive…an animal attack,* Leaflet: Be wise and survive.

Writing Guidelines, organizing guidelines in a leaflet.

Grammar Narrative tenses, Future time clauses and conditionals.

Vocabulary Expressions with *get*, Animals and the environment.

Pronunciation Sound and Spelling: *g*, Intonation in question tags.

UNIT III: Talent A/B/C/D

Listening: Conversation: learning experiences, Radio Programme: The sports gene, Making wedding plans, Interviews about sport.

Speaking: Talking about something you have put a lot of effort into, discussing sport and ways to improve performance, planning a party, Talking about popular sports.

Reading Text about learning; *Learning to learn*, Article: *Born to be the best*; Three articles about athletes, Article: Fitness: Seattle snapshot.

Writing: Article describing data.

Grammar: Multi-word verbs, Present perfect and present perfect continuous.

Vocabulary: Ability and achievement, word connected with sport.

Pronunciation Word stress, sound and spelling consonant sounds.

UNIT IV: Life Lessons A/B/C/D

Listening Interview: Psychology of money; Two monologues: Life-changing events, Two monologues; training for a job, Presenting photos, Three monologues; living in different places.

Speaking: Talking about how your life has changes, discuss experiences of training and rules, describing photos: Expressing careful disagreement, Discussing living in a different country.

Reading: Two texts about life-changing events that helped people become rich, Article: *Training for the emergency frontline,* Advert for being an international student 'buddy

Writing: Job application, giving a positive impression.

Grammar: *Used to* and *would*.

Vocabulary: Cause and result, Talking about difficulty Pronunciation Sound and spelling: *u*

UNIT V: Chance A/B/C/D

Listening Monologue: What are your chances? Conversation: Talking about work, Money problems, News reports: environmental problems.

Speaking: Discussing possible future events, Role Play: job interview, Explaining and responding to an idea for a café, Giving opinions on environmental problems.

Reading Quiz: Are you an optimist or a pessimist? Article: Why we think we're going to have a long and happy life, Quiz: The unknown continent; Article: Cooking in Antarctica, Essay about protecting the environment.

Writing: For and against essay, Arguing for and against an idea.

Grammar: Future probability, Future perfect and future continuous.

Vocabulary: Adjectives describing attitude, The natural world.

Pronunciation: Sound and spelling : *th*, Intonation groups.

Text Book:

1. Cambridge Empower – Second Edition B2 Level - Adrian Doff, Craig Thaine, Herbert Puchta, Jeff Stranks, Peter Lewis – Jones. ISBN: 978-1107468726.

Suggested Software:

1. Cambridge Empower
2. Soft X (K-Van Solutions)

Reference Books:

1. Effective Technical Communication, M Ashraf Rizvi, ISBN: 9352605780.
2. Raymond Murphy: English Grammar in Use, Cambridge University Press. Fifth Edition, ISBN: 978-3125354241.
3. J. Sethi & P.V. Dhamija. A Course in Phonetics and Spoken English, (2nd Ed), Kindle, 2013, ISBN: 9788120314955

Web Links:

1. www.cambridgeone.org/login
2. https://www.britishcouncil.in/english/online
3. www.englishmedialab.com

Advanced Cognitive Skills for Graduates

(Common for B.Sc. Forensic Science & B.Sc. Cyber Security and Digital Forensics)

Course Code: 2510FS29

Semester II	L	T	P	C
Course Outcomes: At the end of the course, student will be able to:	0	0	1	1

CO1: Recognize the basics of communication and summarize formal and informal language expressions in all aspects.

CO2: Establish and maintain interpersonal relationships and transmit the message through different language activities.

CO3: Use language effectively to prepare and demonstrate proficiency in facing various types of interviews.

CO4: Demonstrate and exhibit professionalism in participating in various public speaking activities like debates, group discussions and presentation skills.

CO5: Identify the basic elements of writing and apply the fundamentals to compose e-mails catering to different professional needs.

Mapping of Course Outcomes with Program Outcomes:

CO/PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11
CO1	2	1	1	2	2	2	3	2	2	2	2
CO2	2	1	1	2	2	2	3	2	2	3	3
CO3	2	1	1	2	2	2	3	2	2	3	3
CO4	2	1	1	2	2	2	3	2	2	3	3
CO5	2	1	1	2	2	3	3	2	2	3	2

Mapping of course outcomes with program outcomes:

CO/PSO	PSO1	PSO2
CO1	1	2
CO2	1	2

CO3	2	2
CO4	2	3
CO5	2	3

UNIT I: Around the globe A/B/C/D

Listening: Two monologues about sightseeing tours, Interview: disappearing languages, Asking for a favour, conversation: a trip to the Grand Canyon

Speaking: Comparing different tourist destinations, Agreeing and disagreeing, Asking for a favour, Discussing local tourist destinations.

Reading: Website bout four tourist destinations; Website: *Where to go?*

Writing: Travel blog, Using descriptive language

Grammar: Infinitives and *–ing* forms

Vocabulary: Travel and tourism, Describing changes Pronunciation Consonant clusters, Consonant sounds

UNIT II: City living A/B/C/D

Listening: Interview: 'Smart' cities: Two monologues talking about 'smart' cities, Two monologues: house renovations, Flat hunting, Interviews about a new shopping centre

Speaking: Discussing good and bad points about a city

Reading: Article: *Quick-slow down!* Article: *Who puts the 'real' in reality TV?* Email: Complaining about an important issue.

Writing: Email of complaint, Using formal language

Grammar: *Too/enough*; so/such, Causative *have/get*

Vocabulary Describing life in cities, Film and TV; Houses

Pronunciation Sound and spelling: *o*, Stress in compound nouns.

UNIT III: Dilemmas A/B/C/D

Listening: Radio programme: person finance, three monologues about honesty, Going to the bank, Conversation about a TV programme

Speaking: Giving opinions on financial matters, discussing moral dilemmas, talking about hopes and worries Discussing programmes about crime

Reading: Article*: Is it time to give up on cash?* Newspaper article: *The honesty experiment*, Review: *Crime with a smile*

Writing Review, organising a review

Grammar: First and second conditionals, third conditional; *should have+past participle*
Vocabulary: Money and finance, Crime

Pronunciation: Stressed and unstressed words; Sound and spelling: *l*, Word groups

UNIT IV: Discoveries A/B/C/D

Listening: Conversation about inventions, Conversation about an email hoax, Finding the perfect flat, Four monologues about alternative medicine

Speaking: Talking about inventions, describing a hoax or a scam or a case of fraud, Giving and receiving surprises

Reading: Article: *Too good to be true?* Article: *The rise and fall of Barry Minkow, Essay: The Value of alternative medicine*

Writing: Opinion essay, presenting a series of arguments

Grammar Relative clauses, Reported speech; Reporting verbs

Vocabulary Health, Verbs describing thought and knowledge Pronunciation Sound and spelling : *ui,* Linking and intrusion

UNIT V: Possibilities A/B/C/D

Listening: Interview about Dan Cooper, Two monologues: pursuing a dream, Celebrating good news, conversation about goals

Speaking: Telling stories about coincidences, Describing and comparing brave or amazing people, telling an important piece of news, Talking about performing

Reading: Story: The man who disappeared; Blog: *The Wreck of the Titan*, Article: *Dream to help,* Story: Rosa's diary: *The ultimate goal*

Writing: Story, making a story interesting

Grammar Past modals of deduction, Wishes and regrets

Vocabulary Adjectives with prefixes, Verbs of effort

Pronunciation Word stress, Linking, Consonant clusters

Text Book:

1. Cambridge Empower – Second Edition B2 Level - Adrian Doff, Craig Thaine, Herbert Puchta, Jeff Stranks, Peter Lewis – Jones. ISBN: 978-1107468726

Suggested Software:

1. Cambridge Empower
2. Soft X (K-Van Solutions)

Reference Books:

1. Technical Communication. Raman Meenakshi, Sangeeta-Sharma. Oxford University Press.2018, ISBN: 97893549772256.
2. Practical English Usage -Michael Swan, ISBN: 9780194202466

Web links:

1. https://www.cambridgeone.org/login
2. https://www.coursera.org/
3. https://www.skillshare.com/
4. https://www.mindtools.com/cawh8bu/communication-tools

Human Values and Professional Ethics

(Common for B.Sc. Forensic Science & B.Sc. Cyber Security and Digital Forensics)

Course Code: 2510FS30

Semester II	L	T	P	C
Course Outcomes:	2	0	0	2

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

CO1: Understand the importance of human values and ethics in personal and professional life.

CO2: Analyze ethical dilemmas and develop decision-making skills based on ethical principles.

CO3: Foster a sense of responsibility, empathy, and social awareness in diverse scenarios.

CO4: Apply ethical frameworks to real-world problems in various fields.

CO5: Promote a balanced and value-driven lifestyle for personal and societal well-being.

Mapping of Course Outcomes with Program Outcomes:

CO/PO	**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**
CO1	2	1	1	2	3	2	3	2	2	2	3
CO2	2	1	1	2	3	2	3	3	2	2	3
CO3	2	1	1	2	3	2	3	2	3	3	3
CO4	2	1	1	2	3	2	3	3	2	2	3
CO5	2	1	1	2	3	2	3	2	3	3	3

3

Mapping of course outcomes with program outcomes:

CO/PSO	**PSO1**	**PSO2**
CO1	1	3
CO2	1	3
CO3	1	3
CO4	2	3
CO5	1	3

Unit-Wise Syllabus:

UNIT I: Fundamentals of Human Values

Definition and significance of human values. Universal values: truth, compassion, non-violence, empathy, and integrity. Importance of self-awareness and emotional intelligence. Role of values in shaping character and fostering interpersonal relationships.

UNIT II: Ethics and Ethical Decision-Making

Definition and importance of ethics. Difference between ethics, morals, and laws. Ethical theories: utilitarianism, deontology, and virtue ethics. Frameworks for resolving ethical dilemmas. Role of ethical reasoning in personal and societal decision-making.

UNIT III: Professional Ethics and Workplace Dynamics

Principles of professional ethics: integrity, transparency, and accountability. Codes of conduct and corporate social responsibility (CSR). Ethical leadership and workplace diversity. Ethical challenges: conflicts of interest, harassment, and whistleblowing. Promoting inclusivity and respect in professional environments.

UNIT IV: Values and Ethics in Technology and Society

Ethical implications of technological advancements. Data privacy, artificial intelligence, and digital rights. Ethical challenges in technology: cybersecurity threats, misinformation, and digital inequality. Responsibility in the ethical use of technology for societal well-being.

UNIT V: Cultivating Ethical Behavior and Global Perspectives

Development of moral courage, empathy, and conflict resolution skills. Cross-cultural ethics and global citizenship. Addressing environmental sustainability, social justice, and global inequality. Integration of human values and ethics into personal and professional life.

Textbooks

1. “Human Values and Professional Ethics” by R.R. Gaur, R. Sangal, and G.P. Bagaria. Excel Books.
2. A comprehensive textbook focusing on value-based education and “Professional Ethics and Human Values” by M. Govindarajan, S. Natarajan, and V.S. Senthilkumar. PHI Learning.

Reference Books

1. “Moral Issues in Business” by William H. Shaw and Vincent Barry. Cengage Learning.
2. “Values and Ethics for Organizations: Theory and Practice” by Chakraborty S.K. Oxford University Press.

Weblinks

1. https://www.socialworkers.org/About/Ethics/Code-of-Ethics/Code-of-Ethics-English?utm

2. https://hass.mines.edu/nature-and-human-values/?utm_
3. https://plato.stanford.edu/entries/ethics/
4. https://www.unesco.org/en/ethics
5. https://pll.harvard.edu/course/ethics-action

Forensic Report Writing

(Common for B.Sc. Forensic Science & B.Sc. Cyber Security and Digital Forensics)

Course Code: 2510FS47

Semester IV	L	T	P	C
Course Outcomes:	2	0	0	2

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

CO1: Understand the principles and formats of forensic report writing for legal and investigative purposes.

CO2: Develop skills to write clear, concise, and objective forensic reports.

CO3: Analyze evidence and present findings in an accurate, legally admissible format.

CO4: Ensure reports comply with ethical and professional standards.

CO5: Communicate forensic results effectively to legal professionals and stakeholders.

Mapping of Course Outcomes with Program Outcomes:

CO/PO	**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**
CO1	2	2	2	2	3	3	3	2	2	2	2
CO2	2	2	2	2	2	3	3	2	2	3	2
CO3	3	3	3	2	3	3	2	3	2	2	2
CO4	2	2	2	2	3	3	3	2	2	2	3
CO5	2	2	2	2	3	3	3	2	2	3	3

Mapping of course outcomes with program outcomes:

CO/PSO	**PSO1**	**PSO2**
CO1	2	3
CO2	2	3
CO3	3	3
CO4	2	3
CO5	2	3

Unit-Wise Syllabus:

UNIT I: Fundamentals of Forensic Report Writing

Definition and significance of forensic report writing. Principles of effective technical writing. Structure and components of forensic reports. Importance of clarity, brevity, and precision in report writing. Role of reports in forensic investigations and legal contexts.

UNIT II: Types of Forensic Reports

Classification of forensic reports: analytical reports, expert opinion reports, and crime scene reports. Characteristics of preliminary and final reports. Reporting for different forensic disciplines: toxicology, ballistics, serology, and digital forensics. Examples and templates for various types of forensic reports.

UNIT III: Report Writing Process and Documentation Standards

Steps in report preparation: data collection, analysis, interpretation, and presentation. Documentation standards for forensic reports, including formatting, citations, and referencing. Use of tables, graphs, and photographs in reports. Ensuring objectivity and avoiding biases in reporting. Handling confidential and sensitive information.

UNIT IV: Legal Aspects and Court Presentation of Reports

Admissibility of forensic reports as evidence in court. Legal terminology and requirements for forensic documentation. Role of an expert witness in presenting reports in court. Importance of accuracy and integrity in report writing. Common legal challenges and errors in forensic reports.

UNIT V: Emerging Trends and Technologies in Forensic Report Writing

Advancements in forensic documentation tools and software. Integration of artificial intelligence and machine learning for automated report generation. Digital reporting platforms and paperless documentation systems. Use of blockchain technology for secure and tamper-proof forensic documentation. Future trends in enhancing the accuracy, accessibility, and efficiency of forensic report writing.

Textbooks

1. Forensic Science: An Introduction to Scientific and Investigative Techniques by Stuart H. James, Jon J. Nordby, and Suzanne Bell
2. Forensic Science Handbook, Volume 1 by Richard Saferstein

Reference Books

1. Forensic Testimony: Science, Law and Expert Evidence by C. Michael Bowers
2. Expert Report Writing in Toxicology: Forensic, Environmental, and Industrial Applications by Michael D. Coleman

Weblinks

1. https://nij.ojp.gov/topics/forensics
2. American Academy of Forensic Sciences (AAFS)
3. SWGDE (Scientific Working Group on Digital Evidence)
4. https://www.salvationdata.com/work-tips/write-a-forensic-report/?utm
5. https://www.sifsindia.com/blog-details/forensic-report-writing-best-practices?utm

Intellectual Property Rights and Patents

(Common for B.Sc. Forensic Science & B.Sc. Cyber Security and Digital Forensics)

Course Code: 2510FS06

Semester V

Course Outcomes:	L	T	P	C
At the end of the course, students will be able to:	2	0	0	2

CO1: Understand the fundamental concepts of Intellectual Property Rights (IPR) and their significance in innovation, business, and legal frameworks.

CO2: Analyze various types of intellectual property, including patents, copyrights, trademarks, trade secrets, and geographical indications, along with their legal protections.

CO3: Develop the ability to navigate the patent filing process, including patent search, drafting, and examination, while understanding the criteria for patentability.

CO4: Apply knowledge of IPR enforcement mechanisms, dispute resolution strategies, and legal frameworks to address infringement and ethical considerations.

CO5: Explore emerging trends in IPR, including digital copyright, AI-driven intellectual property, and career opportunities in the field of intellectual property law and consultancy.

Mapping of Course Outcomes with Program Outcomes:

CO/PO	**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**
CO1	2	1	1	2	3	2	2	2	3	2	3
CO2	2	1	1	2	3	2	3	2	2	2	3
CO3	3	2	2	3	3	3	2	3	2	2	2
CO4	2	1	2	2	3	3	3	2	2	2	2
CO5	2	1	1	3	3	2	2	2	3	3	3

Mapping of course outcomes with program outcomes:

CO/PSO	**PSO1**	**PSO2**
CO1	2	3
CO2	2	3

CO3	3	2
CO4	2	3
CO5	2	2

UNIT-Wise Syllabus:

UNIT I: Introduction to Intellectual Property Rights (IPR)

Definition and Scope of IPR, Importance of Intellectual Property in Innovation and Business, Types of Intellectual Property (Patents, Trademarks, Copyrights, Trade Secrets, Industrial Designs, Geographical Indications), International Treaties and Conventions on IPR (TRIPS, WIPO, Berne Convention, Paris Convention).

UNIT II: Patents – Fundamentals and Procedures

Definition and Importance of Patents, Criteria for Patentability, Types of Patents (Utility, Design, Plant), Patent Filing Process (National and International), Patent Search and Examination, Patent Drafting and Specification, Rights and Obligations of Patentees, Duration and Renewal of Patents.

UNIT III: Copyrights and Related Rights

Definition and Scope of Copyright, Works Protected Under Copyright Law, Rights of Copyright Owners, Limitations and Exceptions (Fair Use Doctrine), Copyright Infringement and Remedies, Copyright Registration Process, Digital Copyright and Protection Against Online Piracy**.**

UNIT IV: Trademarks and Brand Protection

Definition and Importance of Trademarks, Types of Trademarks (Word Marks, Logos, Certification Marks, Collective Marks), Trademark Registration Process, Infringement and Passing Off, Remedies for Trademark Violation, Role of Trademarks in Brand Identity and Business Growth.

UNIT :V Trade Secrets and Industrial Designs

Definition and Importance of Trade Secrets, Trade Secret Protection Strategies, Differences Between Patents and Trade Secrets, Legal Framework for Trade Secrets, Industrial Designs and Their Protection, Registration Process for Industrial Designs, Case Studies on Trade Secret Violations.

Textbooks:

1. Ganguli, P. (2001). *Intellectual Property Rights: Unleashing the Knowledge Economy.* Tata McGraw-Hill.
2. Narayanan, P. (2019). *Intellectual Property Law.* Eastern Law House.

References:

1. Das, J. K. (2018). *Intellectual Property Rights.* PHI Learning Pvt. Ltd.

2. David, B. (2021). *Copyright Law: A Handbook of Contemporary Research.* Edward Elgar Publishing.

Web Links:

1. https://www.wipo.int/
2. https://ipindia.gov.in/
3. https://www.uspto.gov/
4. https://ec.europa.eu/growth/industry/intellectual-property_en
5. https://www.inta.org/

Skill Enhancement Courses (SEC)

Course Code	Sem	Course Name	Level	L	T	P	C	CIE	SEE	Total	Pre-requisite
2510FS31	I	Forensic Accounting and Fraud Investigation	FC	2			2	50	50	100	-
2510FS48	III	IT Skills	IC			2	2	50	50	100	-
2510FS49	IV	Court Testimony	IC	2			2	50	50	100	-
2510FS08	VI	Research Methodology & Scientific Writing	AC	2			2	50	50	100	-
Total				**6**		**2**	**8**				

Forensic Accounting and Fraud Investigation

(Common for B.Sc. Forensic Science & B.Sc. Cyber Security and Digital Forensics)

L	T	P	C
2	0	0	2

Course Code: 2510FS31

Semester I

Course Outcomes:

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

CO1: Explain the foundations of forensic accounting, including its scope, historical evolution, and differences from traditional auditing practices.

CO2: Identify various types of financial fraud, such as corporate fraud, embezzlement, tax fraud, and cyber financial crimes, and understand their legal implications.

CO3: Analyze financial statements and apply techniques like ratio analysis, trend analysis, and data analytics to detect anomalies and red flags in financial data.

CO4: Apply investigative approaches including audit trails, digital evidence recovery, and forensic tools (e.g., Excel, IDEA, and ACL) in examining diverse financial fraud schemes.

CO5: Evaluate the nature and scope of insurance fraud, identify different fraud types (life, motor, health, etc.), and implement investigative methods such as surveillance and statement analysis.

