

**Dr. BABASAHEB AMBEDKAR MARATHWADA UNIVERSITY,
CHHATRAPATI SAMBHAJINAGAR.**



CIRCULAR NO.SU/ Sci./College/NEP-2020/105/2024

It is hereby inform to all concerned that, In continuation circular No.SU./Revised B.Sc./NEP/72/2024/25588-96 dated 29.04.2024, the revised syllabi prepared by the Board of Studies/Ad-hoc Boards and recommended by the Dean, Faculty of Science & Technology, the Academic Council at its meeting held on 08 April 2024 has accepted **the following Revised B.Sc. Course Structure & Curriculum** as per direction by the State Government dated on 13 March 2024 under the Faculty of Science & Technology (as per National Education Policy – 2020) run at the Affiliated Colleges, Dr.Babasaheb Ambedkar Marathwada University as appended herewith.

Sr.No.	Courses	Semester
1	Non Conventional & Conventional Energy (Single Major)	Ist and IInd semester
2	Home Science (Single Major)	Ist and IInd semester
3	Bachelor of Computer Application (Single Major)	Ist and IInd semester
4	Computer Science (Single Major)	Ist and IInd semester
5	Data Science (Single Major)	Ist and IInd semester
6	Information Technology (Single Major)	Ist and IInd semester
7	Networking and Multimedia (Single Major)	Ist and IInd semester
8	Automobile Technology (Single Major)	Ist and IInd semester
9	Forensic Science (Single Major)	Ist and IInd semester
10	Forensic Science & Cyber Security (Single Major)	Ist and IInd semester

This is effective from the Academic Year 2024-25 and onwards.

All concerned are requested to note the contents of this circular and bring the notice to the students, teachers and staff for their information and necessary action.

University Campus,
Chhatrapati Sambhajnagar
-431 004.
Ref.No. SU/Sci./2024/27121-28
Date:-27.05.2024.

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**Deputy Registrar,
Academic Section.**

Copy forwarded with compliments to :-

- 1] **The Principal of all concerned Colleges,**
Dr. Babasaheb Ambedkar Marathwada University,
- 2] **The Director, University Network & Information Centre, UNIC, with a request to upload this Circular on University Website.**

Copy to :-

- 1] The Director, Board of Examinations & Evaluation, Dr.Babasaheb Ambedkar Marathwada University,Chhatrapati Sambhajnagar.
- 2] The Section Officer,[B.Sc.Unit] Examination Branch, Dr.Babasaheb Ambedkar Marathwada University,Chhatrapati Sambhajnagar.
- 3] The Programmer [Computer Unit-1] Examinations, Dr.Babasaheb Ambedkar Marathwada University, Chhatrapati Sambhajnagar.
- 4] The Programmer [Computer Unit-2] Examinations, Dr.Babasaheb Ambedkar Marathwada University,Chhatrapati Sambhajnagar.
- 5] The In-charge,[E-Suvidha Kendra], Rajarshi Shahu Maharaj Pariksha Bhavan, Dr.Babasaheb Ambedkar Marathwada University,Chhatrapati Sambhajnagar.
- 6] The Public Relation Officer, Dr.Babasaheb Ambedkar Marathwada University, Chhatrapati Sambhajnagar.
- 7] The Record Keeper, Dr.Babasaheb Ambedkar Marathwada University, Chhatrapati Sambhajnagar.

**DR. BABASAHEB AMBEDKAR MARATHWADA UNIVERSITY
CHHATRAPATI SAMBHAJINAGAR- 431001**



B.Sc. Degree Programme

(Three Year / Four Years (Hons) / Four Years (Hons with Research))

Course Structure and Curriculum

(Revised)

(AS PER NEP-2020)

**Subject (Major): Forensic Science
(Single Major)**

Effective from 2024-25

421-51

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Preface

As we stand on the threshold of a new era in education, the dawn of the National Education Policy 2020 illuminates our path toward a holistic, inclusive, and progressive educational landscape. The Bachelor of Science (B. Sc.) curriculum outlined herein reflects the ethos and aspirations of this transformative policy, aiming to equip learners with the knowledge, skills, and values necessary to thrive in the dynamic world of the 21st century.

At its core, the National Education Policy 2020 envisions an educational framework that is learner-centric, multidisciplinary, and geared towards fostering creativity, critical thinking, and innovation. It emphasizes the integration of knowledge across disciplines, breaking down traditional silos to encourage holistic understanding and application of concepts. The Bachelor of Science (B. Sc.) curriculum embodies these principles by offering a diverse array of courses spanning various scientific domains, while also incorporating interdisciplinary studies to nurture well-rounded graduates capable of addressing complex challenges with agility and insight.