Mapping of Course Outcomes with Program Outcomes:

CO/PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11
CO1	3	2	2	3	2	2	1	2	2	1	2
CO2	3	2	3	3	3	3	2	3	2	2	2

CO3	3	3	3	3	2	3	1	3	2	2	2
CO4	3	3	3	3	2	3	1	3	2	2	2
CO5	3	2	3	3	3	3	2	3	3	2	2

Mapping of course outcomes with program outcomes:

CO/PSO	PSO1	PSO2
CO1	2	2
CO2	2	3
CO3	3	2
CO4	3	3
CO5	3	3

Unit-Wise Syllabus:

Unit I: Foundations of Forensic Accounting and Fraud Investigation:

Introduction to Forensic Accounting, Scope and Applications in Criminal and Civil Cases, Historical Evolution of Forensic Accounting, Difference Between Auditing and Forensic Accounting, Introduction to Fraud and Its Legal Perspective, Types of Crimes Where Forensic Accounting Is Used – Corporate Fraud, Embezzlement and Theft, Financial Statement Fraud, Insurance Fraud, Money Laundering, Securities Fraud, Ponzi Schemes, Tax Fraud and Evasion, Bankruptcy Fraud, Cyber Financial Crimes.

Unit II: Accounting Systems and Red Flags of Fraud:

Basics of Financial Accounting Systems, Reading and Interpreting Financial Statements – Balance Sheet, Income Statement, Cash Flow Statement, Manipulation Techniques in Financial Reporting, Common Red Flags in Financial Data, Ratio Analysis and Trend Analysis for Fraud Detection, Cash Flow Analysis in Identifying Anomalies, Introduction to Data Analytics in Forensic Accounting.

Unit III: Types of Financial Frauds and Investigative Approaches:

Fraud Typologies in Depth – Asset Misappropriation, Bribery and Corruption, Procurement Frauds, Payroll and Vendor Frauds, Shell Company and Fictitious Billing Schemes, Investigation Techniques – Gathering and Securing Financial Evidence, Document Review and Audit Trails, Digital Evidence and Data Recovery, Use of Forensic Tools Such As Excel, IDEA, ACL, Theory

of Fraud Perpetrators – Fraud Triangle and Fraud Diamond, Rationalization and Opportunity Analysis.

Unit IV: Insurance Fraud Investigation:

Nature and Scope of Insurance Fraud, Types of Insurance Frauds – Life, Health, Motor, Property, and Worker's Compensation, Internal Fraud by Agents and Brokers, False Claims and Arson for Profit, Role and Responsibilities of Insurance Fraud Investigators, Insurance Policy As a Legal Contract – Understanding First- and Third-Party Policies, Innocent Co-Insured Clauses, Use of Surveillance and Statement Analysis in Insurance Claims.

Unit V: Legal Aspects and Reporting in Fraud Cases:

Legal Framework and Regulatory Bodies – SEBI, RBI, IRDAI, ED, SFIO, Introduction to Money Laundering and the PMLA Act, Interviewing Suspects and Witnesses – Techniques of Effective Interviews, Cognitive Interviewing and Statement Analysis, Conducting Examination Under Oath, Preparing Expert Reports for Court, Role of Forensic Accountant As Expert Witness, Courtroom Procedures and Evidence Presentation.

Reference Books:

1. Forensic Accounting and Fraud Investigation for Non-Experts by Howard Silverstone and Michael Sheetz
2. Principles of Fraud Examination by Joseph T. Wells

Textbooks:

1. Forensic Accounting and Fraud Examination by Mary-Jo Kranacher and Richard Riley
2. Essentials of Forensic Accounting by Michael A. Crain, William S. Hopwood, et al.

Web Links:

1. https://abfa.us/
2. https://www.iafci.org/Public/Certifications/Public/About_IAFCI/IAFCI_Certifications.aspx?hkey=ae5b4ada-aebe-49da-97ba-6ec68a97d0cf

3. https://www.wiley.com/en-us/Principles+of+Fraud+Examination%2C+4th+Edition-p-9781118922347
4. https://www.iafci.org/
5. http://www.nafraud.com/#:~:text=NAFI%20-%20The%20National%20Association%20of%20Fraud%20Investigators,Law%20Enforcement%2C%20insurance%20investigators%2C%20professional%20investigators%2C%20security%20specialists

IT Skills

(Common for B.Sc. Forensic Science & B.Sc. Cyber Security and Digital Forensics)

L	T	P	C
0	0	2	2

Course Code: 2510FS48

Semester III

Course Outcomes:

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

CO1: Understand the role of computing and information technology in the digital world.

CO2: Identify, describe, and apply emerging technologies in teaching and learning environments.

CO3: Effectively apply written, oral, and interpersonal communication skills and use information technology.

CO4: Analyze organizational context, strategy, operations, processes, and performance.

CO5: Understand the importance of keeping safe online.

Mapping of Course Outcomes with Program Outcomes:

CO/PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11
CO1	3	2	2	3	2	2	1	2	2	2	2
CO2	3	2	2	3	2	2	1	3	3	2	2
CO3	2	1	2	2	2	3	3	2	2	3	3
CO4	3	2	3	3	2	2	2	3	2	3	2
CO5	3	2	2	3	3	2	2	3	2	2	3

Mapping of course outcomes with program outcomes:

CO/PSO	PSO1	PSO2
CO1	2	2
CO2	2	1
CO3	1	2
CO4	1	1
CO5	2	3

Unit-Wise Syllabus:

UNIT I- Introduction to Computer & Office Automation

Introduction of Computer: Overview of Computer, Computer Input and Output devices, Operating System, hardware and Software. Introduction to Ram, Rom, CPU and more devices. Introduction to Office Automation: Overview of Office Automation, Importance and Benefits of Office Automation, Role in Modern Work Environments, Integration with Business Processes, Challenges and Considerations.

UNIT II- Microsoft Word

Microsoft Word: Introduction to MS Word, Getting Familiar with the Interface, Creating a New Document, Basic Text Formatting, Bold, Italic, Underline), Aligning Text (Left, Center, Right),Saving and Opening Documents, Navigate Through a Document, Insert hyperlinks, Search for text, Replace, Create bookmarks, Move to a specific location or object in a document, Apply document themes, Apply document style sets, Insert headers and footers, Insert page numbers, Format page background elements, Create a numbered or bulleted list, Change bullet characters or number formats for a list level, Define a custom bullet character or number format.

UNIT III- Microsoft Excel

Introduction to MS Excel Create a workbook, Search for data within a workbook, Change worksheet tab color, Rename a worksheet, Insert and delete columns or rows, Change workbook themes, Adjust row height and column width, Insert headers and footers, Hide or unhide worksheets, data validation, Duplicate Values, Apply styles to tables, Filter records, Sort data by

multiple columns, Change sort order, Remove duplicate records, Perform calculations by using the SUM function, MIN and MAX functions, COUNT function, AVERAGE function, Create a new chart, Resize charts, Save a workbook as a template, Manage workbook versions, Protect a worksheet

UNIT IV- MS PowerPoint

Microsoft PowerPoint: Create a Presentation, Insert and Format Slides, Modify Slides, Handouts, and Notes, Configure a Presentation for Print, Configure and Present a Slide Show, Insert and Format Text, Insert and Format Shapes and Text Boxes, Insert and Format Images, Order and Group Objects, Insert and Format Tables, Insert and Format Charts, Insert and Format SmartArt graphics, Apply Slide Transitions, Animate Slide Content. Set Timing for Transitions and Animations.

UNIT V- Microsoft Outlook

Create messages, Create and send messages Configure message, Format messages, Format text Apply, themes and styles, Apply styles, Create hyperlinks, Insert images, Manage schedules, Insert memorized content, Insert signatures, Configure calendar settings ,Work with multiple calendars Share calendar information, Create appointments and events Create meetings Manage calendar items, Create tasks Manage tasks Create and manage notes, Create journal entries, Create and manage contacts Create and modify contact records Store contact records Share contact records and address books.

Textbooks:

1. Digital Logic and Computer Design – M. Morris Mano
2. Digital Fundamentals – Thomas L. Floyd

Reference Books:

1. Digital Logic Design and Computer Organization – Nikrouz Faroughi
2. Fundamentals of Digital Logic with VHDL Design – Stephen Brown & Zvonko Vranesic

Web Links:

1. https://www.coursera.org/browse/information-technology
2. https://www.globalknowledge.com/us-en/training/course-catalog/

3. https://alison.com/courses/it
4. https://www.cbtnuggets.com/it-training
5. https://skillsbuild.org/learners

Court Testimony

(Common for B.Sc. Forensic Science & B.Sc. Cyber Security and Digital Forensics)

	L	T	P	C
Course Code: 2510FS49	2	0	0	2

Semester IV

Course Outcomes:

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

CO1: To impart a thorough understanding of the roles and responsibilities of forensic experts in court proceedings.

CO2: To develop the ability to communicate forensic findings effectively to a legal audience.

CO3: To familiarize students with courtroom etiquette, protocols, and legal standards.

CO4: To analyze the admissibility and probative value of forensic evidence in legal proceedings.

CO5: To enhance practical skills in presenting expert testimony through mock trials and case simulations.

Mapping of Course Outcomes with Program Outcomes:

CO/PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11
CO1	3	2	2	2	3	3	3	2	2	2	2
CO2	2	2	2	2	3	3	3	2	2	3	2
CO3	2	2	2	2	3	3	3	2	2	3	3
CO4	3	3	3	3	3	3	2	3	2	2	2
CO5	3	3	3	2	3	3	3	3	2	3	2

Mapping of course outcomes with program outcomes:

CO/PSO	PSO1	PSO2
CO1	2	3
CO2	2	3
CO3	1	3
CO4	3	3
CO5	3	3

Unit-Wise Syllabus:

UNIT – I: Fundamentals of Courtroom Testimony

Overview of the legal system: hierarchy of courts and their functions. Role of forensic experts in judicial proceedings. Admissibility of forensic evidence: Daubert and Frye standards. Key legal terminologies related to expert testimony. Importance of accuracy, neutrality, and scientific rigor in testimony.

UNIT – II: Preparing for Courtroom Testimony

Reviewing forensic reports and case files for trial readiness. Interaction with attorneys: pre-trial consultations and understanding case strategy. Creating and presenting demonstrative evidence: charts, photographs, and digital tools. Drafting expert opinions in compliance with legal standards. Importance of preparing for direct and cross-examinations.

UNIT – III: Testimony Delivery Techniques

Strategies for clear and confident communication in court. Explaining scientific concepts in layman's terms. Handling objections, interruptions, and challenging questions professionally. Use of visual aids to strengthen testimony. Maintaining composure under pressure and adapting to courtroom dynamics.

UNIT – IV: Cross-Examination and Legal Challenges

Understanding the objectives of cross-examination. Techniques for answering leading and challenging questions. Identifying and addressing attempts to discredit testimony. Handling contradictory evidence or expert opinions. Case examples of successful and flawed testimonies. Legal and ethical pitfalls to avoid during testimony.

UNIT – V: Ethical Considerations and Professionalism in Court Testimony

Ethical obligations of forensic experts: honesty, impartiality, and objectivity. Understanding the consequences of biased or false testimony. Professional standards and codes of conduct for expert witnesses. Managing conflicts of interest and maintaining credibility. Case studies highlighting ethical dilemmas and best practices in courtroom testimony.

Textbooks

1. Courtroom Testimony for the Fingerprint Expert by Hillary Moses Daluz
2. Forensic Expert Witness: Roles and Responsibilities by Leila Schneps and Coralie Colmez

Reference Books

1. The Expert Witness Handbook by Dan Poynter
2. Forensic Testimony: Science, Law and Expert Evidence by C. Michael Bowers

Weblinks

1. https://nij.ojp.gov/nij-hosted-online-training-courses/law-101-legal-guide-forensic-expert/general-testifying-tips/fundamental-guidelines-deposition-and-trial-testimony
2. The Expert Witness Institute (EWI)
3. Forensic Science Society (now CSFS) - Expert Witness Resources
4. https://www.aafs.org/
5. https://www.testifyingtraining.com/

Research Methodology & Scientific Writing

(Common for B.Sc. Forensic Science & B.Sc. Cyber Security and Digital Forensics)

Course Code: 2510FS08

L	T	P	C
2	0	0	2

Semester VI

Course Outcomes:

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

CO1: To develop an understanding of the principles and processes of research in scientific disciplines.
CO2: To equip students with skills to design, conduct, and analyze research effectively.
CO3: To familiarize students with various methodologies and tools used in scientific research.
CO4: To develop skills in qualitative and quantitative data analysis and presentation.
CO5: To understand ethical considerations and integrity in conducting and reporting research.

Mapping of Course Outcomes with Program Outcomes:

CO/PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11
CO1	3	2	2	3	2	2	1	2	3	2	2
CO2	3	3	3	3	2	3	1	3	3	2	2
CO3	3	3	3	3	2	3	1	3	3	2	2
CO4	3	3	3	3	2	3	2	3	3	2	2
CO5	2	2	2	2	3	3	3	2	2	2	3

Mapping of course outcomes with program outcomes:

CO/PSO	PSO1	PSO2
CO1	3	2
CO2	3	2
CO3	3	1
CO4	3	1
CO5	2	3

Unit-Wise Syllabus:

UNIT – I: Fundamentals of Research Methodology

Introduction to research: definitions, objectives, and types of research. Scientific methods and approaches: exploratory, descriptive, and experimental research. Formulating research problems and hypotheses. Importance of literature review and its organization. Research design: qualitative and quantitative approaches.

UNIT – II: Data Collection and Analysis

Techniques for data collection: surveys, interviews, observations, and experiments. Sampling methods and their significance. Tools for data analysis: statistical software and manual methods. Interpretation of data: significance testing, correlation, and regression analysis. Representation of data: tables, graphs, and charts.

UNIT – III: Scientific Writing Techniques

Structure of a scientific paper: abstract, introduction, methodology, results, discussion, and conclusion. Writing research proposals and grant applications. Style and tone of scientific writing: clarity, precision, and conciseness. Citation and referencing styles: APA, MLA, and Chicago. Writing ethics: plagiarism, authorship conflicts, and retractions.

UNIT – IV: Advanced Tools and Techniques for Research and Writing

Use of software for research management: reference managers (e.g., Zotero, EndNote, Mendeley). Statistical analysis tools: SPSS, R, and Python for data interpretation. Digital tools for collaboration and project management in research. Techniques for systematic reviews and

meta-analysis. Preparing illustrations, diagrams, and graphs using specialized software. Role of artificial intelligence in enhancing research efficiency and writing quality.

UNIT – V: Ethics and Current Trends in Research

Ethical considerations in research: consent, confidentiality, and research misconduct. Importance of reproducibility and transparency in research. Role of artificial intelligence and big data in modern research. Emerging trends in interdisciplinary research. Case studies on successful research methodologies and their global impact.

Textbooks

1. Research Methodology: Methods and Techniques by C.R. Kothari and Gaurav Garg
2. The Craft of Research by Wayne C. Booth, Gregory G. Colomb, and Joseph M. Williams

Reference Books

1. Research Design: Qualitative, Quantitative, and Mixed Methods Approaches by John W. Creswell and J. David Creswell
2. Writing Science: How to Write Papers That Get Cited and Proposals That Get Funded by Joshua Schimel

Weblinks

1. MIT OpenCourseWare: Introduction to Research Methods
2. https://www.springeropen.com/roadmapasia/author-workshop
3. https://researcheracademy.elsevier.com/
4. https://ocw.mit.edu/
5. https://researcheracademy.elsevier.com/

Value Added Courses (VAC)

Course Code	Sem	Course Name	Level	L	T	P	C	CIE	SEE	Total	Pre-requisite
2510FS50	III	Entrepreneurship Development	IC	2			2	50	50	100	
2510FS09	V	Environmental Science	AC	2			2	50	50	100	
2510FS10	VI	Forensic Journalism & Investigative Reporting	AC	2			2	50	50	100	
Total				**6**			**6**				

Entrepreneurship Development

(Common for B.Sc. Forensic Science & B.Sc. Cyber Security and Digital Forensics)

Course Code: 2510FS50

L	T	P	C
2	0	0	2

Semester III

Course Outcomes:

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

CO1: To understand entrepreneurship, its types, traits, factors influencing it, and the role of women entrepreneurs and SHGs in economic development.
CO2: To identify business opportunities, generate ideas using various techniques, and understand the importance of intellectual property rights.
CO3: To analyze and evaluate business opportunities through market, technical, cost-benefit, and network analysis for project feasibility.
CO4: To learn the business planning process, its advantages, and develop skills to create a model project report for a new venture.
CO5: To explore sources of finance, including venture capital, commercial banks, and government schemes, and understand funding processes.

Mapping of Course Outcomes with Program Outcomes:

CO/PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11
CO1	2	1	1	2	2	2	2	2	3	3	3
CO2	3	1	2	3	3	2	1	3	3	2	2
CO3	3	2	3	3	2	3	1	3	3	3	2
CO4	3	2	2	3	2	3	2	3	3	3	2
CO5	3	2	2	3	2	3	2	2	3	3	2

Mapping of course outcomes with program outcomes:

CO/PSO	PSO1	PSO2
CO1	1	2
CO2	2	2
CO3	2	1
CO4	2	1
CO5	1	1

Unit-Wise Syllabus:

UNIT I: Entrepreneurship Entrepreneur

Meaning of entrepreneurship – Types of Entrepreneurship – Traits of entrepreneurship – Factors promoting entrepreneurship- Barriers to entrepreneurship- the entrepreneurial culture- Stages in entrepreneurial process – Women entrepreneurship and economic development- SHG.

UNIT II: Developing Successful Business Ideas

Recognizing opportunities – trend analysis – generating ideas – Brainstorming, Focus Groups, Surveys, Customer advisory boards, Day in the life research – Encouraging focal point for ideas and creativity at a firm level-Protecting ideas from being lost or stolen – Patents and IPR.

UNIT III: Opportunity Identification and Evaluation

Opportunity identification and product/service selection – Generation and screening the project ideas – Market analysis, Technical analysis, Cost benefit analysis and network analysis- Project formulation – Assessment of project feasibility- Dealing with basic and initial problems of setting up of Enterprises.

UNIT IV: Business Planning Process Meaning of business plan

Business plan process- Advantages of business planning- preparing a model project report for starting a new venture (Team-based project work).

UNIT V: Funding Sources of Finance

Venture capital- Venture capital process- Business angles- Commercial banks- Government Grants and Schemes.

Textbooks:

1. Reddy, Entrepreneurship: Text & Cases - Cengage, New Delhi.

2. Kuratko/rao, Entrepreneurship: a south asian perpective.- Cengage, New Delhi.

Reference Books:

1. Barringer, B., Entrepreneurship: Successfully Launching New Ventures, 3rd Edition, Pearson, 2011.

2. Bessant, J., and Tidd, J., Innovation and Entrepreneurship, 2nd Edition, John Wiley &Sons, 2011.

Weblinks

1. http://inventors.about.com/od/entrepreneur/

2. http://learnthat.com/tag/entrepreneurship/

3. www.managementstudyguide.com

4. www.quintcareers.com

5. www.entrepreneur.com

Environmental Science

(Common for B.Sc. Forensic Science & B.Sc. Cyber Security and Digital Forensics)

Course Code: 2510FS09

L	T	P	C
2	0	0	2

Semester V

Course Outcomes:

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

CO1: To develop an understanding of fundamental concepts of environmental science, including its components and significance in sustainable development.
CO2: To equip students with knowledge of environmental pollution, its sources, effects, and control measures to mitigate environmental degradation.
CO3: To familiarize students with global environmental issues such as climate change, global warming, and biodiversity loss, along with strategies for conservation.
CO4: To develop an understanding of environmental laws, policies, and the role of government and organizations in environmental protection.
CO5: To enhance awareness of sustainable development practices, green technologies, and the role of individuals and industries in achieving sustainability.

Mapping of Course Outcomes with Program Outcomes:

CO/PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11
CO1	3	2	2	3	2	2	2	2	3	2	3
CO2	3	2	3	3	3	2	2	3	3	2	3
CO3	3	2	2	3	3	2	2	3	3	3	3
CO4	2	2	2	2	3	3	3	2	2	2	3
CO5	3	2	2	3	3	2	2	3	3	3	3

Mapping of course outcomes with program outcomes:

CO/PSO	PSO1	PSO2
CO1	2	2
CO2	3	2
CO3	2	2
CO4	1	3
CO5	2	2

Unit-Wise Syllabus:

UNIT I: Fundamentals of Environmental Science

Definition, Scope, and Importance of Environmental Science, Components of Environment (Lithosphere, Hydrosphere, Atmosphere, Biosphere), Natural Resources (Renewable and Non-Renewable), Biodiversity and Its Conservation.

UNIT II: Environmental Pollution and Control Measures

Air Pollution, Water Pollution, Soil Pollution, Noise Pollution, Radioactive Pollution, Sources and Effects of Pollution, Pollution Control Measures, Solid Waste Management, 3Rs (Reduce, Reuse, Recycle), Waste Disposal Methods.

UNIT III: Climate Change and Global Environmental Issues

Greenhouse Effect, Global Warming, Ozone Layer Depletion, Acid Rain, Deforestation, Impact of Deforestation on Climate, Sustainable Development Goals (SDGs), Environmental Policies.

UNIT IV: Environmental Laws and Policies

Environmental Protection Act (1986), Water (Prevention and Control of Pollution) Act (1974), Air (Prevention and Control of Pollution) Act (1981), Wildlife Protection Act (1972), Role of Government, Role of NGOs in Environmental Protection.

UNIT V: Sustainable Development and Green Technologies

Concepts and Principles of Sustainable Development, Renewable Energy Sources (Solar, Wind, Hydro, Biomass), Eco-friendly Technologies, Green Infrastructure, Role of Individuals in Sustainability, Role of Industries in Sustainability.

Textbooks:

1. Basu, M., Xavier, S., & Nag, P. (2007). *Fundamentals of Environmental Studies.* Cambridge University Press.
2. Cunningham, W. P., & Cunningham, M. A. (2017). *Environmental Science: A Global Concern.* McGraw Hill.

References:

1. Carson, R. (1962). *Silent Spring.* Houghton Mifflin Harcourt.
2. Odum, E. P. (1971). *Fundamentals of Ecology.* W.B. Saunders.

Web Links:

1. https://www.unep.org/ (United Nations Environment Programme)
2. https://www.ipcc.ch/ (Intergovernmental Panel on Climate Change)
3. https://www.epa.gov/ (United States Environmental Protection Agency)
4. https://www.iucn.org/ (International Union for Conservation of Nature)
5. https://www.cbd.int/ (Convention on Biological Diversity)

Forensic Journalism and Investigative Reporting

(Common for B.Sc. Forensic Science & B.Sc. Cyber Security and Digital Forensics)

L	T	P	C
2	0	0	2

Course Code: 2510FS10

Semester VI

Course Outcomes:

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

CO1: To understand the fundamentals of forensic journalism, investigative reporting, ethical considerations, and the role of media in crime and justice.

CO2: To develop skills in investigative techniques, data collection, interview methods, and the use of digital tools for fact-finding and verification.

CO3: To analyze media laws, crime reporting, ethical dilemmas, and the legal framework governing journalistic practices, including contempt of court and defamation.

CO4: To explore the role of digital forensics, cybersecurity, and emerging technologies in investigative journalism, along with strategies to identify misinformation and fake news.

CO5: To gain practical experience in undercover reporting, financial crime investigations, human rights journalism, and conflict reporting while adhering to ethical and legal boundaries

Mapping of Course Outcomes with Program Outcomes:

CO/PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11
CO1	2	1	1	2	3	2	3	2	2	2	3
CO2	3	2	2	3	2	3	3	3	3	3	2
CO3	2	1	1	2	3	3	3	2	2	2	3
CO4	3	2	2	3	3	2	2	3	3	2	3
CO5	3	2	2	3	3	3	3	3	3	3	3

Mapping of course outcomes with program outcomes:

CO/PSO	PSO1	PSO2
CO1	2	3
CO2	3	2
CO3	2	3
CO4	3	2
CO5	3	3

Unit-Wise Syllabus:

UNIT I: Introduction to Forensic Journalism and Investigative Reporting

Definition and Scope of Forensic Journalism, Principles and Ethics in Investigative Reporting, Role of Media in Crime and Justice, Differences Between Traditional and Investigative Journalism, Evolution of Investigative Journalism, Responsibilities of a Forensic Journalist.

UNIT II: Investigative Techniques and Data Collection

Methods of Investigative Journalism, Primary and Secondary Sources, Interview Techniques and Witness Testimonies, Freedom of Information Act and Accessing Public Records, Open-Source Intelligence (OSINT), Use of Digital Tools for Investigation, Challenges in Data Collection.

UNIT III: Crime Reporting and Media Laws

Types of Crime Reporting (White-Collar, Organized, Cybercrime), Role of Media in Criminal Investigations, Ethical Dilemmas in Crime Reporting, Contempt of Court and Defamation, Protection of Journalistic Sources, Media Trials and Their Impact on Justice, Press Laws and Journalistic Privileges.

UNIT IV: Digital Forensics and Investigative Journalism

Role of Digital Forensics in Journalism, Cybercrime Investigation and Reporting, Identifying and Verifying Fake News, Use of AI and Big Data in Investigative Reporting, Tracking Digital Footprints, Cybersecurity for Journalists, Case Studies on Digital Investigations.

UNIT V: Undercover Reporting and Surveillance Journalism

Ethical Considerations in Undercover Journalism, Covert Reporting Techniques, Surveillance Laws and Privacy Issues, Hidden Cameras and Recording Devices, Whistleblower Protection, Legal and Ethical Boundaries in Investigative Journalism, Case Studies on Undercover Operations.

Textbooks:

1. Houston, B. (2009). *The Investigative Reporter's Handbook: A Guide to Documents, Databases, and Techniques.* Bedford/St. Martin's.
2. de Burgh, H. (2008). *Investigative Journalism.* Routledge.

References:

1. Pilger, J. (2005). *Tell Me No Lies: Investigative Journalism and Its Triumphs.* Vintage.
2. Schudson, M. (2008). *Why Democracies Need an Unlovable Press.* Polity Press.

Web Links:

1. https://www.icfj.org/ (International Center for Journalists)
2. https://gijn.org/ (Global Investigative Journalism Network)
3. https://www.pulitzer.org/ (The Pulitzer Prizes)
4. https://www.cjr.org/ (Columbia Journalism Review)
5. https://www.reporterslab.org/ (Duke Reporters' Lab)

Mandatory Courses (MC)

Course Code	Sem	Course Name	Level	L	T	P	C	CIE	SEE	Total	Pre-requisite
2510AC01	I	Constitution of India	FC	2				100	-	100	
2510AC02	II	Indian Science & Technology	FC	2				100	-	100	
2510AC03	III	Health & Wellness, Yoga Education, Sports, and Fitness	FC	2				100	-	100	
2510AC04	IV	Indian History & Culture	FC	2				100	-	100	
2510AC05	V	Indian Philosophy & Ethics	FC	2				100	-	100	
		Total		**10**				**500**	**-**	**500**	

Constitution of India

(Common for B.Sc. Forensic Science & B.Sc. Cyber Security and Digital Forensics)

	L	T	P	C
Course Code: 2510AC01	2	0	0	2

Semester I

Course Outcomes:

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

CO1: Understand the Indian Constitution's meaning, importance, evolution, Preamble, and salient features.
CO2: Explain Fundamental Rights, DPSP, and Fundamental Duties, assessing their role in governance and society.
CO3: Describe the structure, powers, and functions of the Union and State Governments, including key executives and legislative bodies.
CO4: Examine the Judiciary, Centre-State relations, emergency provisions, and constitutional bodies like the Election Commission, Finance Commission, UPSC, SPSC, and CAG.
CO5: Evaluate key amendments, legal provisions, and contemporary issues, including RTI, reservations, elections, judicial activism, PIL, human rights, and landmark judgments.

Mapping of Course Outcomes with Program Outcomes:

CO/PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11
CO1	2	1	1	2	3	2	2	2	2	2	3
CO2	2	1	1	2	3	2	2	2	2	2	3
CO3	2	1	1	2	3	2	2	2	2	2	3
CO4	2	1	1	2	3	2	2	2	2	2	3
CO5	2	1	1	2	3	2	2	2	2	2	3

Mapping of course outcomes with program outcomes:

CO/PSO	PSO1	PSO2
CO1	1	3
CO2	1	3
CO3	1	3
CO4	2	3
CO5	2	3

Unit-Wise Syllabus:

UNIT I: Introduction to the Indian Constitution
Meaning, importance, and evolution of the Constitution, Preamble: Objectives and features, Salient features of the Indian Constitution, Fundamental Rights: Articles 12-35, Directive Principles of State Policy (DPSP), Fundamental Duties.

UNIT II: Structure of Government
Union Government: President, Prime Minister and Council of Ministers, Parliament (Lok Sabha & Rajya Sabha) – Structure, powers, and functions, State Government: Governor, Chief Minister and Council of Ministers, State Legislature (Legislative Assembly & Legislative Council), Judiciary: Supreme Court – Composition, powers, and jurisdiction, High Courts and Subordinate Courts.

UNIT III: Federalism and Constitutional Bodies
Indian Federalism: Features, nature, and issues, Centre-State relations: Legislative, administrative, and financial, Emergency provisions: Articles 352, 356, 360, Constitutional Bodies: Election Commission of India, Finance Commission, Union Public Service Commission (UPSC), State Public Service Commission (SPSC), Comptroller and Auditor General (CAG).

UNIT IV: Amendments and Important Provisions
Constitutional Amendments: Procedure and significant amendments (42nd, 44th, 73rd, 74th), Right to Information (RTI) Act, 2005, Reservation policies and social justice, Special provisions for Scheduled Castes, Scheduled Tribes, and Other Backward Classes, Anti-Defection Law.

UNIT V: Governance, Policies, and Contemporary Issues
Political parties and elections in India, Local self-government: Panchayati Raj and municipalities, Public Interest Litigation (PIL) and judicial activism, Human rights and women's rights in the Constitution, Important Supreme Court judgments and their impact, Contemporary issues: Constitutional challenges and reforms.

Textbooks

1. Basu, D. D. (2021). *Introduction to the Constitution of India* (26th ed.). LexisNexis.

2. Pylee, M. V. (2019). *India's Constitution* (16th ed.). S. Chand Publishing.

References

1. Seervai, H. M. (2017). *Constitutional Law of India* (4th ed.). Universal Law Publishing.
2. Austin, G. (2016). *The Indian Constitution: Cornerstone of a Nation*. Oxford University Press.

Web Links

1. https://legislative.gov.in/constitution-of-india
2. https://www.india.gov.in/my-government/constitution-india
3. https://www.mea.gov.in/Images/pdf1/Part1.pdf
4. https://indiankanoon.org/
5. https://niti.gov.in/

Indian Science & Technology

(Common for B.Sc. Forensic Science & B.Sc. Cyber Security and Digital Forensics)

	L	T	P	C
Course Code: 2510AC02				
Semester II	2	0	0	2

Course Outcomes:

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

CO1: Understand the evolution, importance, and contributions of science and technology in India.
CO2: Demonstrate knowledge of India's space and defense technologies, including ISRO missions and DRDO advancements.
CO3: Describe the development of IT, AI, cybersecurity, 5G, and e-governance in India.
CO4: Examine advancements in biotechnology, healthcare, DNA fingerprinting, and ethical concerns.
CO5: Evaluate energy resources, environmental policies, sustainability, and disaster management.

Mapping of Course Outcomes with Program Outcomes:

CO/PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11
CO1	3	2	2	3	2	2	1	2	3	2	3
CO2	3	2	3	3	2	3	1	3	3	2	3
CO3	3	2	3	3	2	3	2	3	3	2	3
CO4	3	2	2	3	3	3	2	2	3	2	3
CO5	3	2	2	3	3	2	2	3	3	2	3

Mapping of course outcomes with program outcomes:

CO/PSO	PSO1	PSO2
CO1	2	2
CO2	3	2
CO3	3	3
CO4	3	3
CO5	2	2

Unit-Wise Syllabus:

UNIT I: Introduction to Science and Technology in India
Definition and scope of science and technology, Historical development of science and technology in ancient, medieval, and modern India, Contributions of Indian scientists, Role of science and technology in national development.

UNIT II: Space and Defence Technologies
Indian space programs: ISRO, major satellite missions (INSAT, IRS, Chandrayaan, Mangalyaan, Gaganyaan), Remote sensing and its applications, Defence technology: DRDO, missile systems (Agni, Prithvi, BrahMos), Indigenous weapon systems and advancements in military technology.

UNIT III: Information Technology and Communication
Evolution of IT and communication in India, Digital India initiative, Artificial Intelligence and Machine Learning, Cybersecurity and data protection laws, 5G technology and its impact, E-governance and its role in development.

UNIT IV: Biotechnology and Healthcare
Biotechnology in agriculture, GM crops, and biofertilizers, Healthcare advancements: Vaccines, pharmaceutical research, and AYUSH, Stem cell research and regenerative medicine, DNA fingerprinting and forensic applications, Ethical issues in biotechnology.

UNIT V: Energy, Environment, and Sustainable Development
Renewable and non-renewable energy resources, Nuclear energy in India, Policies on sustainable development and climate change, Environmental conservation and green technologies, Role of science and technology in disaster management.

Textbooks

1. Agrawal, B. N., & Agrawal, R. (2017). *Satellite Technology: Principles and Applications* (3rd ed.). Wiley India.
2. Rao, C. N. R. (2010). *Understanding Chemistry* (2nd ed.). University Press.

References

1. Kalam, A. P. J., & Rajan, Y. S. (1998). *India 2020: A Vision for the New Millennium*. Penguin Books India.
2. Chattopadhyay, D. (2014). *Science and Society in India*. Pearson Education.

Web Links

1. https://www.isro.gov.in/
2. https://www.drdo.gov.in/
3. https://dst.gov.in/
4. https://www.niti.gov.in/
5. https://www.csir.res.in/

Health & Wellness, Yoga Education, Sports, and Fitness

(Common for B.Sc. Forensic Science & B.Sc. Cyber Security and Digital Forensics)

L	T	P	C
2	0	0	2

Course Code: 2510AC03

Semester III

Course Outcomes:

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

CO1: Understand the meaning, importance, and components of health, wellness, and nutrition.
CO2: Demonstrate knowledge of wellness management, fitness, and the impact of diet and doping.
CO3: Describe the principles and benefits of yoga for mental and physical well-being.
CO4: Examine various yoga practices, including asanas, pranayama, meditation, and mudras.
CO5: Evaluate different fitness activities, including aerobics, dance fitness, and resistance training.

Mapping of Course Outcomes with Program Outcomes:

CO/PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11
CO1	3	2	2	3	2	2	2	2	3	2	3
CO2	3	2	2	3	3	2	2	3	3	2	3
CO3	2	1	1	2	3	2	2	2	3	2	3
CO4	2	1	1	2	3	2	2	2	3	2	3
CO5	3	2	2	3	2	2	2	3	3	3	3

Mapping of course outcomes with program outcomes:

CO/PSO	PSO1	PSO2
CO1	2	2
CO2	2	3
CO3	2	3
CO4	2	3
CO5	2	2

Unit-Wise Syllabus:

UNIT I: Health & Wellness

Define and differentiate health and wellness – Components of health wellness and their relationship between physical activity – Local, demographic, societal issues and factors affecting health and wellness.

Diet and nutrition for health & wellness – Essential components of balanced diet for healthy living with specific reference to the role of carbohydrates, proteins, fats, vitamins & minerals – malnutrition, under nutrition and over nutrition.

UNIT II: Management of Health And Wellness

Meaning & importance of various dimensions of wellness. Relationship of physical fitness in achieving wellness. Drugs, doping and wellness. Role of diet and exercise in health management.

UNIT-III Yoga Education

Meaning and definition of yoga and its aims and objectives – Basic principles of yoga and its importance in our daily life – Yoga for mental attitude – Mind, body, breath and emotional level for higher plan of living.

UNIT-IV Yoga Practices

Types and limbs of yoga – Yoga postures – Asana – Breathing Practices – Pranayama – Relaxation-Meditation – Mudra.

UNIT-V Fitness Activities

Types of fitness activities – Outdoor activities – Basic movement patterns. Indoor activity – Aerobics/Dance Fitness, Resistance Training for fitness.

Textbooks

1. Hoeger, W. W. K., & Hoeger, S. A. (2021). *Principles and Labs for Fitness and Wellness* (15th ed.). Cengage Learning.
2. Khanna, G. L. (2020). *Health and Physical Education*. Sports Publication.

References

1. Chaturvedi, A. (2019). *Fitness and Wellness: A Holistic Approach*. Khel Sahitya Kendra.
2. Saraswati, S. (2008). *Asana Pranayama Mudra Bandha*. Bihar School of Yoga.

Web Links

1. https://www.who.int/health-topics/
2. https://www.nhp.gov.in/health-wellness-home_pg
3. https://www.ayush.gov.in/
4. https://www.cdc.gov/physicalactivity/
5. https://www.yogajournal.com/

Indian History & Culture

(Common for B.Sc. Forensic Science & B.Sc. Cyber Security and Digital Forensics)

	L	T	P	C
Course Code: 2510AC04	2	0	0	2

Semester IV

Course Outcomes:

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

CO1: Understand Early Societies – Analyze Harappan civilization, urban planning, and cultural continuity.
CO2: Explore Vedic Age & Religions – Study Vedic society, Mahajanapadas, and the impact of Jainism & Buddhism.
CO3: Assess Mauryan Governance – Examine Chandragupta, Asoka's policies, and Mauryan cultural influence.
CO4: Analyze Post-Mauryan to Gupta Era – Explore political, social, and cultural developments under key rulers.
CO5: Evaluate Harshavardhana & Southern Kingdoms – Study Harsha's rule and contributions of Chalukyas & Pallavas.

Mapping of Course Outcomes with Program Outcomes:

CO/PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11
CO1	3	2	2	3	2	2	1	2	3	2	3
CO2	3	2	2	3	3	2	2	3	3	2	3
CO3	3	2	3	3	3	2	2	3	3	2	3
CO4	3	2	2	3	3	2	2	3	3	2	3
CO5	3	2	2	3	3	2	2	3	3	2	3

Mapping of course outcomes with program outcomes:

CO/PSO	PSO1	PSO2
CO1	1	2
CO2	1	3
CO3	1	3
CO4	1	2
CO5	1	2

Unit-Wise Syllabus:

UNIT-I: Early Societies and Harappan Civilization

India's geographical and environmental setting, sources of history, and prehistoric cultures (Paleolithic, Mesolithic, Chalcolithic, Megalithic, and rock art). Examines the Harappan Civilization, its urban planning, socio-economic life, religious beliefs, decline, and cultural continuity.

UNIT-II: Vedic Age and the 6th Century B.C.

Discusses Rig Vedic and Later Vedic polity, society, economy, and religion. Explores the Mahajanapadas, rise of Magadha, Persian and Greek influences, and the emergence of Jainism and Buddhism, including their teachings and impact.

UNIT-III: Mauryan Empire

Focuses on the establishment of the Mauryan Empire, Chandragupta Maurya's rule, and Megasthenes' accounts. Highlights Asoka's administration, policies, promotion of Buddhism, and Mauryan art and culture.

UNIT-IV: Post-Mauryan to Gupta Period

Covers the Sungas, Satavahanas, Indo-Greeks, Kushans, and their contributions. Discusses the Gupta Empire's rise, administration, key rulers, social, economic, and religious developments, along with advancements in science, literature, and art.

UNIT-V: Harshavardhana and South Indian Kingdoms

Examines Harshavardhana's rule, administration, and contributions. Highlights the Chalukyas of Badami (Pulakesi II) and Pallavas, focusing on their political history, literature, and architectural achievements.

Textbooks:

1. An advanced history of India – causes and decline of Guptas by B.C. Majumdar and others, 1967, Macmillan.
2. Ancient India by R.C. Majumdar, 1977, Motilal Banarasi Das.

Reference Books:

1. History of Ancient India by Krishnaswamy Aiyangar, 1980, Seema Publishers.
2. Ancient India by V.D. Mahajan, 1985, S.Chand and Company.

Web Links:

1. https://iasscore.in/upsc-syllabus/history/ancient-history?
2. https://byjus.com/free-ias-prep/ncert-ancient-history-notes/?
3. https://exams.nta.ac.in/CUET-PG/images/syllabus/humanities/Ancient%20Indian%20History%2C%20Culture%20%26%20Architecture%20%20%28HUQP01%29.pdf?
4. https://skmu.ac.in/syllabus/Sybllaus-Ancient-Indian-History-converted.pdf?
5. https://www.drishtiias.com/pdf/1656490275_History%20Syllabus_Final.pdf?