Furthermore, the curriculum is designed to promote experiential learning, research, and hands-on exploration, recognizing the importance of practical engagement in deepening understanding and cultivating real-world skills. Through laboratory work, field experiences, internships, and project-based learning opportunities, students will have the chance to apply theoretical knowledge in practical settings, develop problem-solving abilities, and cultivate a spirit of inquiry and discovery.

Integral to the National Education Policy 2020 is the commitment to inclusivity, equity, and access to quality education for all. The Bachelor of Science (B. Sc.) curriculum reflects this commitment by embracing diversity in perspectives, backgrounds, and experiences, and by fostering an inclusive learning environment where every student feels valued, supported, and empowered to succeed.

Moreover, the curriculum emphasizes the cultivation of ethical values, social responsibility, and global citizenship, instilling in students a sense of accountability towards society and the environment. By integrating courses on ethics, sustainability, and social sciences, the Bachelor of Science (B. Sc.) program aims to produce graduates who are not only proficient in their respective fields but also compassionate, ethical leaders committed to making a positive impact on the world.

As we embark on this journey of educational transformation guided by the National Education Policy 2020, the Bachelor of Science (B. Sc.) curriculum stands as a testament to our collective vision of a more equitable, inclusive, and enlightened society. We hope that through rigorous academics, innovative pedagogy, and unwavering dedication to excellence, we can inspire the next generation of scientists, scholars, and change-makers to realize their full potential and contribute meaningfully to the advancement of knowledge and the betterment of humanity.

Forensic Science is in a true sense a multidisciplinary science, wherein various disciplines of science, humanities, health sciences, engineering, and commerce are applied to the investigation of crime. Dr. Babasaheb Ambedkar Marathwada University, Aurangabad is committed to providing a comprehensive syllabus for UG programs in Forensic Science in line with the objectives and philosophies of National Education Policy 2020. However, as Forensic Science is a diverse field, minors have been incorporated keeping the existing requirements of forensic science laboratories and industries in the mind.

Programme Educational Objectives (PEOs)

Programme Educational Objectives (PEOs) for the Bachelor of Science Curriculum under the National Education Policy 2020

1. **Mastery of Discipline-Specific Knowledge:** Graduates of the Bachelor of Science program will demonstrate a deep understanding of fundamental principles, theories, and methodologies in their chosen scientific discipline, enabling them to analyse complex problems, propose innovative solutions, and contribute to advancements in their field.
2. **Interdisciplinary Proficiency:** Graduates will possess the ability to integrate knowledge and skills from multiple scientific disciplines, fostering a holistic approach to problem-solving and innovation. They will be equipped to address multifaceted challenges by drawing upon diverse perspectives and methodologies.
3. **Critical Thinking and Analytical Skills:** Graduates will develop strong critical thinking abilities, enabling them to evaluate information rigorously, analyze data effectively, and make informed decisions based on evidence. They will demonstrate proficiency in applying logical reasoning and scientific methods to solve problems and generate new knowledge.
4. **Leadership and Innovation:** Graduates will demonstrate leadership qualities and entrepreneurial mindset, capable of initiating and driving positive change in their organizations and communities. They will exhibit creativity, resilience, and adaptability, harnessing innovation to address complex challenges and seize opportunities for growth and advancement.
5. **Global Citizenship and Cultural Sensitivity:** Graduates will possess a global perspective and cultural sensitivity, recognizing the interconnectedness of diverse communities and the importance of collaboration across borders. They will engage in cross-cultural dialogue, embrace diversity, and contribute to the advancement of knowledge and understanding on a global scale.

These Programme Educational Objectives serve as guiding principles for the Bachelor of Science curriculum, reflecting our commitment to nurturing well-rounded graduates who are

prepared to excel in their careers, contribute to society, and lead meaningful lives in a rapidly changing world.

Programme Outcomes (POs)

The National Education Policy (NEP) 2020 for India emphasizes several key aspects for Bachelor of Science (B.Sc.) programs, aiming to produce graduates who are not only well-versed in their respective disciplines but also equipped with skills necessary for holistic development and employability. While specific program outcomes may vary between institutions and disciplines within B.Sc. programs, here are some common outcomes aligned with NEP 2020:

- **PO1. The citizenship and society:** Apply broad understanding of ethical and professional skill in science subjects in the context of global, economic, environmental and societal realities while encompassing relevant contemporary issues.
- **PO2. Environment and sustainability:** Apply broad understanding of impact of science subjects in a global, economic, environmental and societal context and demonstrate the knowledge of, and need for sustainable development.
- **PO3. Ethics:** Apply ability to develop sustainable practical solutions for science subject related problems within positive professional and ethical boundaries.
- **PO4. Individual and team work:** Function effectively as a leader and as well as team member in diverse/ multidisciplinary environments.
- **PO5. Communication:** Communicate effectively on complex science subject related activities with the scientific community in particular and with the society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
- **PO6. Project management and finance:** Demonstrate knowledge and understanding of the first principles of science and apply these to one's own work as a member and leader in a team, to complete project in any environment.