Indian Philosophy & Ethics

(Common for B.Sc. Forensic Science & B.Sc. Cyber Security and Digital Forensics)

	L	T	P	C
Course Code: 2510AC05	2	0	0	2

Semester V

Course Outcomes:

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

CO1: Develop a comprehensive understanding of advanced biochemical principles, including molecular interactions, reaction mechanisms, and macromolecular structures.
CO2: Acquire proficiency in analytical techniques for biomolecular characterization, such as chromatography, electrophoresis, and spectroscopy.
CO3: Understand metabolic pathways and bioenergetics, emphasizing the integration and regulation of carbohydrate, lipid, amino acid, and nucleotide metabolism.
CO4: Gain insights into neurophysiology and neuromuscular functions, focusing on neural communication, muscle contraction mechanisms, and related physiological processes.
CO5: Comprehend hematological, cardiovascular, and endocrine system functions, including blood composition, cardiac physiology, hormonal regulation, and associated disorders.

Mapping of Course Outcomes with Program Outcomes:

CO/PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11
CO1	3	2	2	3	2	2	2	2	3	2	2
CO2	3	3	3	3	2	3	2	3	3	2	2
CO3	3	3	3	3	2	3	2	3	3	2	2
CO4	3	2	2	3	3	2	2	3	3	2	2
CO5	3	2	2	3	3	2	2	3	3	2	3

Mapping of course outcomes with program outcomes:

CO/PSO	PSO1	PSO2
CO1	-	2
CO2	-	2
CO3	-	2
CO4	-	2
CO5	-	2

Unit-Wise Syllabus:

Unit I : The foundational concepts of Indian philosophy

Introduction and the foundational concepts of Indian philosophy, highlighting common features across different schools and the Upanishadic doctrine of the self and critique of ritual.

Unit II: Heterodox traditions

Cārvāka's materialism, Buddhist teachings on the Four Noble Truths and Dependent Origination, and Jainism's doctrines of Anekāntavāda and Syādvāda.

Unit III : The orthodox schools.

The epistemological and metaphysical perspectives of orthodox schools-such as Nyāya-Vaiśeṣika, Mīmāṃsā, and Sāṃkhya's dualistic approach to reality, along with debates on causation like Asatkāryavāda and Satkāryavāda.

Unit IV: Philosophical Perspectives in Vedānta

Vedānta schools, particularly Śaṃkara's Advaita Vedānta, which discusses Brahman and Māyā, and Rāmānuja's Viśiṣṭādvaita, which critiques Māyā and presents a theistic interpretation of Brahman.

Unit V:Ethical Foundations in Indian Philosophy

Indian ethical theories, covering moral philosophy, family and societal values, the four puruṣārthas (Dharma, Artha, Kāma, Mokṣa), Nishkama Karma as explained in the Bhagavad Gita, and ethical teachings in Jainism and Buddhism.

Textbooks:

1. Biochemistry by Jeremy M. Berg, John L. Tymoczko, and Lubert Stryer.

2. Lehninger Principles of Biochemistry by David L. Nelson and Michael M. Cox.

Reference Books:

1. Harper's Illustrated Biochemistry by Victor W. Rodwell, David Bender, Kathleen M. Botham, Peter J. Kennelly, and Anthony Weil.
2. Textbook of Medical Physiology by Arthur C. Guyton and John E. Hall.

Web Links:

1. https://biochem.oregonstate.edu/undergraduate/educational-resources?
2. https://open.umn.edu/opentextbooks/textbooks/biochemistry-free-for-all-ahern?
3. https://www.bioch.ox.ac.uk/recommended-reading-list?
4. https://annamalaiuniversity.ac.in/studport/download/agri/soilsci/resources/SAC%20124%20fundamentals%20of%20biochemistry%20lecture%20notes.pdf?
5. https://www.studocu.com/en-gb/document/university-of-nottingham/advanced-biochemistry-of-cancer/advanced-biochemistry-lecture-notes-2017/12359618

Minor Stream: Computer Science

Course Code	Sem	Course Name	Level	L	T	P	C	CIE	SEE	Total	Pre-requisite
2510FS32	I	Introduction to Operating System	FC	2		2	4	50	50	100	-
2510FS33	II	Computer Network	FC	2		2	4	50	50	100	-
2510FS51	III	Data Structure & Algorithms	IC	2		2	4	50	50	100	CN
2510FS52	IV	Database Management Systems	IC	2		2	4	50	50	100	-
2510FS14	V	Programming Languages	AC	2		2	4	50	50	100	IOS DS & A
2510FS15	VI	Artificial Intelligence/ Machine Learning	AC	2		2	4	50	50	100	DMS
Total				**12**		**12**	**24**				

Introduction to Operating System

	L	T	P	C
Course Code: 2510FS32	2	0	2	4

Semester I

Course Outcomes:

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

CO1: Understand various types and structures of operating systems.
CO2: Analyze and implement process synchronization and communication techniques.
CO3: Apply CPU scheduling and deadlock handling methods in real-time systems.
CO4: Evaluate memory management strategies including paging and segmentation.
CO5: Explain the architecture of file systems and disk I/O management.

Mapping of Course Outcomes with Program Outcomes:

CO/PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11
CO1	3	2	2	3	2	2	1	2	2	1	2
CO2	3	3	3	3	2	2	1	3	2	2	2
CO3	3	3	3	3	2	2	1	3	2	2	2
CO4	3	3	3	3	2	3	1	3	2	2	2
CO5	3	3	3	3	2	3	1	3	2	2	2

Mapping of course outcomes with program outcomes:

CO/PSO	PSO1	PSO2
CO1	3	1
CO2	3	2
CO3	3	2
CO4	3	1
CO5	3	2

Unit-Wise Syllabus:

UNIT – I: Operating System Basics and Structures

What is an operating system? Main functions and purpose. Types of operating systems. Basic structure of operating systems, Layered design, Components and Services. Introduction to Kernel types – Monolithic and Microkernel.

Practice - Implement CPU scheduling algorithms (FCFS, SJF, RR, Priority).

UNIT – II: Concurrency and Inter-Process Communication (IPC)

Concurrent Process: Process Concept, Principle of Concurrency, Producer /Consumer Problem, Mutual Exclusion, Critical Section Problem, Deker's solution, Peterson's solution, Semaphores, Test and Set operation; Classical Problem in Concurrency- Dining Philosopher Problem, Sleeping Barber Problem; Inter Process Communication models and Schemes, Proces generation.

Practice - Simulate classical synchronization problems using semaphores.

UNIT – III: Process Scheduling and Deadlock Management

CPU Scheduling: Scheduling Concepts, Performance Criteria, Process States, Process Transition Diagram, Schedulers, Process Control Block (PCB), Process address space, Process identification information, Threads and their management, Scheduling Algorithms, Multiprocessor Scheduling. Deadlock: System model, Deadlock characterization, Prevention, Avoidance and detection, Recovery from deadlock.

Practice - Demonstrate page replacement algorithms (FIFO, LRU, Optimal).

UNIT – IV: Memory Management Techniques

Memory Management: Basic bare machine, Resident monitor, Multiprogramming with fixed partitions, Multiprogramming with variable portions, Protection schemes, Paging, Segmentation,

Paged segmentation, Virtual memory concepts, Demand paging, Performance of demand paging, Page replacement algorithms, Thrashing, Cache memory organization, Locality of reference.

Practice - Analyze file system implementation through Linux shell commands.

UNIT – V: I/O and File System Management

I/O Management and Disk Scheduling: I/O devices, and I/O subsystems, I/O buffering, Disk storage and disk scheduling, RAID. File System: File concept, File organization and aces mechanism, File directories, and File sharing, Filesystem implementation issues, File system protection and security.

Practice - Perform disk scheduling simulations (FCFS, SSTF, SCAN).

Textbooks:

1. Silberschatz, Galvin & Gagne – *Operating System Concepts*, Wiley.
2. Andrew S. Tanenbaum – *Modern Operating Systems*, Pearson.

Reference Books:

1. Maurice J. Bach – *The Design of the UNIX Operating System*, Pearson.
2. Richard Stevens – *Advanced Programming in the UNIX Environment*, Addison Wesley.

Web Links:

1. https://www.geeksforgeeks.org/operating-systems/
2. https://www.tutorialspoint.com/operating_system/index.htm
3. https://www.javatpoint.com/operating-system-tutorial
4. https://www.ibm.com/docs/en/zos
5. https://linuxjourney.com/

Computer Networks

	L	T	P	C
Course Code: 2510FS33	2	0	2	4

Semester II

Course Outcomes:

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

CO1: Understand the fundamental concepts of computer networks, architectures, and protocols.
CO2: Analyze and compare network models like OSI and TCP/IP.
CO3: Understand the functionality of various layers of networking and their protocols.
CO4: Identify security threats and solutions in networking.
CO5: Design simple network topologies and implement basic network applications.

Mapping of Course Outcomes with Program Outcomes:

CO/PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11
CO1	3	2	2	3	2	2	1	2	3	2	2
CO2	3	3	3	3	2	2	1	2	3	2	2
CO3	3	3	3	3	2	2	1	3	2	2	2
CO4	3	2	2	3	3	3	2	3	2	2	3
CO5	3	3	3	3	2	3	2	3	3	3	2

Mapping of course outcomes with program outcomes:

CO/PSO	PSO1	PSO2
CO1	3	1
CO2	3	1
CO3	3	2
CO4	3	3
CO5	3	2

Unit-Wise Syllabus:

UNIT – I: Introduction to Computer Networks

Basics of Computer Networks, Types of Networks: LAN, MAN, WAN. Network Topologies. Transmission Media (Guided & Unguided). Network Devices: Hub, Switch, Router, Bridge, Gateway. Network Models: OSI & TCP/IP.

Practice - Basic Networking Commands: ping, traceroute, ipconfig, nslookup, etc.

UNIT – II: Physical and Data Link Layer

Physical Layer: Encoding, Modulation, Transmission Modes. Data Link Layer Functions. Framing Techniques. Error Detection and Correction (Parity, CRC, Hamming). Flow and Error Control Protocols (Stop & Wait, Sliding Window). MAC Protocols – CSMA/CD, CSMA/CA.

Practice - Packet Capture and Analysis using Wireshark

UNIT – III: Network Layer

IPv4 & IPv6. Subnetting and Supernetting. Routing Algorithms: Distance Vector, Link State. Congestion Control Techniques. ICMP, ARP, RARP Protocols. Addressing Schemes.

Practice - Subnetting and IP Address Calculation Exercises

UNIT – IV: Transport Layer

Process-to-Process Delivery. TCP and UDP Protocols. Port Numbers and Sockets. Connection Establishment and Termination. Flow Control and Congestion Avoidance. Quality of Service (QoS).

Practice - Socket Programming in Python/Java (Client-Server Communication)

UNIT – V: Application Layer and Network Security

DNS, HTTP, FTP, SMTP, POP3, SNMP. Firewalls and Intrusion Detection Systems. Cryptography Basics: Symmetric and Asymmetric. Digital Signatures and Certificates. Secure Protocols: SSL, TLS, HTTPS.

Practice - Simulation of CSMA/CD Protocol using NS2/NS3 or Cisco Packet Tracer

Textbooks:

1. "Data Communications and Networking" – Behrouz A. Forouzan, McGraw Hill
2. "Computer Networking: A Top-Down Approach" – James Kurose & Keith Ross, Pearson

Reference Books:

1. "Internetworking with TCP/IP" – Douglas E. Comer
2. "Network+ Guide to Networks" – Jill West

Web Links:

1. https://www.geeksforgeeks.org/computer-network-tutorial/
2. https://www.tutorialspoint.com/data_communication_computer_network/index.htm
3. https://www.ietf.org/
4. https://www.packetlife.net/
5. https://wireshark.org/

Programming Languages

	L	T	P	C
Course Code: 2510FS14	2	0	2	4

Semester V

Course Outcomes:

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

CO1: Understand the evolution, paradigms, and core principles of programming languages including procedural, object-oriented, and functional styles.
CO2: Apply fundamental programming constructs such as variables, data types, operators, and control statements in C, Python, and Java.
CO3: Implement object-oriented programming concepts like classes, inheritance, and polymorphism using C++, Python, and Java.
CO4: Solve problems using data structures and algorithms in multiple languages and evaluate memory management techniques.
CO5: Build real-world applications using file handling, exception handling, multithreading, and GUI components across languages.

Mapping of Course Outcomes with Program Outcomes:

CO/PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11
CO1	3	2	2	3	2	2	1	2	3	2	2
CO2	3	3	3	3	2	2	1	3	3	2	2
CO3	3	3	3	3	2	2	1	3	3	2	2
CO4	3	3	3	3	2	3	2	3	3	2	2
CO5	3	3	3	3	3	3	2	3	3	3	2

Mapping of course outcomes with program outcomes:

CO/PSO	PSO1	PSO2
CO1	2	1
CO2	3	1
CO3	3	2
CO4	3	2
CO5	3	2

Unit-Wise Syllabus:

UNIT – I: Introduction to Programming Languages and C Programming

History and types of programming languages, Compiled vs. Interpreted languages, Introduction to C: Features, structure of a program, Data types, variables, constants, operators, Control statements: if, switch, loops (for, while, do-while), Functions: basics, recursion, storage classes, Preprocessor directives, macros, header files

Practice - Mini Calculator in C and Python, Demonstrate control statements, functions, and user input.

UNIT – II: Arrays, Pointers, and File Handling in C; Introduction to Python

Arrays: 1D, 2D and strings, Pointers: basics, pointer arithmetic, functions, arrays, Dynamic memory: malloc(), calloc(), free(), File handling: opening, reading, writing files, Introduction to Python: features, basic syntax, Variables, data types, control statements, functions, modules

Practice - Student Record Management System in C++, Use classes, file handling, and basic data structures.

UNIT – III: Object-Oriented Programming in C++, Python, and Java

C++ basics and OOP concepts: classes, objects, inheritance, polymorphism. Constructors, destructors, function and operator overloading. Python OOP: classes, inheritance, polymorphism. Java basics: structure, features, OOP, data types, control structures

Practice - Banking System in Java, Apply OOP concepts, exception handling, and multithreading.

UNIT – IV: Advanced Concepts in C++, Python, and Java

Templates in C++. Exception handling in C++, Python, and Java. File handling in Python and Java. Multithreading basics in all three languages. Introduction to libraries: NumPy, Pandas (Python), JavaFX (Java), STL (C++). Basic GUI with Tkinter (Python).

Practice - Data Structure Visualization, Implement stack, queue, and linked list in Python or C++ with simple menu-driven interface.

UNIT – V: Data Structures and Algorithms Across Languages

Arrays, linked lists, stacks, queues. Searching: linear, binary. Sorting: bubble, selection, merge, quick. Trees and graphs: basics and traversal. Memory management in C/C++. Java JDBC basics for database access. Comparing data structure code in C, Python, and Java.

Practice - Multiform GUI Application in Python using Tkinter, Create a basic GUI with form submission and data display.

Textbooks:

1. E. Balagurusamy, *Programming in ANSI C*, McGraw-Hill Education
2. Bjarne Stroustrup, *The C++ Programming Language*, Addison-Wesley

Reference Books:

1. Brian W. Kernighan and Dennis M. Ritchie, *The C Programming Language*, Prentice Hall
2. Herbert Schildt, *C++: The Complete Reference*, McGraw-Hill

Web Links:

1. https://www.geeksforgeeks.org/
2. https://www.w3schools.com/
3. https://www.tutorialspoint.com/
4. https://docs.python.org/3/
5. https://dev.java/

Data Structures & Algorithms

	L	T	P	C
Course Code: 2510FS51	2	0	2	4

Semester III

Course Outcomes:

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

CO1: Understand and apply fundamental data structures such as arrays, linked lists, stacks, and queues.

CO2: Implement and analyze searching, sorting, and hashing algorithms.

CO3: Design and apply tree and graph data structures for problem-solving.

CO4: Utilize algorithmic paradigms for optimization and computational efficiency.

CO5: Evaluate the time and space complexity of algorithms.

Mapping of Course Outcomes with Program Outcomes:

CO/PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11
CO1	3	3	3	3	2	2	1	2	2	2	2
CO2	3	3	3	3	2	3	1	3	2	2	2
CO3	3	3	3	3	2	3	1	3	3	2	2
CO4	3	3	3	3	2	3	1	3	3	2	2
CO5	3	3	3	3	3	3	1	3	3	2	2

Mapping of course outcomes with program outcomes:

CO/PSO	PSO1	PSO2
CO1	3	1
CO2	3	2
CO3	3	2
CO4	3	2
CO5	3	1

Unit-Wise Syllabus:

UNIT – I: Introduction to Data Structures & Complexity Analysis

Introduction to data structures: Definition, need, types (linear & nonlinear). Abstract Data Type (ADT) concept. Time and space complexity: Big-O, Omega, and Theta notations. Asymptotic analysis, best-case, worst-case, and average-case complexity. Recursion: Principles, recursive functions, tail recursion, and applications.

Practice - Implementing stacks, queues, linked lists, and trees.

UNIT – II: Linear Data Structures

Arrays: Representation, operations, applications, and limitations. Linked lists: Single, double, and circular linked lists, operations (insertion, deletion, traversal). Stacks: Definition, operations, applications (expression evaluation, backtracking). Queues: Types (simple, circular, priority, deque), applications (job scheduling, BFS).

Practice - Sorting and searching algorithm implementation and comparison.

UNIT – III: Searching, Sorting, and Hashing

Searching algorithms: Linear search, binary search, interpolation search. Sorting algorithms: Bubble sort, selection sort, insertion sort, merge sort, quicksort, heap sort, radix sort. Hashing: Hash functions, collision resolution techniques (chaining, open addressing). Applications of hashing in databases and cryptography.

Practice - Graph algorithms: BFS, DFS, Dijkstra's algorithm.

UNIT – IV: Trees and Graphs

Trees: Binary trees, binary search trees (BST), AVL trees, B-trees, B+ trees, heap trees. Tree traversal: Inorder, preorder, postorder. Graphs: Representation (adjacency matrix, adjacency list), BFS and DFS traversal. Shortest path algorithms: Dijkstra's and Floyd-Warshall. Minimum spanning trees: Kruskal's and Prim's algorithms. Applications in networking and AI.

Practice - Hashing techniques and collision resolution.

UNIT – V: Algorithmic Paradigms and Applications

Divide and conquer: Merge sort, quicksort, binary search. Greedy algorithms: Knapsack problem, Huffman coding, Kruskal's algorithm. Dynamic programming: Fibonacci series, longest common subsequence (LCS), matrix chain multiplication. Backtracking: N-Queens problem, subset sum problem. Applications in AI, bioinformatics, and optimization.

Practice - Solving real-world optimization problems using dynamic programming and backtracking.

Textbooks:

1. "Data Structures and Algorithms in C++" – Adam Drozdek, Cengage, ISBN: 978-1337117562
2. "Introduction to Algorithms" – Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, Clifford Stein, MIT Press, ISBN: 978-0262033848

Reference Books:

1. "Data Structures and Algorithm Analysis in C++" – Mark Allen Weiss, Pearson, ISBN: 978-0132847377
2. "Algorithms" – Robert Sedgewick & Kevin Wayne, Addison-Wesley, ISBN: 978-0321573513

Web Links:

1. https://www.geeksforgeeks.org/data-structures/
2. https://leetcode.com/
3. https://www.khanacademy.org/computing/computer-science/algorithms
4. https://www.coursera.org/specializations/data-structures-algorithms
5. https://ocw.mit.edu/courses/6-046j-design-and-analysis-of-algorithms-spring-2015/

Database Management Systems

	L	T	P	C
Course Code: 2510FS52	2	0	2	4

Semester IV

Course Outcomes:

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

CO1: Understand the concepts of databases, DBMS architecture, and data models.

CO2: Apply normalization techniques for database design and optimization.

CO3: Implement SQL queries for database creation, manipulation, and retrieval.

CO4: Analyze transaction management, concurrency, and recovery mechanisms.

CO5: Explore advanced database concepts like NoSQL, distributed databases, and big data.

Mapping of Course Outcomes with Program Outcomes:

CO/PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11
CO1	3	2	2	3	2	2	1	2	2	2	2
CO2	3	3	3	3	2	3	1	3	3	2	2
CO3	3	3	3	3	2	3	1	3	3	2	2
CO4	3	3	3	3	3	3	1	3	3	2	2
CO5	3	3	3	3	3	2	2	3	3	3	2

Mapping of course outcomes with program outcomes:

CO/PSO	PSO1	PSO2
CO1	3	1
CO2	3	1
CO3	3	2
CO4	3	2
CO5	3	2

Unit-Wise Syllabus:

UNIT – I: Introduction to Database Systems

What is a database and why we use it. Difference between file-based and database systems. Types of databases: Hierarchical, Network, Relational, Object-Oriented. Components of a DBMS. Types of data models: Conceptual, Logical, Physical. ER Model: Entities, attributes, relationships, keys, and ER diagrams.

Practice - Designing an ER model and converting it into a relational schema.

UNIT – II: Relational Model and Normalization

Relational databases and tables. Relational Algebra (basic operations). Types of constraints: Primary key, foreign key, domain rules. Functional Dependency. Normalization: 1NF, 2NF, 3NF, BCNF – Why we need it. Removing data redundancy and anomalies

Practice - Implementing SQL queries for database creation, retrieval, and manipulation.

UNIT – III: SQL and Query Processing

Introduction to SQL: DDL, DML, DCL, TCL. Basic SQL commands: SELECT, INSERT, UPDATE, DELETE. Joins, GROUP BY, ORDER BY, HAVING. Subqueries and nested queries. Views, Indexes, Stored Procedures, and Triggers. Basics of query optimization.

Practice - Writing stored procedures, triggers, and functions in SQL.

UNIT – IV: Transaction Management and Concurrency Control

What is a transaction? ACID properties. How transactions are processed. Concurrency issues and solutions: Locks, Timestamps. Deadlock and how to handle it.Backup and recovery: Log-based, checkpoints.

Practice - Implementing transaction control and concurrency management.

UNIT – V: Advanced Database Concepts and Emerging Technologies

Distributed databases: How they work across systems. NoSQL: Key-value, Document, Column, Graph databases. Big Data and Databases: Hadoop, Spark basics. Cloud Databases and DBaaS. New trends in databases.

Practice - Working with NoSQL databases like MongoDB and Cassandra.

Textbooks:

1. "Database System Concepts" – Abraham Silberschatz, Henry F. Korth, S. Sudarshan, McGraw-Hill, ISBN: 978-0078022159
2. "Fundamentals of Database Systems" – Ramez Elmasri, Shamkant B. Navathe, Pearson, ISBN: 978-0133970777

Reference Books:

1. "Modern Database Management" – Jeffrey A. Hoffer, V. Ramesh, Heikki Topi, Pearson, ISBN: 978-0132662253
2. "NoSQL Distilled: A Brief Guide to the Emerging World of Polyglot Persistence" – Pramod J. Sadalage, Martin Fowler, Addison-Wesley, ISBN: 978-0321826626

Web Links:

1. https://docs.oracle.com/en/database/
2. https://www.mongodb.com/docs/manual/
3. https://ocw.mit.edu/courses/electrical-engineering-and-computer-science/6-830-database-systems-fall-2010/
4. https://www.w3schools.com/sql/
5. https://cs.stanford.edu/people/chrismre/cs145/

Artificial Intelligence / Machine Learning

Course Code: 2510FS15	L	T	P	C
Semester VI	2	0	2	4

Course Outcomes:

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

CO1: Explain basic concepts and classifications in AI and ML.

CO2: Apply problem-solving techniques using search algorithms.

CO3: Build and evaluate basic supervised and unsupervised models.

CO4: Work with common Python libraries for ML tasks.

CO5: Understand applications and ethical aspects of AI/ML in real life.

Mapping of Course Outcomes with Program Outcomes:

CO/PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11
CO1	3	2	2	3	2	2	1	2	3	2	2
CO2	3	3	3	3	2	2	1	3	3	2	2
CO3	3	3	3	3	2	3	1	3	3	2	2
CO4	3	3	3	3	2	3	2	3	3	2	2
CO5	3	2	2	3	3	2	3	2	3	3	3

Mapping of course outcomes with program outcomes:

CO/PSO	PSO1	PSO2
CO1	3	1
CO2	3	1
CO3	3	1
CO4	3	1
CO5	2	3

Unit-Wise Syllabus:

UNIT – I: Introduction to Artificial Intelligence

What is AI? History and Evolution. Types of AI: Narrow, General, Super AI. Applications of AI in daily life. Introduction to Intelligent Agents and Environments. Problem-solving techniques: BFS, DFS, Heuristics

Practice - Implement Breadth-First Search (BFS) and Depth-First Search (DFS).

UNIT – II: Fundamentals of Machine Learning

What is Machine Learning?, ML vs AI vs Deep Learning, Types of ML: Supervised, Unsupervised, Reinforcement, Basic workflow of an ML project, Common ML applications.

Practice - Linear Regression for predicting house prices using Scikit-learn.

UNIT – III: Supervised Learning Algorithms

Linear Regression, Logistic Regression, Decision Trees and Random Forests, Support Vector Machines (SVM), Evaluation Metrics: Accuracy, Precision, Recall, F1 Score.

Practice - Classification using Decision Trees and SVM.

UNIT – IV: Unsupervised Learning & Clustering

Clustering: K-Means, Hierarchical. Dimensionality Reduction: PCA basics. Association Rule Mining: Apriori Algorithm. Applications in Market Basket Analysis, Anomaly Detection.

Practice - K-Means clustering on simple datasets.

UNIT – V: Tools, Libraries, and Applications

Introduction to Python Libraries: NumPy, Pandas, Scikit-learn, Matplotlib. Hands-on with Jupyter Notebooks. Simple Projects: Spam detection, House price prediction. Ethical aspects of AI and ML. AI in Cybersecurity: Threat detection, Intrusion detection.

Practice - Spam Email Detection using Naive Bayes.

Textbooks:

1. Stuart Russell & Peter Norvig – Artificial Intelligence: A Modern Approach
2. Tom M. Mitchell – Machine Learning

Reference Books:

1. Sebastian Raschka – Python Machine Learning

2. Jason Brownlee – Machine Learning Mastery series

Web Links:

1. https://scikit-learn.org
2. https://www.kaggle.com
3. https://www.geeksforgeeks.org/machine-learning
4. https://towardsdatascience.com
5. https://www.coursera.org/learn/machine-learning

Minor Stream Courses (MSC): Physics

Course Code	Sem	Course Name	Level	L	T	P	C	CIE	SEE	Total	Pre-requisite
2510FS34	I	Mathematical Physics	FC	2		2	4	50	50	100	
2510FS35	II	Mechanics and Properties of Matter	FC	2		2	4	50	50	100	
2510FS53	III	Waves & Optics	IC	2		2	4	50	50	100	MMP
2510FS54	IV	Electricity and Magnetism	IC	2		2	4	50	50	100	MPM
2510FS16	V	Modern Physics	AC	2		2	4	50	50	100	EM
2510FS17	VI	Applications of Electricity & Electronics	AC	2		2	4	50	50	100	EM
Total				**12**		**12**	**24**				

Mathematical Physics

(Common for B.Sc. Forensic Science & B.Sc. Cyber Security and Digital Forensics)

Course Code: 2510FS34

L	T	P	C
2	0	2	4

Semester I

Course Outcomes:

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

CO1: Apply critical thinking skills to solve complex problems involving complex numbers, trigonometric ratios, vectors, and statistical measures.
CO2: To Explain the basic principles and concepts underlying a broad range of fundamental areas of physics and to Connect their knowledge of physics to everyday situations
CO3: To Explain the basic principles and concepts underlying a broad range of fundamental areas of chemistry and to Connect their knowledge of chemistry to daily life.
CO4: Understand the interplay and connections between mathematics, physics, and chemistry in various applications. Recognize how mathematical models and physical and chemical principles can be used to explain and predict phenomena in different contexts.
CO5: To explore the history and evolution of the Internet and to gain an understanding of network security concepts, including threats, vulnerabilities, and countermeasures.

Mapping of Course Outcomes with Program Outcomes:

CO/PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11
CO1	3	3	3	3	2	2	1	3	2	2	2
CO2	3	2	3	3	3	2	2	3	3	2	3
CO3	3	2	2	3	3	2	2	3	3	2	3
CO4	3	3	3	3	3	3	2	3	3	2	3
CO5	3	2	2	3	3	2	2	3	3	3	3

Mapping of course outcomes with program outcomes:

CO/PSO	PSO1	PSO2
CO1	3	1
CO2	2	1
CO3	2	1
CO4	3	1
CO5	3	2

Unit-Wise Syllabus:

UNIT I: Essentials of Mathematics

Complex Numbers: Introduction of the new symbol i – General form of a complex number – Modulus-Amplitude form and conversions Trigonometric Ratios: Trigonometric Ratios and their relations – Problems on calculation of angles Vectors: Definition of vector addition – Cartesian form – Scalar and vector product and problems Statistical Measures: Mean, Median, Mode of a data and problems.

Practice - Verification of Vector Addition and Analysis of Forces Using a Force Table.

UNIT II: Essentials of Physics

Definition and Scope of Physics- Measurements and Units - Motion of objects: Newtonian Mechanics and relativistic mechanics perspective - Laws of Thermodynamics and Significance- Acoustic waves and electromagnetic waves- Electric and Magnetic fields and their interactions- Behaviour of atomic and nuclear particles- Wave-particle duality, the uncertainty principle- Theories and understanding of universe.

Practice - Statistical Analysis of Experimental Data: Mean, Median, Mode, and Error Calculation.

UNIT III: Classical Mechanics in Physics

D'Alembert's principle, cyclic coordinates, variational principle, Lagrange's equation of motion, central force and scattering problems, rigid body motion; small oscillations, Hamilton' s formalisms; Poisson bracket; special theory of relativity: Lorentz transformations, relativistic kinematics, mass-energy equivalence.

Practice - Study of Oscillatory Motion in a Spring-Mass System and Validation of Small Oscillations Theory.

UNIT IV- Linear algebra

Linear vector space: basis, orthogonality and completeness; matrices; vector calculus; linear differential equations; elements of complex analysis: Cauchy-Riemann conditions, Cauchy's theorems, singularities, residue theorem and applications; Laplace transforms, Fourier analysis; elementary ideas about tensors: covariant and contra variant tensor, Levi-Civita and Christoffel symbols.

Practice - Fourier Analysis of Waveforms Using Function Generator and Oscilloscope

UNIT V: Applications of Physics & Mathematics

Applications of Mathematics in Physics: Calculus, Differential Equations & Complex Analysis Application of Physics in Industry and Technology: Electronics and Semiconductor Industry, Robotics and Automation, Automotive and Aerospace Industries, Quality Control and Instrumentation, Environmental Monitoring and Sustainable Technologies.

Practice - Measurement of Carrier Density and Mobility in Semiconductors Using the Hall Effect.

Textbooks

1. Functions of one complex variable by John.B.Conway, Springer- Verlag.
2. ElementaryTrigonometry by H.S.Hall and S.R.Knight

Reference Books

1. Fundamentals of Physics by David Halliday, Robert Resnick, and Jearl Walker
2. Physics for Scientists and Engineers with Modern Physics" byRaymond A. Serway and John W. Jewett Jr.

Web Links

1. https://ocw.mit.edu/search/?d=Physics&s=department_course_numbers.sort_coursenum
2. https://www.khanacademy.org/science/physics
3. https://phys.libretexts.org/Bookshelves/Mathematical_Physics_and_Pedagogy
4. https://tutorial.math.lamar.edu/
5. https://mathworld.wolfram.com/

Mechanics and Properties of Matter

(Common for B.Sc. Forensic Science & B.Sc. Cyber Security and Digital Forensics)

Course Code: 2510FS35

L	T	P	C
2	0	2	4

Semester II

Course Outcomes:

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

CO1: Students will be able to understand and apply the concepts of scalar and vector fields, calculate the gradient of a scalar field, determine the divergence and curl of a vector field.

CO2: Students will be able to apply the laws of motion, solve equations of motion for variable mass systems.

CO3: Students will be able to define a rigid body and comprehend rotational kinematic relations, derive equations of motion for rotating bodies, analyze the precession of a top and gyroscope, understand the precession of the equinoxes.

CO4: Students will be able to define central forces and provide examples, understand the characteristics and conservative nature of central forces, derive equations of motion under central forces.

CO5: Students will be able to differentiate between Galilean relativity and the concept of absolute frames, comprehend the postulates of the special theory of relativity, apply Lorentz transformations, understand and solve problems

Mapping of Course Outcomes with Program Outcomes:

CO/PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11
CO1	3	3	3	2	2	2	1	2	2	1	2
CO2	3	3	3	3	2	2	1	3	2	2	2
CO3	3	3	3	3	2	2	1	3	2	2	2
CO4	3	3	3	3	2	2	1	2	2	2	2
CO5	3	2	2	3	3	2	1	2	2	2	3

Mapping of course outcomes with program outcomes:

CO/PSO	PSO1	PSO2
CO1	3	-
CO2	2	-
CO3	2	-
CO4	2	-
CO5	2	1

Unit-Wise Syllabus:

UNIT-I Vector Analysis

Scalar and vector fields, gradient of a scalar field and its physical significance. Divergence and curl of a vector field with derivations and physical interpretation. Vector integration (line, surface and volume), Statement and proof of Gauss and Stokes theorems.

Practice – Determine Viscosity of liquid by the flow method (Poiseuille's method).

UNIT-II Mechanics of Particles

Laws of motion, motion of variable mass system, Equation of motion of a rocket. Conservation of energy and momentum, Collisions in two and three dimensions, Concept of impact parameter, scattering cross-section, Rutherford scattering-derivation.

Practice – Determine Young's modulus of the material of a bar (scale) by uniform bending.

UNIT-III Mechanics of Rigid bodies and Continuous

Definition of rigid body, rotational kinematic relations, equation of motion for a rotating body, Precession of a top, Gyroscope, Precession of the equinoxes. Elastic constants of isotropic solids and their relations, Poisson's ratio and expression for Poisson's ratio. Classification of beams, types of bending, point load, distributed load.

Practice – Determine Young's modulus of the material a bar (scale) by non- uniform bending.

UNIT-IV Central forces

Central forces, definition and examples, characteristics of central forces, conservative nature of central forces, conservative force as a negative gradient of potential energy, equations of motion under a . Derivation of Kepler's laws. Motion of satellites.

Practice – Calculate Surface tension of a liquid by capillary rise method.

UNIT-V Special Theory of Relativity

Galilean relativity, Absolute frames. Michelson-Morley experiment, The negative result. Postulates of special theory of relativity. Lorentz transformation, time dilation, length contraction, addition of velocities, mass-energy relation.

Practice - Determination of radius of capillary tube by Hg thread method.

Textbooks

1. Mechanics - D.S. Mathur, Sulthan Chand & Co, New Delhi
2. Mechanics - J.C. Upadhyaya, Ramprasad & Co., Agra.

Reference Books

1. Mechanics by J.C. Slater and N.H. Frank – A classic resource on the fundamentals of mechanics.
2. An Introduction to Mechanics by Daniel Kleppner and Robert J. Kolenkow – Covers Newtonian mechanics and advanced applications.

Web Links

1. https://ocw.mit.edu/search/?d=Physics&s=department_course_numbers.sort_coursenum
2. https://www.khanacademy.org/science/physics
3. https://phys.libretexts.org/Bookshelves/Mathematical_Physics_and_Pedagogy
4. https://tutorial.math.lamar.edu/
5. https://mathworld.wolfram.com/

Waves & Optics

(Common for B.Sc. Forensic Science & B.Sc. Cyber Security and Digital Forensics)

Course Code: 2510FS53

Semester III

L	T	P	C
2	0	2	4

Course Outcomes:

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

CO1: Understand the fundamental concepts of wave motion, oscillatory systems, and energy transport in waves.
CO2: Analyze wave propagation in different media and its applications, including acoustics and the Doppler effect.
CO3: Apply the principles of geometrical optics to design and understand the working of optical systems and instruments.
CO4: Explore the wave nature of light through interference, diffraction, and polarization, and apply these principles in practical scenarios.
CO5: Understand advanced optical technologies such as lasers and fiber optics and their applications in communication and medical fields.

Mapping of Course Outcomes with Program Outcomes:

CO/PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11
CO1	3	3	3	2	2	1	1	2	2	1	2
CO2	3	3	3	3	2	2	1	3	2	2	2
CO3	3	3	3	3	2	2	1	3	2	2	2
CO4	3	3	3	3	2	2	1	3	2	2	3
CO5	3	2	2	3	3	2	1	3	2	3	3

Mapping of course outcomes with program outcomes:

CO/PSO	PSO1	PSO2
CO1	2	-
CO2	2	-
CO3	3	-
CO4	3	-
CO5	3	-

Unit-Wise Syllabus:

UNIT I: Waves and Oscillations

Introduction to wave motion, types of waves (mechanical and electromagnetic), longitudinal and transverse waves, derivation of wave equation, characteristics of simple harmonic motion (SHM), damped oscillations, forced oscillations, resonance and its applications, principle of superposition, formation of standing waves, beats, energy transport in waves.

Practice - Determine the velocity of sound in air using the resonance tube method.

UNIT II: Wave Propagation and Acoustics

Wave propagation in solids, gases, and liquids, sound waves and their speed in various media, Doppler effect and its applications in sound and light, acoustics of buildings, reverberation, echo, absorption of sound, Sabine's formula for reverberation time, factors affecting sound quality in auditoriums.

Practice - Measure the refractive index of a given glass slab using the critical angle method.

UNIT III: Geometrical Optics

Laws of reflection and refraction, total internal reflection, critical angle and applications (optical fibers, mirages), image formation by spherical mirrors and thin lenses, lens maker’s formula, magnification, chromatic aberration, spherical aberration, methods to minimize aberrations, applications of lenses and mirrors in optical instruments.

Practice - Study the interference pattern using Young's double-slit experiment and determine the wavelength of light.

UNIT-IV: Wave Optics

Principle of superposition in light waves, interference of light, Young’s double-slit experiment, conditions for constructive and destructive interference, thin-film interference, Fresnel and Fraunhofer diffraction, single-slit diffraction, diffraction grating, resolving power of optical instruments, polarization of light, types of polarization, Brewster’s law, Malus’s law, applications of polarized light.

Practice - Observe diffraction using a single-slit and calculate the slit width.

UNIT-V: Advanced Topics in Optics

Introduction to lasers, principles of laser action, population inversion, stimulated emission, applications of lasers in communication and medicine, optical instruments (microscopes, telescopes), resolving power, fiber optics, principle and structure of optical fibers, advantages and applications in communication, sensors, and medical technology.

Practice - Demonstrate the working of optical fibers and study light propagation through different fiber structures.

Textbooks

1. Optics by Eugene Hecht
2. Introduction to Classical Mechanics by David Morin

Reference Books

1. The Feynman Lectures on Physics, Volume 1 by Richard P. Feynman, Robert B. Leighton, and Matthew Sands
2. Wave Physics by Stephen Nettel

Web Links

1. https://ocw.mit.edu/courses/physics/
2. https://hyperphysics.phy-astr.gsu.edu/hbase/wavcon.html
3. https://www.khanacademy.org/science/physics/waves-and-optics
4. https://scienceworld.wolfram.com/physics/topics/Waves.html
5. https://www.physicsclassroom.com/class/light

Electricity and Magnetism

(Common for B.Sc. Forensic Science & B.Sc. Cyber Security and Digital Forensics)

Course Code: 2510FS54

L	T	P	C
2	0	2	4

Semester IV

Course Outcomes:

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

CO1: Explain the fundamental principles of electrostatics and their applications in charge distributions and capacitance.
CO2: Analyze the principles of current electricity and apply them to solve electrical circuit problems.
CO3: Understand the magnetic effects of current and their applications in devices like galvanometers and solenoids.
CO4: Explore electromagnetic induction, Faraday's laws, and their applications in modern electrical systems.
CO5: Comprehend Maxwell's equations and the propagation of electromagnetic waves in free space and their technological applications.