- **PO7. Life-long learning:** Recognize the need for lifelong learning and have the ability to engage in independent and life-long learning in the broadest context of technological change.

These program outcomes align with the broader goals of NEP 2020 to transform higher education in India and prepare students for the challenges and opportunities of the 21st century. Board of Studies designing B.Sc. curricula are encouraged to incorporate these outcomes into their program objectives and learning outcomes.

Programme Specific Outcomes (PSOs)

B.Sc. Forensic Science program is also aligned with the NEP 2020 and has the following program specific outcomes.

PSO1. Domain knowledge: Apply the knowledge of forensic science and allied disciplines to provide comprehensive solutions to complex forensic problems.

PSO2. Problem Analysis: Identify problems related to forensic sciences at varied complexity and analyse the same to formulate/ develop substantiated conclusion using principles of forensic sciences

PSO3. Design Development of solutions: Design/ develop solutions for problems of varied complexity in various areas of forensic sciences to address changing challenges put forward by market demand/ stakeholder

PSO4. Conduct Investigation of complex problems: Use established knowledge and methods to design of experiments, analyze resulting data and interpret the same to provide valid conclusions.

PSO5. Modern tools: Create, select, and apply appropriate techniques, resources, and modern electronics and relevant IT tools including prediction and modelling to complex forensic technology related activities with clear understanding of the limitations.

Eligibility

A candidate who has passed 12th in science from a recognized board with at least 45% marks will be eligible for getting admission to the first year of UG programs. Reservation policy and relaxation of marks will be as per the norms of the university and the Government of Maharashtra.

Duration

As per the guidelines of the Government of Maharashtra and the university, the UG Program will be for three/four years. Lateral entry/exit is applicable as per the guidelines of the university.

Medium of Instruction

Presently, the medium of instruction is English. However, any change in this will be as per the guidelines of the university and the government of Maharashtra.

Attendance

Students must have a minimum of 75 % attendance in each theory and practical course to appear in the Semester End Examination (SEE), otherwise he/she will not be strictly allowed to appear for the SEE. However, students having 65 % attendance may request the Head of the concerned Institution for the condonation of attendance on medical grounds.

Selection of Minor

Based on the requirements of industries and laboratories, four minors have been identified as follows: Physics, Chemistry, Biology and Computer Science. The students can opt for any of the minors subject to availability in the respective college/institute. Based on the availability of infrastructure and faculty members, the principal/director of the college/institute can decide what minor/electives have to be started and how many students will be enrolled in a particular minor/elective. However, as forensic science is highly applied in nature, the batch size for both theory and practical purposes of elective should ideally be 10 students (Student: teacher ratio of 10:1).

Curriculum and Structure as per NEP 2020
Structure of B. Sc. (Three / Four Years Honours / Honours with Research Degree) Programme with Multiple Entry and Exit Options

Structure and Curriculum for Semester-I

BSc First Year: 1st Semester

Subject (Major): Forensic Science

Course Type	Course Code	Course Name	Teaching Scheme (Hrs / Week)		Credits Assigned		Total Credits
			Theory	Practical	Theory	Practical	
Major (Core) M1 Mandatory	DSC-1	Forensic Science-I	2		2		2+2= 04
	DSC-2	Practical based on DSC-1		4		2	
Major (Core) M2 Mandatory	DSC-3	Allied Forensic Science-I	2		2		2+2= 04
	DSC-4	Practical based on DSC-3		4		2	
Major (Core) M3 Mandatory	DSC-5	Forensic Psychology-I	2		2		2+2= 04
	DSC-6	Practical based on DSC-5		4		2	
Generic / Open Elective (GE/OE) (Choose any one from the pool of courses) It should be chosen compulsorily from the faculty other than that of the Major	GE/OE-1	To be chosen from other faculty	2		2		02
SEC (Skill Enhancement Courses) (Choose any one from pool of courses: Theory and practical course together make a complete course)	SEC-1A	Basic Instrumentation skills in Physics-I	1		1		1+1=02
	SEC-1B	Chemical Laboratory Techniques					
	SEC-1C	General Laboratory Practices in Life Sciences					
	SEC-1D	Data Analysis using Excel					
	SEC-1E	Forensic Photography					
	SEC-1F	Basic Criminal Drafting					
	SEC-2A	Practical Based on SEC-1A	2				
	SEC-2B	Practical Based on SEC-1B					
	SEC-2C	Practical Based on SEC-1C					
	SEC-2D	Practical Based on SEC-1D					