Mapping of Course Outcomes with Program Outcomes:

CO/PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11
CO1	3	3	3	2	2	1	1	2	2	1	2
CO2	3	3	3	3	2	2	1	3	2	2	2
CO3	3	3	3	3	2	2	1	3	2	2	2
CO4	3	3	3	3	2	2	1	3	2	2	3
CO5	3	3	3	3	3	2	1	3	2	2	3

Mapping of course outcomes with program outcomes:

CO/PSO	PSO1	PSO2
CO1	2	-
CO2	3	-
CO3	2	-
CO4	2	-
CO5	2	-

Unit-Wise Syllabus:

UNIT-I: Electrostatics

Electric charge and its properties, Coulomb's law, electric field and electric flux, Gauss's law and its applications, electric potential, potential energy of a system of charges, conductors and insulators, capacitance, energy stored in a capacitor, dielectrics and their behavior in an electric field.

Practice - Verify Ohm's Law using a resistor.

UNIT-II: Current Electricity

Electric current, drift velocity and mobility, Ohm's law, electrical resistance and resistivity, temperature dependence of resistance, combination of resistances, Kirchhoff's laws and their applications in electrical circuits, Wheatstone bridge, potentiometer and its applications, heating effects of current, Joule's law, thermoelectric effects.

Practice - Study and verify Kirchhoff's Current and Voltage Laws.

UNIT-III: Magnetic Effects of Current

Biot-Savart law, Ampere's circuital law, magnetic field due to a straight conductor, circular loop, and solenoid, force on a charged particle moving in a magnetic field, torque on a current loop in a magnetic field, moving coil galvanometer, conversion of galvanometer to ammeter and voltmeter.

Practice - Determine the horizontal component of Earth's magnetic field using a tangent galvanometer.

UNIT-IV: Electromagnetic Induction

Faraday's laws of electromagnetic induction, Lenz's law, self-inductance and mutual inductance, energy stored in an inductor, eddy currents, applications of electromagnetic induction (e.g., transformers, electric generators, and induction cooktops).

Practice - Measure the capacitance and dielectric constant of a given material.

UNIT-V: Maxwell's Equations and Electromagnetic Waves

Displacement current, Maxwell's equations (integral and differential forms), electromagnetic wave propagation, wave equation for free space, energy density in electromagnetic waves, Poynting vector, applications of electromagnetic waves in communication technologies.

Practice - Study electromagnetic induction using a solenoid and calculate induced EMF.

Textbooks

1. Introduction to Electrodynamics by David J. Griffiths
2. Electricity and Magnetism by Edward M. Purcell and David J. Morin

Reference Books

1. Electromagnetic Fields and Waves by Paul Lorrain and Dale Corson
2. Classical Electrodynamics by John D. Jackson

Web Links

1. https://ocw.mit.edu/courses/physics/
2. https://www.khanacademy.org/science/physics/magnetic-forces-and-magnetic-fields
3. https://hyperphysics.phy-astr.gsu.edu/hbase/electric/elecon.html
4. https://www.physicsclassroom.com/class/estatics
5. https://scienceworld.wolfram.com/physics/topics/Electricity.html

Modern Physics

(Common for B.Sc. Forensic Science & B.Sc. Cyber Security and Digital Forensics)

Course Code: 2510FS16

L	T	P	C
2	0	2	4

Semester V

Course Outcomes:

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

CO1: Understand the fundamental principles of relativity and its applications in modern physics.
CO2: Develop a comprehensive understanding of quantum mechanics and its implications for atomic and subatomic systems.
CO3: Analyze atomic spectra and the behavior of atomic structures under different physical conditions.
CO4: Explore the principles and applications of nuclear physics in energy and medical technologies.
CO5: Gain insights into particle physics and cosmology to understand the universe at a fundamental level.

Mapping of Course Outcomes with Program Outcomes:

CO/PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11
CO1	3	3	3	3	2	2	1	2	2	2	3
CO2	3	3	3	3	3	3	1	3	2	2	3
CO3	3	3	3	3	3	2	1	3	2	2	3
CO4	3	3	3	3	3	2	1	3	2	3	3
CO5	3	3	3	3	3	2	2	3	3	3	3

Mapping of course outcomes with program outcomes:

CO/PSO	PSO1	PSO2
CO1	2	-
CO2	3	-
CO3	3	-
CO4	2	1
CO5	2	-

Unit-Wise Syllabus:

UNIT I: Relativity

Introduction to classical mechanics and its limitations, Einstein's theory of special relativity, postulates of relativity, Lorentz transformations, time dilation, length contraction, relativistic mass and energy, mass-energy equivalence, applications of relativity.

Practice - Verify the photoelectric effect and determine the Planck's constant.

UNIT II: Quantum Mechanics

Wave-particle duality, Planck's hypothesis, photoelectric effect, Compton effect, de Broglie hypothesis, Davisson-Germer experiment, Heisenberg's uncertainty principle, Schrödinger wave equation (time-dependent and time-independent forms), particle in a box, quantum tunneling, applications of quantum mechanics.

Practice - Study the characteristics of alpha, beta, and gamma radiation using a GM counter.

UNIT III: Atomic Structure

Bohr's model of the hydrogen atom, energy levels, spectral series, fine structure, vector atom model, quantum numbers, Zeeman effect, Stark effect, spin-orbit coupling, introduction to atomic spectra.

Practice - Determine the wavelength of monochromatic light using a diffraction grating.

UNIT IV: Nuclear Physics

Structure of the nucleus, nuclear forces, binding energy, mass defect, nuclear models (liquid drop model and shell model), radioactivity, alpha, beta, and gamma decay, half-life and mean life, nuclear fission and fusion, applications of nuclear physics in energy production and medicine.

Practice - Demonstrate the quantum tunneling effect using a simulated setup.

UNIT V: Particle Physics and Cosmology

Fundamental particles, classification of particles (leptons, baryons, mesons), quark model, fundamental forces of nature, standard model of particle physics, Higgs boson, introduction to cosmology, Big Bang theory, dark matter, dark energy, and the expanding universe.

Practice - Measure the charge-to-mass ratio (e/me/me/m) of an electron using Thomson's method.

Textbooks

1. Concepts of Modern Physics by Arthur Beiser
2. Modern Physics for Scientists and Engineers by John R. Taylor, Chris D. Zafiratos, and Michael A. Dubson

Reference Books

1. Special Relativity and Classical Field Theory by Leonard Susskind and Art Friedman
2. Relativity: The Special and General Theory by Albert Einstein

Web Links

1. HyperPhysics - Modern Physics: https://hyperphysics.phy-astr.gsu.edu/hbase/hframe.html
2. MIT OpenCourseWare - Modern Physics: https://ocw.mit.edu/courses/physics/8-04-quantum-physics-i-spring-2013/
3. Khan Academy - Quantum Mechanics and Nuclear Physics: https://www.khanacademy.org/science/physics
4. Physics LibreTexts - Modern Physics: https://phys.libretexts.org/
5. Particle Data Group (PDG): https://pdg.lbl.gov/

Applications of Electricity & Electronics

(Common for B.Sc. Forensic Science & B.Sc. Cyber Security and Digital Forensics)

Course Code: 2510FS17

Semester VI

L	T	P	C
2	0	2	4

Course Outcomes:

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

CO1: Understand the fundamental principles of electricity and apply them to analyze electrical circuits.
CO2: Gain knowledge of electrical machines and their applications in various industries.
CO3: Explore the working and applications of semiconductor devices in electronics.
CO4: Develop skills in designing and analyzing analog and digital electronic circuits.
CO5: Understand the applications of electricity and electronics in instrumentation, communication, and automation systems.

Mapping of Course Outcomes with Program Outcomes:

CO/PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11
CO1	3	3	3	3	2	2	1	2	2	2	2
CO2	3	3	3	3	3	2	1	3	2	3	3
CO3	3	3	3	3	3	2	1	3	2	2	3
CO4	3	3	3	3	3	2	1	3	2	3	3
CO5	3	3	3	3	3	2	2	3	3	3	3

Mapping of course outcomes with program outcomes:

CO/PSO	PSO1	PSO2
CO1	3	-
CO2	2	-
CO3	3	-
CO4	3	-
CO5	3	-

Unit-wise Syllabus

UNIT I: Fundamentals of Electricity

Basic concepts of electric charge, current, voltage, resistance, and power, Ohm's law and its applications, series and parallel circuits, Kirchhoff's laws, calculation of electrical energy and cost, introduction to AC and DC, RMS and average values, power factor and its significance.

Practice - Verify Ohm's law and study the characteristics of series and parallel circuits.

UNIT II: Electrical Machines

Principles of electromagnetic induction, construction and working of transformers, types and applications of transformers, construction and working of DC machines (generators and motors), AC machines (synchronous and induction motors), basic concepts of electric drives and their applications.

Practice - Determine the efficiency and regulation of a single-phase transformer under different loads.

UNIT III: Semiconductor Devices

Introduction to semiconductors, PN junction diode, characteristics and applications (rectifiers, voltage regulators), Zener diode, bipolar junction transistors (BJTs), field-effect transistors (FETs), thyristors, optoelectronic devices (LED, photodiode, and solar cell), applications in power electronics.

Practice - Study the VI characteristics of a PN junction diode and Zener diode.

UNIT IV: Analog and Digital Electronics

Operational amplifiers (OP-AMPs): characteristics and applications (amplifiers, oscillators, and filters), introduction to digital electronics, logic gates, Boolean algebra, combinational and sequential circuits, flip-flops, counters, and shift registers, introduction to microcontrollers and their applications.

Practice - Design and implement basic logic gates and verify truth tables using a breadboard.

.

UNIT V: Applications and Instrumentation

Electric heating and welding, applications of electricity in lighting (incandescent, fluorescent, and LED lamps), basics of electrical measuring instruments (voltmeter, ammeter, wattmeter, multimeter), introduction to sensors and transducers, applications of electronics in communication, automation, and medical technologies.

Practice - Build and test a simple OP-AMP-based amplifier circuit.

Textbooks

1. Basic Electrical Engineering by D.P. Kothari and I.J. Nagrath
2. Principles of Electronics by V.K. Mehta and Rohit Mehta

Reference Books

1. Electrical Machines by J.B. Gupta
2. Power Electronics: Circuits, Devices, and Applications by Muhammad H. Rashid

Web Links

1. Khan Academy - Electricity and Circuits: https://www.khanacademy.org/science/electrical-engineering
2. All About Circuits: https://www.allaboutcircuits.com/
3. Electronics Tutorials: https://www.electronics-tutorials.ws/
4. MIT OpenCourseWare - Electrical Engineering: https://ocw.mit.edu/courses/electrical-engineering-and-computer-science/
5. Electrical4U - Basics of Electrical and Electronics: https://www.electrical4u.com/

Minor Stream Courses (MSC): Mathematics

Course Code	Sem	Course Name	Level	L	T	P	C	CIE	SEE	Total	Pre-requisite
2510FS36	I	Differential Calculus	FC	2		2	4	50	50	100	
2510FS37	II	Differential Equations	FC	2		2	4	50	50	100	DC
2510FS55	III	Group Theory &Problem-Solving Sessions	IC	2		2	4	50	50	100	-
2510FS56	IV	Ring Theory & Problem-Solving Sessions	IC	2		2	4	50	50	100	-
2510FS18	V	Introduction to Real Analysis & Problem-Solving Sessions	AC	2		2	4	50	50	100	DE
2510FS19	VI	Linear Algebra &Problem-Solving Sessions	AC	2		2	4	50	50	100	DE
Total				**12**		**12**	**24**				

Differential Calculus

(Common for B.Sc. Forensic Science & B.Sc. Cyber Security and Digital Forensics)

Course Code: 2510FS36

L	T	P	C
2	0	2	4

Semester I

Course Outcomes:

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

CO1: Apply first and second derivative tests, analyze asymptotes, and use L'Hôpital's rule for limits.
CO2: Calculate volumes of solids using disk, washer, and cylindrical shells; find arc lengths and surface areas of revolution.
CO3: Sketch conics, convert between Cartesian and polar coordinates, and graph polar equations.
CO4: Analyze vector-valued functions, compute derivatives, integrals, arc lengths, and understand curvature and normal vectors.
CO5: Work with functions of several variables, compute partial derivatives, and identify extreme values and saddle points.

Mapping of Course Outcomes with Program Outcomes:

CO/PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11
CO1	3	3	3	3	2	2	1	2	2	2	2
CO2	3	3	3	3	2	2	1	3	2	2	2
CO3	3	3	3	3	2	2	1	3	2	2	2
CO4	3	3	3	3	3	2	1	3	3	2	2
CO5	3	3	3	3	3	2	1	3	3	2	3

Mapping of course outcomes with program outcomes:

CO/PSO	PSO1	PSO2
CO1	2	-
CO2	2	-
CO3	1	-
CO4	3	-
CO5	3	-

Unit-Wise Syllabus

Unit I: Applications of Derivatives and Limits

First derivative test; Concavity and inflection points; Second derivative test; Curve sketching using first and second derivative tests; Limits at infinity; Horizontal asymptotes; Vertical asymptotes; Graphs with asymptotes; L'Hôpital's rule; Applications in business, economics, and life sciences; Hyperbolic functions; Higher-order derivatives; Leibniz rule and its applications to problems of the form eax+bsinx, eax+bcosx, (ax+b)n sinx, (ax+b)n cosx.

Practice - Plotting of graphs of function eax + b, log(ax + b), 1/(ax + b), sin(ax + b), cos(ax + b), |ax + b| and to illustrate the effect of a and b on the graph.

Unit II: Applications of Definite Integrals

Reduction formulae and derivations for integrals of the form:

∫sinf0(nx) dx,∫cosf0(nx) dx,∫tanf0(nx) dx,∫secf0(nx) dx,∫(logf0x)n dx,∫sinf0nxcosf0mx dx.\int \sin(nx) \, dx, \int \cos(nx) \, dx, \int \tan(nx) \, dx, \int \sec(nx) \, dx, \int (\log x)^n \, dx, \int \sin^n x \cos^m x \, dx.∫sin(nx)dx, ∫cos(nx)dx, ∫tan(nx)dx, ∫sec(nx)dx, ∫(logx)ndx,∫sinnx cosmxdx. Volumes by slicing; Volumes of solids of revolution by the disk method; Volumes of solids of revolution by the washer method; Volume by cylindrical shells; Length of plane curves; Arc length of parametric curves; Area of surface of revolution.

Practice - Plotting the graphs of polynomials of degree 4 and 5, the derivative graph, the second derivative graph and comparing them.

Unit III: Conics and Polar Coordinates

Techniques of sketching conics; Reflection properties of conics; Rotation of axes and second-degree equations; Classification of conics using the discriminant; Polar equations of conics; Graphing in polar coordinates.

Practice - Sketching parametric curves (Eg. Trochoid, cycloid, epicycloids, hypocycloid).

Unit IV: Vector-Valued Functions

Triple product; Introduction to vector functions; Operations with vector-valued functions; Limits and continuity of vector functions; Differentiation and integration of vector functions; Tangent and normal components of acceleration; Modeling ballistics and planetary motion; Kepler's second law.

Practice - Obtaining the surface of the revolution of curves.

Unit V: Functions of Several Variables and Partial Derivatives

Functions of several variables: Graphs and level curves; Limits and continuity of multivariable functions; Partial derivatives and differentiability; The chain rule for

multivariable functions; Directional derivatives and gradient vectors; Tangent plane and normal line; Extreme values and saddle points of multivariable functions.

Practice - Tracing of conics in cartesian coordinates/ polar coordinates.

Text Books:

1. "Calculus: Early Transcendentals" by James Stewart
2. "Thomas' Calculus" by George B. Thomas, Maurice D. Weir, and Joel R. Hass

Reference Books:

1. "Differential Equations and Linear Algebra" by Stephen W. Goode and Scott A. Annin
   "Calculus: A Complete Course" by Robert A. Adams and Christopher Essex
2. "Introduction to Calculus and Analysis" by Richard Courant and Fritz John
   "Calculus: Concepts and Contexts" by James Stewar

Web Links:

1. Khan Academy - Calculus
   https://www.khanacademy.org/math/calculus-1
2. Paul's Online Math Notes - Calculus I
   https://tutorial.math.lamar.edu/
3. Brilliant.org - Calculus Courses
   https://brilliant.org/courses/calculus/
4. Math StackExchange - Calculus Discussions
   https://math.stackexchange.com/questions/tagged/calculus
5. MIT OpenCourseWare - Calculus
   https://ocw.mit.edu/courses/mathematics/18-01-single-variable-calculus-fall-2010/

Differential Equations

(Common for B.Sc. Forensic Science & B.Sc. Cyber Security and Digital Forensics)

L	T	P	C
2	0	2	4

Course Code: 2510FS37

Semester II

Course Outcomes:

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

CO1: Solve first-order linear differential equations and Bernoulli's equations using integrating factors and exact differential equations.
CO2: Solve first-order differential equations of non-first-degree and apply methods such as Clairaut's equation and orthogonal trajectories.
CO3: Solve higher-order linear differential equations with constant coefficients and apply polynomial operators to non-homogeneous equations.
CO4: Solve non-homogeneous linear differential equations with constant coefficients and determine particular integrals using various methods.
CO5: Solve higher-order linear differential equations with non-constant coefficients, including Cauchy-Euler and Legendre equations, using methods like variation of parameters.

Mapping of Course Outcomes with Program Outcomes:

CO/PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11
CO1	3	3	3	3	2	2	1	2	2	2	2
CO2	3	3	3	3	2	2	1	3	2	2	2
CO3	3	3	3	3	3	2	1	3	3	2	2
CO4	3	3	3	3	3	2	1	3	3	2	3
CO5	3	3	3	3	3	2	1	3	3	3	3

Mapping of course outcomes with program outcomes:

CO/PSO	PSO1	PSO2
CO1	2	-
CO2	2	-
CO3	3	-
CO4	3	-
CO5	3	-

Unit-Wise Syllabus:

Unit – I Differential Equations of first order and first degree

Linear Differential Equations – Bernoulli's Equations - Exact Differential Equations – Integrating factors - Equations reducible to Exact Equations by Integrating Factors - i) Inspection Method ii) 1 Mx Ny iii) 1 Mx Ny

Practice - Solving First-Order Linear Differential Equations

Unit – II Differential Equations of first order but not of first degree

Equations solvable for p, Equations solvable for y, Equations solvable for x – Clairaut's equation - Orthogonal Trajectories: Cartesian and Polar forms.

Practice - Solving Bernoulli's Differential Equation

Unit – III Higher order linear differential equations

Solutions of homogeneous linear differential equations of order n with constant coefficients - Solutions of non-homogeneous linear differential equations with constant coefficients by means of polynomial operators (i) ax Q(x) e = (ii) $Q(x) = Sin\ ax$ (or) $Cos\ ax$

Practice - Solving Higher-Order Linear Differential Equations with Constant Coefficients

Unit – IV Higher order linear differential equations (continued.)

Solution to a non-homogeneous linear differential equation with constant coefficients P.I. of $(D) = Q$ when $Q = bx\ k$ P.I. of $(D)y = Q$ when $Q = e\ axV$, where V is a function of x P.I. of $f(D)y = Q$ when $Q = xV$, where V is a function of x

Practice - Solving Non-Homogeneous Higher-Order Linear Differential Equations

Unit – V Higher order linear differential equations with non-constant coefficients

Linear differential Equations with non-constant coefficients; Cauchy-Euler Equation; Legendre Equation; Method of variation of parameters Activities Seminar/ Quiz/ Assignments/ Applications of Differential Equations to Real life Problem /Problem Solving Sessions.

Practice - Solving Cauchy-Euler and Legendre Equations

Text Books:

1. "Advanced Engineering Mathematics" by Erwin Kreyszig
2. "A Textbook of Differential Equations" by N. S. S. H. Rao

Reference Books:

1. "Theory of Ordinary Differential Equations" by Earl A. Coddington
2. "Differential Equations and Their Applications" by M. Braun

Web Links:

1. MIT OpenCourseWare - Differential Equations
   https://ocw.mit.edu/courses/mathematics/18-03-differential-equations-spring-2010/
2. Khan Academy - Differential Equations
   https://www.khanacademy.org/math/differential-equations
3. Paul's Online Math Notes - Differential Equations
   https://tutorial.math.lamar.edu/Classes/DE/DE.aspx
4. Coursera - Ordinary Differential Equations (by UC Santa Barbara)
   https://www.coursera.org/learn/ordinary-differential-equations
5. EdX - Differential Equations for Engineers (by MIT)
   https://www.edx.org/course/differential-equations-for-engineers

GROUP THEORY

(Common for B.Sc. Forensic Science & B.Sc. Cyber Security and Digital Forensics)

L	T	P	C
2	0	2	4

Course Code: 2510FS55

Semester III

Course Outcomes:

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

CO1: Understand the real number system, sequences, and their limits, and apply convergence tests to sequences.
CO2: Analyze infinite series, test their convergence, and apply relevant convergence criteria.
CO3: Study the properties of continuous functions, limits, and apply concepts of uniform continuity.
CO4: Understand differentiation, the Mean Value Theorems, and their applications to real-valued functions.
CO5: Grasp the concept of Riemann integration, test for integrability, and apply the Fundamental Theorem of Integral Calculus.

Mapping of Course Outcomes with Program Outcomes:

CO/PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11
CO1	3	3	3	3	2	2	1	2	2	2	2
CO2	3	3	3	3	2	2	1	3	2	2	2
CO3	3	3	3	3	2	2	1	3	2	2	2
CO4	3	3	3	3	3	2	1	3	3	2	2
CO5	3	3	3	3	3	2	1	3	3	2	3

Mapping of course outcomes with program outcomes:

CO/PSO	PSO1	PSO2
CO1	2	-
CO2	2	-
CO3	3	-
CO4	3	-
CO5	3	-

Unit-Wise Syllabus:

Unit I: Groups

Binary operation; Algebraic structures; Semigroup; Monoid; Group definition and elementary properties; Finite and infinite groups; Examples of groups; Order of a group; Composition tables with examples.

Practice - Verification of Group Properties Using Binary Operations

Unit II: Subgroups

Definition of a subgroup; Inverse of a complex; Subgroup criterion; Criterion for the product of two subgroups to be a subgroup; Union and intersection of subgroups; Coset definition and properties; Index of a subgroup; Lagrange's Theorem.

Practice - Finding Subgroups and Cosets in Groups

Unit III: Normal Subgroups

Definition of normal subgroup; Proper and improper normal subgroups; Hamilton group; Criterion for a subgroup to be a normal subgroup; Intersection of two normal subgroups; Subgroup of index 2 is a normal subgroup.

Practice - Investigating Normal Subgroups and Their Properties

Unit IV: Homomorphisms

Quotient groups; Definition of homomorphism; Image of homomorphism; Elementary properties of homomorphism; Isomorphism; Automorphism; Kernel of a homomorphism; Fundamental theorem on homomorphisms and its applications.

Practice - Homomorphisms and Isomorphisms in Groups

Unit V: Permutations and Cyclic Groups

Definition of permutation; Permutation multiplication; Inverse of a permutation; Cyclic permutations; Transposition; Even and odd permutations; Cayley's theorem; Definition of cyclic group; Elementary properties of cyclic groups; Classification of cyclic groups.

Practice - Permutations, Cyclic Groups, and Applications of Cayley's Theorem

Text Book:

1. "Modern Algebra" by A. R. Vasishtha and A. K. Vasishtha
2. "Abstract Algebra" by J. B. Fraleigh

Reference Books:

1. "Abstract Algebra" by J. B. Fraleigh
2. "Modern Algebra" by M. L. Khanna

Web Links:

1. Khan Academy - Abstract Algebra
   https://www.khanacademy.org/math/abstract-algebra
2. MIT OpenCourseWare - Group Theory
   https://ocw.mit.edu/courses/mathematics/18-100c-abstract-algebra-spring-2018/
3. Coursera - Group Theory and Symmetry (by University of Maryland)
   https://www.coursera.org/learn/group-theory-symmetry
4. Paul's Online Math Notes - Group Theory
   https://tutorial.math.lamar.edu/Classes/AbstractAlgebra/AbstractAlgebra.aspx
5. YouTube - Abstract Algebra and Group Theory Playlist by Prof. Gilbert Strang

   https://www.youtube.com/playlist?list=PLK1A1QyPpXY4iD2Y5wQz5LDkq7Yl8o9uK

RING THEORY

(Common for B.Sc. Forensic Science & B.Sc. Cyber Security and Digital Forensics)

Course Code: 2510FS56

Semester -IV

L	T	P	C
2	0	2	4

Course Outcomes:

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

CO1: Understand and apply the algebraic and order properties of real numbers, sequences, and their limits, including Cauchy's criterion and the Bolzano-Weierstrass theorem.
CO2: Analyze and test the convergence of infinite series, using tests like the P-test, Cauchy's nth root test, and Leibnitz's test for alternating series.
CO3: Study and apply the concepts of limits and continuity of real-valued functions, including uniform continuity and the combinations of continuous functions.
CO4: Understand and apply differentiation and the Mean Value Theorems, including Rolle's theorem, Lagrange's theorem, and Cauchy's mean value theorem.
CO5: Learn and apply the concepts of Riemann integration, including the Fundamental Theorem of Calculus, the Darboux theorem, and conditions for R-integrability.

Mapping of Course Outcomes with Program Outcomes:

CO/PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11
CO1	3	3	3	3	2	2	1	2	2	2	2
CO2	3	3	3	3	2	2	1	3	2	2	2
CO3	3	3	3	3	2	2	1	3	2	2	2
CO4	3	3	3	3	3	2	1	3	3	2	2
CO5	3	3	3	3	3	2	1	3	3	2	3

Mapping of course outcomes with program outcomes:

CO/PSO	PSO1	PSO2
CO1	2	-
CO2	2	-
CO3	3	-
CO4	3	-
CO5	3	-

Unit-Wise Syllabus:

Unit I: Real Numbers, Real Sequences

The algebraic and order properties of R; Absolute value and Real line; Completeness property of R; Applications of supremum property; Intervals. Sequences and their limits; Range and boundedness of sequences; Limit of a sequence and convergent sequence; Cauchy's criterion; Properly divergent sequences; Monotone sequences; Necessary and sufficient condition for convergence of monotone sequences; Limit point of a sequence; Subsequences and the Bolzano-Weierstrass theorem; Cauchy Sequences; Cauchy's general principle of convergence.

Practice - Verification of Properties of Real Numbers and Sequences

Unit II: Infinite Series

Introduction to series; Convergence of series; Cauchy's general principle of convergence for series; Tests for convergence of series; Series of non-negative terms; P-test; Cauchy's nth root test; D'Alembert's test; Alternating series; Leibnitz's test.

Practice - Convergence and Divergence of Infinite Series

Unit III: Limit & Continuity

Real-valued functions; Boundedness of a function; Limits of functions; Some extensions of the limit concept; Infinite limits; Limits at infinity; Continuous functions; Combinations of continuous functions; Continuous functions on intervals; Uniform continuity.

Practice - Exploring Continuity and Limits of Real-Valued Functions

Unit IV: Differentiation and Mean Value Theorems

The derivability of a function at a point and on an interval; Derivability and continuity of a function; Mean value theorems; Rolle's theorem; Lagrange's theorem; Cauchy's mean value theorem.

Practice - Application of Mean Value Theorems: Rolle's and Lagrange's Theorem

Unit V: Riemann Integration

Riemann integral; Riemann integral functions; Darboux theorem; Necessary and sufficient conditions for R-integrability; Properties of integrable functions; Fundamental theorem of integral calculus; Integral as the limit of a sum; Mean value theorems.

Practice - Demonstrating Riemann Integration and the Fundamental Theorem of Calculus

Text Books:

1. "An Introduction to Real Analysis" by Robert G. Bartle and Donald R. Sherbert
2. "Principles of Mathematical Analysis" by Walter Rudin

Reference Books:

1. "An Introduction to Real Analysis" by William F. Trench
2. "Real Analysis" by H.L. Royden

Web Links:

1. Khan Academy - Real Analysis
   https://www.khanacademy.org/math/calculus-1
2. MIT OpenCourseWare - Real Analysis
   https://ocw.mit.edu/courses/mathematics/18-100c-abstract-algebra-spring-2018/
3. Paul's Online Math Notes - Real Analysis
   https://tutorial.math.lamar.edu/Classes/CalcI/CalcI.aspx
4. YouTube - Real Analysis Playlist by Prof. Gilbert Strang

   https://www.youtube.com/playlist?list=PLK1A1QyPpXY4iD2Y5wQz5LDkq7Yl8o9uK
5. Coursera - Real Analysis Courses
   https://www.coursera.org/courses?query=real%20analysis

INTRODUCTION TO REAL ANALYSIS

(Common for B.Sc. Forensic Science & B.Sc. Cyber Security and Digital Forensics)

Course Code: 2510FS18

Semester V

L	T	P	C
2	0	2	4

Course Outcomes:

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

CO1: Understand the real numbers and real-valued functions.
CO2: Analyze the convergence of sequences and series, applying appropriate methods.
CO3: Test the continuity, differentiability, and Riemann integration of functions.
CO4: Understand the geometrical interpretation of the mean value theorems.
CO5: Apply the fundamental theorem of integral calculus.

Mapping of Course Outcomes with Program Outcomes:

CO/PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11
CO1	3	3	3	3	2	2	1	2	2	2	2
CO2	3	3	3	3	2	2	1	3	2	2	2
CO3	3	3	3	3	2	2	1	3	2	2	2
CO4	3	3	3	3	3	2	1	3	3	2	2
CO5	3	3	3	3	3	2	1	3	3	2	3

Mapping of course outcomes with program outcomes:

CO/PSO	PSO1	PSO2
CO1	2	-
CO2	2	-
CO3	3	-
CO4	2	-
CO5	3	-

Unit-Wise Syllabus:

Unit I: Real Numbers, Real Sequences

The algebraic and order properties of R; Absolute value and the real line; Completeness property of R; Applications of the supremum property; Intervals. Sequences and their limits; Range and boundedness of sequences; Limit of a sequence and convergent sequences; The Cauchy's criterion; Properly divergent sequences; Monotone sequences; Necessary and sufficient conditions for convergence of monotone sequences; Limit point of a sequence; Subsequences and the Bolzano-Weierstrass theorem; Cauchy sequences; Cauchy's general principle of convergence.

Practice - Verification of Algebraic and Order Properties of Real Numbers

Unit II: Infinite Series

Introduction to series; Convergence of series; Cauchy's general principle of convergence for series; Tests for convergence of series; Series of non-negative terms; P-test; Cauchy's nth root test; D'Alembert's test; Alternating series; Leibnitz test.

Practice - Convergence and Boundedness of Sequences

Unit III: Limit & Continuity

Real-valued functions; Boundedness of a function; Limits of functions; Some extensions of the limit concept; Infinite limits; Limits at infinity; Continuous functions; Combinations of continuous functions; Continuous functions on intervals; Uniform continuity.

Practice - Testing the Convergence of Infinite Series

Unit IV: Differentiation and Mean Value Theorems

The derivability of a function at a point and on an interval; Derivability and continuity of a function; Mean value theorems; Rolle's theorem; Lagrange's theorem; Cauchy's mean value theorem.

Practice - Exploring the Continuity and Differentiability of Real-Valued Functions

Unit V: Riemann Integration

Riemann integral; Riemann integral functions; Darboux theorem; Necessary and sufficient conditions for R-integrability; Properties of integrable functions; Fundamental theorem of integral calculus; Integral as the limit of a sum; Mean value theorems.

Practice - Demonstrating Riemann Integration and the Fundamental Theorem of Calculus

Text Books:

1. "An Introduction to Real Analysis" by Robert G. Bartle and Donald R. Sherbert
2. "Elements of Real Analysis" by Shanthi Narayan and Dr. M.D. Raisinghania

Reference Books:

1. "Real Analysis: Modern Techniques and Their Applications" by Gerald B. Folland
2. "Real Mathematical Analysis" by Charles C. Pugh.

Web Links:

1. Khan Academy - Real Analysis
   https://www.khanacademy.org/math/calculus-1
2. MIT OpenCourseWare - Real Analysis
   https://ocw.mit.edu/courses/mathematics/18-100c-real-analysis-fall-2008/
3. Coursera - Introduction to Real Analysis
   https://www.coursera.org/courses?query=real%20analysis
4. YouTube - Real Analysis Lectures by Prof. Shilpi Gupta
   https://www.youtube.com/watch?v=9sUxfSjr-6I
5. Paul's Online Math Notes - Real Analysis
   https://tutorial.math.lamar.edu/Classes/CalcII/RealAnalysis.aspx

Linear Algebra

(Common for B.Sc. Forensic Science & B.Sc. Cyber Security and Digital Forensics)

Course Code: 2510FS19

Semester VI

L	T	P	C
2	0	2	4

Course Outcomes:

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

CO1: Learn multiple integrals as a natural extension of definite integrals to functions of two variables in the case of double integrals and three variables in the case of triple integrals.
CO2: Learn applications in terms of finding surface area by double integrals and volume by triple integrals.
CO3: Determine the gradient, divergence, and curl of a vector and understand vector identities.
CO4: Evaluate line, surface, and volume integrals.
CO5: Understand the relation between surface and volume integrals (Gauss's Divergence Theorem), the relation between line integrals and volume integrals (Green's Theorem), and the relation between line and surface integrals (Stokes' Theorem).

Mapping of Course Outcomes with Program Outcomes:

CO/PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11
CO1	3	3	3	3	2	2	1	2	2	2	2
CO2	3	3	3	3	2	2	1	3	2	2	2
CO3	3	3	3	3	3	2	1	3	3	2	2
CO4	3	3	3	3	3	2	1	3	3	2	3
CO5	3	3	3	3	3	2	1	3	3	3	3

Mapping of course outcomes with program outcomes:

CO/PSO	PSO1	PSO2
CO1	2	-
CO2	2	-
CO3	3	-
CO4	3	-
CO5	3	-

Unit-Wise Syllabus:

Unit – I Real Numbers, Real Sequences

The algebraic and order properties of R - Absolute value and Real line - Completeness property of R - Applications of supremum property - intervals. (No question is to be set from this portion) Sequences and their limits -Range and Boundedness of Sequences - Limit of a sequence and Convergent sequence -The Cauchy's criterion - properly divergent sequences - Monotone sequences - Necessary and Sufficient condition for Convergence of Monotone Sequence - Limit Point of Sequence -Subsequence In the Bolzano-weierstrass theorem – Cauchy Sequences – Cauchy's general principle of convergence.

Practice - Verification of Algebraic and Order Properties of Real Numbers

Unit – II Infinite Series

Introductiontoseries -convergenceofseries -Cauchy'sgeneralprincipleof convergencefor series tests for convergence of series - Series of non-negative terms - P-test - Cauchy's Nth root test -D'- Alembert'sTest-AlternatingSeries–Leibnitz Test.

Practice - Convergence and Boundedness of Sequences

Unit –III Limit & Continuity

Real valued Functions - Boundedness of a function - Limits of functions - Some extensions of the limit concept - Infinite Limits - Limits at infinity (No question is to be set from this portion).Continuous functions - Combinations of continuous functions - Continuous Functions on intervals - uniform continuity.

Practice - Testing the Convergence of Infinite Series

Unit –IV Differentiation and mean value theorms

The derivability of a function at a point and and on an interval - Derivability and continuity of a function -MeanvalueTheorems -Rolle'sTheorem,Lagrange's Theorem, Cauchy's Mean value Theorem

Practice - Exploring Continuity of Real-Valued Functions

Unit – V Riemann Integration

Riemann Integral - Riemann integral functions - Darboux theorem -Necessary and sufficient condition for R integrability - Properties of integrable functions - Fundamental theorem of integral calculus - integral as the limit of a sum - Mean value Theorems.

Practice - Application of Mean Value Theorems to Real Functions

Text Books

1. A Textbook of Higher Engineering Mathematics by B.S. Grewal, Khanna Publishers, 43rd Edition
2. Vector Calculus by J. Marsden & A. Tromba, 6th Edition, Pearson

Reference Books

1. Vector Calculus by P.C. Matthews, Springer Verlag
2. Vector Analysis by Murray R. Spiegel, Schaum's Outline Series, McGraw-Hill

Web Links:

1. Khan Academy - Multivariable Calculus
2. MIT OpenCourseWare - Multivariable Calculus- https://ocw.mit.edu/courses/18-02sc-multivariable-calculus-fall-2010/
3. Paul's Online Math Notes - https://tutorial.math.lamar.edu/classes/calciii/calciii.aspx
4. Coursera - Vector Calculus
5. YouTube - 3Blue1Brown - Linear Algebra and Calculus Series

Minor Stream: Forensic Science

Course Code	Sem	Course Name	Level	L	T	P	C	CIE	Pre - requisite
2510FS38	I	Forensic Science & Criminalistics	FC	2		2	4	50	FS & C
2510FS39	II	Questioned Document & Fingerprint Science	FC	2		2	4	50	FS & C
2510FS57	III	Forensic Biology, Serology & DNA Fingerprinting	IC	2		2	4	50	FS & C
2510FS11	IV	Forensic Chemistry & Toxicology	IC	2		2	4	50	FS & C
2510FS20	V	Forensic Physics & Ballistics	AC	2		2	4	50	FS & C FC & T
2510FS21	VI	Digital & Cyber Forensics	AC	2		2	4	50	FS & C
Total				**12**		**12**	**24**		

Forensic Science and Criminalistics

Course Code: 2510FS38

L	T	P	C
2	0	2	4

Semester I

Course Outcomes:

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

CO1: Understand the basic concepts, scope, and importance of forensic science.
CO2: Identify and describe fundamental forensic techniques for crime scene investigation.
CO3: Learn the basics of evidence collection, handling, and preservation.
CO4: Recognize the role of forensic experts and institutions in criminal justice.
CO5: Develop awareness of forensic ethics and professional responsibilities.

Mapping of Course Outcomes with Program Outcomes:

CO/PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11
CO1	3	3	3	3	2	2	1	2	2	2	2
CO2	3	3	3	3	3	2	1	3	2	2	3
CO3	3	3	3	3	3	3	1	3	2	3	3
CO4	3	3	3	3	3	2	1	3	3	3	3
CO5	3	3	3	3	3	2	3	3	3	3	3

Mapping of course outcomes with program outcomes:

CO/PSO	PSO1	PSO2
CO1	2	2
CO2	3	2
CO3	3	3
CO4	2	3
CO5	1	3

Unit-Wise Syllabus:

UNIT – I: Introduction to Forensic Science

Definition, scope, and importance of forensic science, overview of key domains including forensic biology, chemistry, physics, ballistics, and digital forensics, history and development of forensic science, basic functions of forensic laboratories such as CFSL, SFSL, DFSS, role of investigative agencies like CBI, CID, IB, NCRB, and INTERPOL.

Practice - Basic Crime Scene Investigation Techniques (Search patterns, documentation).

UNIT – II: Basics of Crime and Criminal Investigation

Definition and types of crime, fundamental legal concepts including mens rea, actus rea, and corpus delicti, introduction to crime scene investigation, role of forensic science in criminal investigations, introduction to ethics in forensic science.

Practice - Simulation of Simple Crime Scenes (Theft, Road Accident, Vandalism).

UNIT – III: Crime Scene Management & Evidence Handling

Basics of crime scene documentation including photography, sketching, and note-taking, introduction to search methods and crime scene processing, types of physical evidence and their significance, general principles of evidence collection and preservation, chain of custody and its importance.

Practice - Basic Evidence Collection and Packaging Techniques.

UNIT – IV: Introduction to Forensic Techniques

Fundamental techniques for examining physical, chemical, and biological evidence, overview of fingerprint examination, bloodstain analysis, and toolmark identification, simple analytical techniques used in forensic science, admissibility of evidence in court, role of forensic experts in legal proceedings.

Practice - Fingerprint Identification and Analysis.

UNIT – V: Basic Crime Scene Reconstruction & Legal Framework

Introduction to crime scene reconstruction, overview of key Indian legal provisions related to forensic science including BNS, BNSS, and BSA, basics of forensic report writing and presentation of findings, introduction to digital forensics and cybercrime investigations, ethical considerations in forensic science.

Practice - Basic Blood Pattern Recognition and Analysis.

Textbooks:

1. Sharma, B. R. *Forensic Science in Criminal Investigation & Trials.* Universal Law Publishing.
2. Saferstein, R. *Criminalistics: An Introduction to Forensic Science.* Pearson.

Reference Books:

1. Houck, M. M., & Siegel, J. A. *Fundamentals of Forensic Science.* Elsevier.
2. Fisher, B. A. J. *Techniques of Crime Scene Investigation.* CRC Press.