	SEC-2E	Practical Based on SEC-1E					
	SEC-2F	Practical based on SEC-1F					
AEC, VEC, IKS	AEC-1	English (Common for all the faculty)	2		2		2+2=04
	IKS-1	Choose any one from pool of courses	2		2		
OJT/ FP/CEP/CC/RP	CC-1	Health and Wellness (Common for all the faculty)		4		2	02
			13	18	13	09	22

GE/OE-1: Introduction to Forensic Science (This is a 2-credit theory course to be designed for the other faculty than Science and Technology)

Structure and Curriculum for Semester-II

BSc First Year: 1st Semester

Subject (Major): Forensic Science

Course Type	Course Code	Course Name	Teaching Scheme (Hrs / Week)		Credits Assigned		Total Credits
			Theory	Practical	Theory	Practical	
Major (Core) M1 Mandatory	DSC-7	Forensic Science-II	2		2		2+2 = 4
	DSC-8	Practical based on DSC-7		4		2	
Major (Core) M2 Mandatory	DSC-9	Allied Forensic Science-II	2		2		2+2 = 4
	DSC-10	Practical based on DSC-9		4		2	
Major (Core) M3 Mandatory	DSC-11	Forensic Psychology-II	2		2		2+2 = 4
	DSC-12	Practical based on DSC-11		4		2	
Generic / Open Elective (GE/OE) (Choose any two from pool of courses) It should be chosen compulsorily from the faculty other than that of Major	GE/OE-2	To be chosen from other faculty	2		2		2
VSC (Vocational Skill Courses) (Choose any one from pool of courses: Theory and practical course together make a complete course)	VSC-1A	Basic Instrumentation Skill in Physics-II	1		1	1	1+1=02
	VSC-1B	Chemical and Laboratory Safety					
	VSC-1C	Laboratory Techniques in Life Sciences					
	VSC-1D	HTML Programming					
	VSC-1E	Blood Pattern Analysis					
	VSC-1F	Intellectual Property Right					
	VSC-2A	Practical based on SEC-1A	2			1	
	VSC-2B	Practical based on SEC-1B					
	VSC-2C	Practical based on SEC-1C					
	VSC-2D	Practical based on SEC-1D					
	VSC-2E	Practical based on SEC-1E					
	VSC-2F	Practical based on SEC-1F					
		AEC-1	English (Common for all the faculty)	2		2	

AEC, VEC, IKS	VEC-1	Constitution of India (Common for all the faculty)	2		2		2+2=4
OJT/ FP/CEP/CC/RP	CC-2	Yoga Education / Sports and Fitness (Common for all the faculty)		4		2	2
			13	18	13	09	22
Exit Option: Award of UG Certificate in 3 Majors with 44 credits and an additional 4 credits of core NSQF course / Internship OR continue with Major and Minor							

GE/OE-2: Forensic Handwriting Identification (This is a 2-credit theory course to be designed for the other faculty than Science and Technology)

Detailed Illustration of Courses included in 1st and 2nd semester:

- 1) **Major (Core)** subject is mandatory.

DSC-1,3,5,7,9,11: This is a 2-credit theory course corresponding to Major (core) subject

DSC-2, 4, 6, 8, 10, 12: This is a 2-credit practical course based on DSC-1,3,5,7,9,11

- 2) **Generic / Open Elective (GE/OE)**: (Needs to be chosen (any two) from pool of courses available at respective college). **These courses should be chosen compulsorily from faculty other than that of Major.**

GE/OE -1: This is a 2-credit theory course should be chosen compulsorily from faculty other than that of Major.

GE/OE -2: This is a 2-credit theory course should be chosen compulsorily from faculty other than that of Major.

- 3) **SEC (Skill Enhancement Courses)**: Choose any one from pool of courses. These courses need to be designed to enhance the technical skills of the students in specific area.

SEC-1: This is a 1 credit theory course to enhance the technical skills of the students in specific area.

SEC-2: This is a 1 credit practical course based on SEC-1.

- 4) **VSC (Vocational Skill Courses)**: Choose any one from pool of courses. These courses should be based on Hands on Training corresponding to Major (core) subject.

VSC-1: This is a 1 credit theory course-based Hands-on Training corresponding to Major (core) subject.

VSC-2: This is a 1 credit practical course based on VSC-1

- 5) **AEC (Ability Enhancement courses)**: The focus of these courses should be based on linguistic and communication skills. In first semester it will be English and will be common for all the faculty.

AEC-1: English

This is a 2-credit theory course based on linguistic proficiency. It will be common for all the faculty.

AEC-2: English

This is a 2-credit theory course based on linguistic proficiency. It will be common for all the faculty.