Web Links:

1. https://www.sjsu.edu/people/mary.juno/courses/1066/s8/Intro.pdf?
2. https://www.tn.gov.in/rti/proactive/home/handbook_forensic_sciences.pdf?
3. https://www.fbi.gov/services/laboratory
4. https://nij.ojp.gov/topics/forensic-science
5. https://sites.chemistry.unt.edu/~tgolden/courses/Vol%20I%20Chapter%201%20Legal%20Aspects%20of%20Forensic%20Science.pdf

Questioned Document & Fingerprint Science

Course Code: 2510FS39	L	T	P	C
Semester II	2	0	2	4

Course Outcomes:

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

CO1: To provide fundamental knowledge of questioned documents, fingerprint science, and impression evidence.
CO2: To understand the history, principles, and forensic significance of handwriting, fingerprints, and impression evidence.
CO3: To develop skills in recognizing, analyzing, and preserving different types of forensic evidence.
CO4: To explore legal aspects, admissibility, and challenges in forensic document and fingerprint examination.
CO5: To familiarize students with recent advancements, including AI, biometric systems, and forensic databases.

Mapping of Course Outcomes with Program Outcomes:

CO/PO	**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**
CO1	3	3	3	2	2	2	1	2	2	2	2
CO2	3	3	3	3	3	2	1	3	2	2	2
CO3	3	3	3	3	3	3	1	3	2	3	3
CO4	3	3	3	3	3	3	2	3	3	3	3
CO5	3	3	3	3	3	2	2	3	3	3	3

Mapping of course outcomes with program outcomes:

CO/PSO	**PSO1**	**PSO2**
CO1	3	2
CO2	3	2
CO3	3	2
CO4	2	3
CO5	3	2

Unit-Wise Syllabus:

UNIT – I: Introduction to Questioned Documents
Definition and types of questioned documents, principles of handwriting analysis, class and individual handwriting characteristics, factors affecting handwriting, forgery detection techniques, role of forensic document examiners in criminal cases.

Practice - To examine class and individual characteristics in given handwriting samples.

UNIT – II: Fundamentals of Fingerprint Science
History and significance of fingerprints in forensic science, classification of fingerprint patterns, ridge characteristics (minutiae), types of fingerprint impressions, collection and preservation of fingerprints, introduction to Automated Fingerprint Identification System (AFIS).

Practice - To study the various types of classification in fingerprints.

UNIT – III: Document Forgery and Alterations
Types of forgeries including traced, simulated, and disguised writings, signature forgery and digital manipulation, common document alterations such as erasures, additions, and obliterations, forensic examination techniques using specialized instruments like Video Spectral Comparator (VSC) and Electrostatic Detection Apparatus (ESDA).

Practice - To detect various types of alteration and forgery in a given document.

UNIT – IV: Development and Analysis of Fingerprints
Methods for detecting and enhancing fingerprints, chemical and physical techniques such as powder dusting, ninhydrin, cyanoacrylate fuming, and alternate light sources, fingerprint comparison and matching techniques, biometric systems and their forensic applications.

Practice - To develop latent fingerprints using physical and chemical methods.

UNIT – V: Basics of Impression Evidence
Types of impression evidence including shoeprints, tire marks, tool marks, and bite marks, forensic significance of lip and ear prints, methods of collection, preservation, and comparison, casting and lifting techniques for impression evidence, forensic odontology in criminal identification.

Practice - To perform casting of impression evidence.

Textbooks:

1. Hilton, O. (1993). *Scientific examination of questioned documents (Revised ed.).* CRC Press.
2. Kelly, J. S., & Lindblom, B. S. (2006). *Scientific examination of questioned documents (2nd ed.).* CRC Press.

Reference:

1. Ellen, D. (2005). *Scientific examination of documents: Methods and techniques (3rd ed.).* CRC Press.
2. Morris, R. N. (2000). *Forensic handwriting identification: Fundamental concepts and principles.* Academic Press.

Web Links:

1. https://nij.ojp.gov/library/publications/fingerprint-sourcebook
2. https://www.gutenberg.org/ebooks/19022
3. https://www.swgdoc.org
4. https://www.theiai.org
5. https://www.aafs.org

Forensic Biology, Serology & DNA Fingerprinting

Course Code: 2510FS57	L	T	P	C
Semester III	2	0	2	4

Course Outcomes:

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

CO1: Understand the fundamental principles of forensic biology, including biological evidence collection and analysis.
CO2: Demonstrate knowledge of immunological techniques and blood group analysis for forensic applications.
CO3: Perform forensic serological tests to identify biological fluids and species differentiation.
CO4: Apply microscopic techniques for hair, fiber, and diatom analysis in forensic casework.
CO5: Utilize basic DNA profiling techniques for forensic human identification.

Mapping of Course Outcomes with Program Outcomes:

CO/PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11
CO1	3	3	3	3	2	3	1	2	2	2	2
CO2	3	3	3	3	3	3	1	3	2	3	3
CO3	3	3	3	3	3	3	1	3	3	3	3
CO4	3	3	3	3	3	2	1	3	3	3	3
CO5	3	3	3	3	3	3	2	3	3	3	3

Mapping of course outcomes with program outcomes:

CO/PSO	PSO1	PSO2
CO1	3	2
CO2	3	2
CO3	3	2
CO4	3	1
CO5	3	3

Unit-Wise Syllabus:

UNIT – I: Basics of Forensic Biology

Introduction to forensic biology and its applications, Identification and collection of biological evidence, Role of proteins, lipids, and nucleic acids in forensic investigations. Handling and preservation of biological samples in forensic casework.

Practice - Presumptive and Confirmatory Tests for Biological Fluids.

UNIT – II: Blood and Immunology in Forensics

Structure and composition of blood, Blood group systems: ABO, Rh, Bombay Phenotype, and their forensic significance, Antigen-antibody interactions and serological techniques in forensic analysis, Blood spatter analysis: principles, patterns, and forensic interpretation.

Practice - ABO and Rh Blood Group Determination.

UNIT – III: Forensic Serology and Biological Fluids

Presumptive and confirmatory tests for body fluids (blood, semen, saliva, urine, vaginal secretions), Species identification methods in forensic biology, Importance of forensic serology in criminal investigations, Role of forensic microbiology in biological evidence analysis.

Practice - Microscopic Examination and Differentiation of Hair and Fiber samples.

UNIT – IV: Forensic Analysis of Hair, Fibers & Botanical Evidence

Identification of human vs. animal hair (microscopic characteristics), Analysis of fiber types and forensic significance, Diatoms and palynology: forensic applications in drowning cases and environmental evidence, Role of forensic botany and poisonous plants in forensic investigations.

Practice - Diatom Identification under Microscope.

UNIT – V: Introduction to DNA Fingerprinting

Basics of DNA structure and function, DNA extraction techniques and quality assessment, DNA fingerprinting methods: STR, SNP, and mitochondrial DNA analysis. Applications of DNA databases in forensic investigations (NDDB, CODIS), Ethical and legal considerations in forensic DNA analysis.

Practice - DNA extraction and analysis using Gel Electrophoresis

Textbooks:

1. Forensic Biology by Richard Li.
2. Fundamentals of Forensic DNA Typing by John M. Butler.

Reference Books:

1. Advanced Forensic Biology by Ashraf Mozayani and Carla Noziglia.
2. Molecular Biology in Forensic Science by James R. Robertson.

Web Links:

1. https://www.ncbi.nlm.nih.gov/?utm
2. https://www.cfsre.org/research/forensic-biology?utm
3. https://forensiccoe.org/forensicbiology-dna/?utm
4. https://www.cdfd.org.in/?utm
5. https://nij.ojp.gov/topics/forensics/forensic-biology-forensic-dna?utm

Forensic Chemistry and Toxicology

	L	T	P	C
Course Code: 2510FS11	2	0	2	4

Semester IV

Course Outcomes:

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

CO1: Understand the significance and scope of forensic chemistry and toxicology in criminal investigations, including poisoning, drug, and explosive cases.

CO2: Analyze chemical evidence, including narcotic drugs, explosives, and food adulteration, using appropriate forensic techniques.

CO3: Apply analytical methods to identify, extract, and preserve toxicological samples, including blood, urine, and other biological fluids.

CO4: Explore toxicokinetics and toxicodynamics, focusing on poisons, drugs, and their impact on human health.

CO5: Evaluate the role of forensic chemistry and toxicology in legal proceedings and ethical considerations in forensic analysis.

Mapping of Course Outcomes with Program Outcomes:

CO/PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11
CO1	3	3	3	3	3	2	1	2	2	2	3
CO2	3	3	3	3	3	3	1	3	3	3	3
CO3	3	3	3	3	3	3	1	3	3	3	3
CO4	3	3	3	3	3	2	1	3	3	3	3
CO5	3	3	3	3	3	3	2	3	3	3	3

Mapping of course outcomes with program outcomes:

CO/PSO	PSO1	PSO2
CO1	3	2
CO2	3	1
CO3	3	2
CO4	3	1
CO5	2	3

Unit-Wise Syllabus:

UNIT-I: Introduction to Forensic Chemistry and Toxicology

Definition, scope, and significance of forensic chemistry and toxicology in criminal investigations. Overview of forensic chemistry: chemical evidence, types (drugs, poisons, explosives, trace evidence). Overview of forensic toxicology: nature and need, role in fatal and survival cases, and toxicological exhibits. Forensic significance of chemical and toxicological evidence. Introduction to poisoning: types, symptoms, and legal implications (The Poisons Act, 1919; Section 286 of BNS, 2023). Role of forensic chemist and toxicologist in criminal investigations and court proceedings.

Practice - Extraction of Organic Poisons: Use methods like Stas-Otto or ammonium sulfate for extracting poisons from biological samples.

UNIT-II: Narcotic Drugs and Psychotropic Substances

Classification and historical background of narcotic drugs and psychotropic substances. Common narcotic drugs: opioids, cannabis, cocaine, amphetamines, LSD, etc. Forensic chemical analysis of narcotics and psychotropic substances. Drug trafficking and law enforcement: global and national patterns. Analytical methods: chemical techniques for drug identification, such as chromatography. Drug abuse and rehabilitation: societal impact, legal issues, and prevention programs.

Practice - Forensic Analysis of Narcotic Drugs: Use chromatography techniques (TLC, HPLC) to identify narcotic substances in forensic samples.

UNIT-III: Qualitative and Quantitative analysis of Toxins and Poisons

Techniques for extraction of non-volatile organic poisons (Stas-Otto, ammonium sulphate method). Volatile poisons: industrial solvent acid and basic distillation methods. Isolation and clean-up methods for toxic cations (dry ashing, wet digestion) and anions (dialysis method). Methods for preserving toxicological samples. Qualitative Analysis of forensic toxicology samples and Data Interpretation .

Practice - Fire Debris Analysis: Analyze fire residues for accelerants using gas chromatography or mass spectrometry.

UNIT-IV: Explosives, Fire, and Arson

Classification, chemistry, and types of explosives. Post-blast residue analysis (organic and inorganic) using chemical and instrumental techniques. Forensic analysis of fire debris: accelerants, incendiary devices, and thermodynamics of fire. Forensic chemical analysis of petroleum products and adulteration in the context of fire investigations. Case studies involving explosions and fires.

Practice – Pharmacokinetics of Drugs: Study the absorption and distribution of drugs through biological models or simulators.

UNIT-V: Pharmacology and Drug Classes

Introduction to pharmacology, classification, and nature of drugs. Pharmacokinetics: drug absorption, distribution, metabolism, and excretion (L-ADME). Pharmacodynamics: dose-response relationships, mechanisms of action, and adverse drug reactions. Drug addiction, tolerance, and the role of forensic toxicology in determining the effects of drugs on the human body. Legal implications of drugs and cosmetics as per the Drugs and Cosmetics Act, 1945. Detection of adulteration in drugs and cosmetics.

Practice - Toxicological Sample Preservation: Perform sample preservation techniques for forensic toxicological analysis (blood, urine, etc.).

Textbooks:

1. "Forensic Chemistry" – Richard Saferstein
2. "Principles of Forensic Toxicology" – Barry S. Levine, William C. Marlow

Reference Books:

1. "Criminalistics: An Introduction to Forensic Science" – Richard Saferstein
2. "Forensic Science: An Introduction to Scientific and Investigative Techniques" – Stuart H. James, Jon J. Nordby

Web Link

1. https://onlinecourses.swayam2.ac.in/ini24_bt04/preview
2. https://www.toxicology.org/education/ce/onlineCourses.asp
3. https://www.classcentral.com/subject/toxicology
4. https://entechonline.com/a-beginners-guide-to-forensic-chemistry/
5. https://wne.edu/academics/undergraduate/forensic-chemistry.cfm

Forensic Physics & Ballistics

Course Code: 2510FS20

Semester V

L	T	P	C
2	0	2	4

Course Outcomes:

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

CO1: Understand the principles and scope of forensic physics and ballistics.
CO2: Identify and analyze various types of physical evidence in forensic physics.
CO3: Comprehend firearm mechanics and ammunition classifications.
CO4: Apply forensic techniques for ballistic evidence examination.
CO5: Interpret legal frameworks and ethical aspects in forensic ballistics.

Mapping of Course Outcomes with Program Outcomes:

CO/PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11
CO1	3	3	3	3	2	2	1	2	2	2	2
CO2	3	3	3	3	3	3	1	2	2	2	2
CO3	3	3	3	3	3	2	1	3	2	3	3
CO4	3	3	3	3	3	3	1	3	3	3	3
CO5	3	3	3	3	3	2	2	3	3	3	3

Mapping of course outcomes with program outcomes:

CO/PSO	PSO1	PSO2
CO1	3	2
CO2	3	2
CO3	3	1
CO4	3	2
CO5	2	3

Unit-Wise Syllabus:

Unit I: Introduction to Forensic Physics and Ballistics
Fundamentals of forensic physics, scope, and role in investigations. Newton's laws, conservation of energy and momentum in crime scene analysis. Basics of ballistics, firearm

characteristics, classification, and historical developments. Importance of ballistics in criminal investigations.

Practice - Physical Evidence Analysis – Examination of soil, cement, and glass samples using forensic techniques

Unit II: Physical Evidence – Building Materials and Speech Analysis
Forensic examination of soil, cement, and concrete – composition, particle size analysis, pH, density, and ignition-loss tests. Methods for detecting adulteration. Basics of speech recognition – sound production, perception, and forensic voice analysis techniques.

Practice - Firearm Identification – Study of firearm components, rifling patterns, and bullet examination.

Unit III: Paint, Fibers, Glass, and Toolmarks
Types of forensic evidence – paint, fibers, and glass. Paint analysis – composition, pigment distribution, and chemical tests. Glass fracture patterns, refractive index, and forensic examination methods. Toolmark identification – striated and compression marks, forensic restoration techniques.

Practice - Toolmark and Paint Analysis – Comparative analysis of toolmarks and paint samples.

Unit IV: Firearms, Ammunition, and Ballistics
Firearm classification, working mechanisms, and components. Introduction to standard and improvised firearms. Basics of ammunition – cartridge construction, propellants, primers, and bullet types. Internal ballistics – propellant ignition, recoil theory, and muzzle velocity factors. External ballistics – projectile trajectory, bullet shape, yaw, and air resistance.

Practice - Ballistic Trajectory Simulation – Understanding projectile motion and factors affecting bullet trajectory.

Unit V: Terminal Ballistics and Firearm Identification
Bullet impact, penetration, tumbling, and wound ballistics. Identification of firearms through bullet and cartridge markings. Gunshot residue (GSR) – detection methods (Walker's test, Harrison & Gilroy test), instrumental analysis, and forensic applications. Overview of the Indian Arms Act and forensic report writing.

Practice - Gunshot Residue Analysis – Demonstration of GSR detection techniques and forensic significance.

Textbooks:

1. Heard, B. J. (2008). *Handbook of firearms and ballistics: Examining and interpreting forensic evidence* (2nd ed.). Wiley.
2. Rathore, L. (2021). *Ballistic in forensic science*. Walnut Publication.

Reference Books:

1. Mann, R. W., & Goliath, J. R. (2019). *Forensic firearm examination*. Academic Press.
2. Heard, B. J. (2013). *Forensic ballistics in court: Interpretation and presentation of firearms evidence*. Wiley-Blackwell.

Web Links:

1. https://www.nist.gov/firearms-and-toolmarks
2. https://www.scribd.com/document/457481678/FORENSIC-BALLISTIC-FINAL
3. https://www.hilarispublisher.com/open-access/unveiling-the-mysteries-of-forensic-ballistics-solving-crimes-one-bullet-at-a-time-99959.html
4. https://link.springer.com/article/10.1007/s11042-022-14037-x
5. https://dfsl.maharashtra.gov.in/en/ballistics

Digital & Cyber Forensics

Course Code: 2510FS21

Semester VI

L	T	P	C
2	0	2	4

Course Outcomes:

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

CO1: Understand the principles and techniques of digital evidence acquisition, preservation, and forensic integrity.
CO2: Identify and analyze different types of cybercrimes and apply basic investigative techniques for incident response.
CO3: Demonstrate knowledge of network, cloud, and IoT forensic methodologies for data acquisition and analysis.
CO4: Apply basic cryptographic and malware forensic techniques to investigate encrypted data, blockchain, and malicious software.
CO5: Recognize legal and ethical challenges in digital forensics, including cyber laws, evidence admissibility, and privacy concerns.

Mapping of Course Outcomes with Program Outcomes:

CO/PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11
CO1	3	3	3	3	3	3	1	3	3	3	3
CO2	3	3	3	3	3	3	1	3	3	3	3
CO3	3	3	3	3	3	2	1	3	3	3	3
CO4	3	3	3	3	3	2	1	3	3	3	3
CO5	3	3	3	3	3	3	2	3	3	3	3

Mapping of course outcomes with program outcomes:

CO/PSO	PSO1	PSO2
CO1	3	2
CO2	3	2
CO3	3	2

CO4	3	1
CO5	2	3

Unit-Wise Syllabus:

Unit I: Digital Evidence Acquisition and Preservation

Basics of digital forensics principles, techniques for evidence acquisition and preservation, live forensics vs. dead forensics, fundamentals of disk forensics including SSDs and hybrid storage, role of blockchain in ensuring evidence integrity, introduction to anti-forensics methods and basic countermeasures.

Practice - Creating and analyzing a forensic disk image using FTK Imager.

Unit II: Cybercrime Investigation and Incident Response

Types of cybercrimes such as phishing, hacking, and ransomware, basics of Open-Source Intelligence (OSINT), techniques for event log analysis, simple threat detection methods, introduction to incident response planning, and basics of cybercrime intelligence gathering.

Practice - Recovering deleted files and metadata with Autopsy.

Unit III: Network, Cloud, and IoT Forensics

Introduction to network forensics, basics of analyzing network traffic, challenges in cloud forensics, acquisition of forensic data from cloud platforms, fundamentals of IoT forensics, techniques for data extraction from IoT devices, and forensic considerations for smart and industrial devices.

Practice - Examining network traffic and identifying anomalies using Wireshark.

Unit IV: Cryptographic and Malware Forensics

Basics of encryption in forensic investigations, introduction to cryptographic techniques, fundamentals of malware analysis, introduction to blockchain forensics, cryptocurrency and digital wallet tracking, basics of ransomware and other malware forensics.

Practice - Extracting and analyzing mobile data with forensic tools.

Unit V: Legal and Ethical Challenges in Digital Forensics

Overview of major cyber laws and legal frameworks, principles of admissibility of digital evidence in court, ethical issues in digital forensic investigations, privacy concerns, and case studies on real-world cybercrime investigations highlighting key lessons.

Practice - Detecting hidden information in images using steganalysis techniques.

Textbooks:

1. "Incident Response & Computer Forensics" – Kevin Mandia, Chris Prosise.
2. "Cyber Forensics: A Field Manual for Collecting, Examining, and Preserving Evidence of Computer Crimes" – Albert Marcella, Robert Greenfield.

Reference Books:

1. "Computer Forensics and Cyber Crime: An Introduction" – Marjie T. Britz.
2. "Guide to Computer Forensics and Investigations" – Bill Nelson, Amelia Phillips, Christopher Steuart.

Web Links:

1. https://www.researchgate.net/publication/253393425_Digital_Forensics_and_Cyber_Crime
2. https://annamalaiuniversity.ac.in/studport/download/engg/it/resources/Cyber%20Forensics.pdf
3. https://mrcet.com/downloads/digital_notes/CSE/III%20Year/12082022/DIGITAL%20FORENSICS.pdf
4. https://www.geeksforgeeks.org/cyber-forensics
5. https://www.eccouncil.org/train-certify/computer-hacking-forensic-investigator-chfi/