- 6) **IKS (Indian Knowledge System)** : The courses related to traditional and ancient culture of India will be included in this section. The respective college will have to choose one of the courses from the pool of courses designed by the University.

IKS-1: To be chosen from the pool of courses designed by the University

This is a 2-credit theory course based on Indian Knowledge System. It will be common for all the faculty

- 7) **VEC (Value Education Courses):** The courses such as understanding India, Environmental Science / Education, Digital and Technological solutions etc will be part of Value Education Courses.

VEC-1: Constitution of India

This is a 2-credit theory course based on value education. It will be common for all the faculty

- 8) **CC (Curricular Courses):** The courses such as Health and wellness, Yoga education, Sports and Fitness, Cultural activities, NSS/NCC, Performing Arts.

CC-1: Health and Wellness

This is a 2-credit practical course based on Co-curricular activities. It will be common for all the faculty

CC-2: Yoga education / Sports and Fitness

This is a 2-credit practical course based on Co-curricular activities. It will be common for all the faculty

- 9) For Allied Forensic Science-I and II (DSC-3 and DSC-9 respectively), which is the second mandatory major, the students have to choose, one of the four papers given below in the first and the second semester as per the table given below. Depending on the infrastructure and faculty available, the Institute/college can decide on batch size. Even they may divide the students equally into the four options.

Sem	Course Code	Name of the course	Number of Credits
I	DSC-3A	Forensic Physics-I OR	2
	DSC-3B	Forensic Chemistry-I OR	2
	DSC-3C	Forensic Biology-I OR	2
	DSC-3D	Digital Forensics-I	2
II	DSC-9A	Forensic Physics-II OR	2
	DSC-9B	Forensic Chemistry-II OR	2
	DSC-9C	Forensic Biology-II OR	2
	DSC-9D	Digital Forensics-II	2

Semester-I

Detailed Curriculum of Semester-I

Discipline-Specific Core Courses (Major)

DSC-1: Forensic Science-I		
Total Credits: 02 Maximum Marks: 50		Total Contact Hours: 30 Hrs.
<p>Learning Objectives of the Course: The learning objectives of the course are as follows:</p> <ul style="list-style-type: none"> • Students will gain an idea of forensic science and its applications • Students will learn and analyze the various crime scenes and their investigation • Students will get an idea of the organizational set-up of forensic science laboratories and other related organizations • Students will have an understanding of various physical evidence <p>Course Outcomes (COs): After completion of the course, students will be able to:</p> <ul style="list-style-type: none"> • CO1: Define and explain forensic science, crime scene, physical evidence, and related organizations of forensic science • CO2: Explain and interpret crime scene investigation • CO3: Classify and evaluate the crime scene • CO4: Analyze various crime scene scenarios 		
ModuleNo.	Topics / actual contents of the syllabus	Contact Hours
I	<p>Introduction to Forensic Science</p> <ul style="list-style-type: none"> • Introduction to Forensic Science • Laws and principles of forensic science • Criminal justice system in India • Organizational set-up and functions of police, prosecution, and courts in India • Domains of Forensic Science 	10 Hrs.

II	<p>Organization related to Forensic Science</p> <ul style="list-style-type: none"> • Forensic Science Laboratory in India, Central and State Forensic Science Laboratories • Regulatory bodies: Directorate of Forensic Science Services, Bureau of Police Research and Development, National Crime Record Bureau • Intelligence agencies: Intelligence Bureau and Research and Analysis wing • Law enforcement agencies: CID, CBI, NIA, Interpol • Ethics in Forensic Science 	10 Hrs.
III	<p>Crime Scene Investigation</p> <ul style="list-style-type: none"> • Crime Scene and its types • First responding officer at the crime scene • Crime Scene Management • Crime Scene Processing: protection of crime scene, documentation, evidence search, collection, preservation, packaging, and forwarding of evidence to FSL • Physical evidence 	10 Hrs.
<p>Suggested Readings/Reference Books:</p> <ol style="list-style-type: none"> 1. Richard Saferstien, Forensic Science: From the Crime Scene to the Crime Lab, 4th edition, Pearson, USA. 2. Suzane Bell, Forensic Science: An Introduction to Scientific and Investigative Techniques, Fifth Edition, CRC Press. 3. Max M. Houck and Jay A. Siegel, Fundamental of Forensic Science 4. Richard Saferstein, Handbook of Forensic Science, Volume-I, II and III 5. Forensic Science in Criminal Investigation and Trial, 4th Edition, B.R. Sharma 		

DSC-2: Practical based on DSC-1 (Forensic Science-I)

Total Credits: 02

Total Contact Hours: 60 Hrs.

Maximum Marks: 50

Learning objectives and outcomes of the course:

This is a laboratory course based on **Forensic Science-I (DSC-1)**. The course objectives and outcomes of this laboratory course have been added to the theory course. A minimum of 10 practical has to be covered in the semester for successful completion of the course.

ModuleNo.	List of Practical	Contact Hours
I	<ol style="list-style-type: none">1. To get familiar with the instruments and apparatus of the laboratory2. To apply laws and principles of forensic science in real crime scenario3. To classify crime scenes based on the given crime scene/images4. To identify and classify physical evidence of the given crime scene5. To perform a preliminary survey of the crime scene6. To perform photography/videography of crime scene7. To perform a rough/final sketch of the crime scene8. To Perform collection and preservation of evidence9. To prepare a forwarding letter to send the case to FSL10. To perform a preliminary examination of bangle pieces11. To perform a preliminary examination of cloth pieces12. Any other practical designed by the faculty member based on recent advances/latest trends	60 Hrs.

DSC-3	Allied Forensic Science-I	Credit:02	Contact Hours:30	Marks:50
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As forensic science is an application of natural and applied sciences. The students need to select one of the four options:

SN	Code	Name of the course	Credit	Contact Hours	Marks
1	DSC-3A	Forensic Physics-I	02	30	50
OR					
2	DSC-3B	Forensic Chemistry-I	02	30	50
OR					
3	DSC-3C	Forensic Biology-I	02	30	50
OR					
4	DSC-3D	Digital Forensics-I	02	30	50

DSC-3A: Forensic Physics-I		
Total Credits: 02		Total Contact Hours: 30 Hrs.
Maximum Marks: 50		
Learning Objectives of the Course:		
The learning objectives of the course are as follows:		
<ul style="list-style-type: none"> • Students will gain an idea of the basic concepts of refraction, aberration, interference, and diffraction • Students will learn and analyze the difference between interference and diffraction • Students will have an understanding of polarization 		
Course Outcomes (COs):		
After completion of the course, students will be able to:		
<ul style="list-style-type: none"> • CO1: Define and explain optical concepts like reflection, refraction, interference, diffraction, and polarization • CO2: Differentiate between interference and diffraction • CO3: Classify various aberration concepts • CO4: Calculate the resolving power of the microscope 		
ModuleNo.	Topics / actual contents of the syllabus	Contact Hours
I	Reflection, refraction, and dispersion of light <ul style="list-style-type: none"> • Laws of reflection, real and virtual image • Laws of refraction, Physical significance of refractive index, refraction through several media, Total internal reflection 	10 Hrs.

	<ul style="list-style-type: none"> • Dispersion and dispersive power, Deviation without dispersion and dispersion without deviation, Fermat's principle, • Refraction through thin and thick lenses, combination of two thin lenses (including derivation for focal length and cardinal point) 	
II	<p>Interference and Aberration</p> <ul style="list-style-type: none"> • Interference: Introduction, Conditions for interference of light, Interference in thin film, Newton's ring, Wedge-shaped film, Determination of refractive index of a liquid, Applications of interference- interference filters, thickness of thin film coating, anti-reflecting coating. • Aberration: Achromatic and chromatic aberration, Types of Achromatic aberration and their reduction- Spherical aberration, Coma, Astigmatism, Curvature of field, Distortion, Types of chromatic aberration- achromatism (lenses in contact and separated by finite distance). 	10 Hrs.
III	<p>Polarization and Diffraction</p> <ul style="list-style-type: none"> • Polarization: Introduction, Polarization of light waves, Types of polarization, Plane of polarization, Brewster's law, Law of Malus, Production of polarized light, Polarizer and analyzer. • Diffraction: Introduction to Fresnel and Fraunhofer's of diffraction, Difference between interference and diffraction, Plane diffraction grating. Resolving power: Rayleigh's criterion of resolution, resolving power of grating and microscope, Huygen's and Ramden's eye pieces and their comparison. 	10 Hrs.
<p>Suggested Readings/Reference Books:</p> <ol style="list-style-type: none"> 1. A textbook of Optics, Multicoloured Revised Edition 2014, Subramanyam, Brij Lal, Avadhanulu, S. Chand and Co. Pvt. Ltd, 2. Engineering Physics Seventh Enlarged, Revised Edition 2004, M.N. Avadhanulu and P.G. Kshirsagar, S. Chand and Company Ltd. 3. Optics – Ajoy Ghatak (3rd Ed) Mc. Graw Hill Co. 4. Modern Physics Concept and Applications – Sanjeev Puri, Narosa Publication. 		

5. Principles of Optics – B. K. Mathur and T. P. Pandya (3rd Ed.) 1981, McGraw Hill International.
6. Fundamentals of Optics – Khanna and Gulati (1994), S. Chand.
7. Optics – C. L. Arora, S. Cand and Co. Ltd (2001)
8. Fundamentals of Physics-Resnik, Halliday and Walker, John Wiley Publication.
9. Fundamentals of Optics – Jenkins and White. (4th Ed) McGraw Hill International

DSC-3B: Forensic Chemistry-I

Total Credits: 02

Total Contact Hours: 30 Hrs.

Maximum Marks: 50

Learning Objectives of the Course:

The learning objectives of the course are as follows:

- Students will gain an idea of the basic concepts of chemical energetics, chemical, and ionic equilibria
- Students will understand exergonic and endergonic reactions
- Students will be able to apply thermodynamic principles to physical and chemical process

Course Outcomes (COs):

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

- CO1: Define and explain concepts of thermodynamics, chemical energetics, chemical, and ionic equilibria
- CO2: Understand variation of enthalpy with temperature
- CO3: Calculate enthalpy, Bond energy, Bond dissociation energy, resonance energy
- CO4: Apply thermodynamic principles to physical and chemical process

ModuleNo.	Topics / actual contents of the syllabus	Contact Hours
I	Atomic Structure and periodicity of elements <ul style="list-style-type: none">• Atomic Structure: Bohr's theory of hydrogen atom and its limitations, wave particle duality, Heisenberg uncertainty principle, Quantum numbers and their significance, Shapes of s, p and d atomic orbitals, Electrons filling rules in various orbitals: a) Aufbau's principle b) Hund's rule of maximum multiplicity c) Pauli's exclusion principle. Electronic configuration of elements. Stability of empty, half-filled and completely filled orbitals.• Periodicity of the elements: General discussion of the following properties of the elements with reference to s block elements: a) electronic configuration b) atomic radii c) ionic radii d) ionization energy e) electron affinity f) electronegativity g) metallic characters h) reactivity i) oxidation state j) melting and boiling points k) chemical properties.	10 Hrs.

II	<p>Chemical Bonding and Molecular Structure</p> <ul style="list-style-type: none"> • Types of Chemical Bonds: a) Ionic bond b) Covalent Bond c) Co-ordinate bond d) metallic bond e) Hydrogen Bond f) Van-der walls force. • Definition and formation of ionic bond. General characteristics of ionic bonding. Energetic in Ionic bond formation. Born-Haber cycle for NaCl and its applications. Fajan's Rule, Applications of Fajan's rule for i) Polarizing power and polarizability ii) Ionic character in covalent compounds iii) Bond moment, dipole moment and percentage ionic character • VSEPR Theory. Concept of hybridization, different types of hybridization and geometry of following molecules, i) Linear geometry- BeCl₂ (sp hybridization) ii) Planer trigonal geometry- BF₃ (sp² hybridization) iii) Tetrahedral geometry- SiCl₄ (sp³ hybridization) iv) Trigonal bipyramidal geometry- PCl₅ (sp³d hybridization) v) Octahedral geometry- SF₆ (sp³d² hybridization) vi) Pentagonal bipyramidal geometry –IF₇ (sp³d³ hybridization) 	10 Hrs.
III	<p>Acid and Bases</p> <ul style="list-style-type: none"> • Theories of Acids and Bases – Arrhenius concept, Bronsted –Lowry concept, Lewis's concept, Lux-Flood concept. (Definition and examples only). • Hard and Soft Acids and Bases (HSAB concept), Classification of Acids and Bases as hard soft and borderline. Pearson's HSAB concept. Acid –Base strength and hardness-softness. Application and limitations of HSAB concept. • Position of elements in periodic table. Characteristics of group 13th, 14th and 15th elements with special reference to electronic configuration and periodic properties. • Compounds of group 13th, 14th and 15th elements. Boron –diborane (only structure). Allotropes of carbon and phosphorus. Oxyacids of Nitrogen (HNO₂, HNO₃). 	10 Hrs.
Suggested Readings/Reference Books:		

1. Lee, J. D. Concise Inorganic Chemistry ELBS, 1991.
2. Cotton, F.A., Wilkinson, G. & Gaus, P.L. Basic Inorganic Chemistry, 3rd ed., Wiley.
3. Douglas, B. E., McDaniel, D. H. & Alexander, J. J. Concepts and Models in Inorganic Chemistry, John Wiley & Sons.
4. Hughey, J. E., Keiter, E. A., Keiter, R. L. & Medhi, O. K. Inorganic Chemistry.
5. Principles of Structure and Reactivity, Pearson Education India, 2006.
6. Puri, Sharma, Kalia. Principles of Inorganic Chemistry
7. Madan R. L. Chemistry for Degree Students (B. Sc. First year), S. Chand

DSC-3C: Forensic Biology-I

Total Credits: 02

Total Contact Hours: 30 Hrs.

Maximum Marks: 50

Learning Objectives of the Course:

The learning objectives of the course are as follows:

- Students will gain an idea of the basic concepts of evolution and biochemistry
- Students will understand amino acids and related concepts
- Students will be able to analyze various pathways in metabolism

Course Outcomes (COs):

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

- CO1: Define and explain concepts of evolution and biochemistry
- CO2: Understand the structure, reaction and classification of amino acids and other biomolecules
- CO3: Analyze various metabolic pathways
- CO4: Perform nomenclature of oils and fats

ModuleNo.	Topics / actual contents of the syllabus	Contact Hours
I	Biochemistry-I <ul style="list-style-type: none">• Evolutionary thoughts: brief history of life on earth and evolutionary theories.• Amino acids: definition, structure and classification, isoelectric point,• Proteins: the structure of proteins-primary, secondary, super secondary, tertiary, and quaternary.• Enzymes: definition, types, mechanism of action (Lock and key and induced fit model).• Michaelis-Menton equation, enzyme inhibition, allosteric enzymes, Isozymes, polymeric enzymes, polymorphic enzymes. Coenzyme and Cofactors.	10 Hrs.

II	<p>Biochemistry-II</p> <ul style="list-style-type: none"> • Carbohydrates: Classification, types and functions, isomerism and optical activity. • Carbohydrate metabolism: Glycolysis, Kreb's Cycle and oxidative phosphorylation, Pentose phosphate pathway, Gluconeogenesis, Glyoxylate cycle. • Oils and Fats: classification, properties. Significance of saturated and unsaturated fatty acids and essential fatty acids • Vitamins: significance and deficiencies. Hormones: importance and functions in brief. 	10 Hrs.
III	<p>Classical Genetics</p> <ul style="list-style-type: none"> • Genetic material: Griffith's experiment, Avery-Macleod-McCarty experiment, Hershey-Chase experiment, Meselson-Stahl experiment. RNA as genetic material. • Structure of DNA: X-ray crystallography, Chargaff's rule, Watson-Crick's double-helical model, forms of DNA. • Types of RNA. Chromosome: types, organization, staining. • Mendelian inheritance and non-mendelian inheritance. 	10 Hrs.
<p>Suggested Readings/Reference Books:</p> <ol style="list-style-type: none"> 1. Origin of species-Charles Darwin 2. Evolution: the modern synthesis-Julian Huxley 3. Biology: Raven, Johnson, Singer 4. Evolution: Donald Prothero 5. Biology: Taylor 6. Biochemistry: Berg, Tymoczko, Stryer 7. Lehninger Principles of Biochemistry: Nelson and Cox. 		

DSC-3D: Digital Forensics-I

Total Credits: 02

Total Contact Hours: 30 Hrs.

Maximum Marks: 50

Learning Objectives of the Course:

The learning objectives of the course are as follows:

- Students will gain a basic idea of computer system, software, hardware
- Students will understand memory concept of a computer
- Students will be able to compare structure of various operating system

Course Outcomes (COs):

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

- CO1: Define and explain concepts of computer software, hardware and memory
- CO2: Understand the structure of file systems
- CO3: Differentiate the structure of various operating system
- CO4: Classify various memory devices

ModuleNo.	Topics / actual contents of the syllabus	Contact Hours
I	Computer fundamentals-I <ul style="list-style-type: none">• Basic Organization of Computer System, Computer Hardware and Software• Input/output Devices: Input/output Devices, Input/output Interface,• Asynchronous Data Transfer, Modes of Data Transfer.• Computer Memory: Primary Memory (RAM, SRAM, DRAM, ROM, EPROM, etc.), Secondary Memory (Magnetic Floppy, Hard Disk, SSD, RAID), Optical Memory (CDROM, WORM) Concept of Virtual Memory, Concept of Cache and their need, Memory hierarchy.	10 Hrs.

II	<p>Computer fundamentals-II</p> <ul style="list-style-type: none"> • Types of Software: Application software, System Software, firmware • Types of Computers: Micro Computer, Mini Computer, Super Computer, Mainframe Computer. • Number System: Types of Number Systems: Binary, Decimal, Octal, Hexadecimal, Conversion of Number System. Binary Arithmetic. Basic Logic Gates 	10 Hrs.
III	<p>Introduction to Operating System</p> <ul style="list-style-type: none"> • Understanding Computer Operating Systems, Understanding the Role of the Operating System, Types of Operating Systems, Multitasking, Multiprogramming, Distributed OS, Multiprocessing, Multithreading, Network OS, Proprietary and Open-Source Operating Systems, • An Overview of Commonly Used Operating Systems: Windows, Linux, Mobile OS. 	10 Hrs.
<p>Suggested Readings/Reference Books:</p> <ol style="list-style-type: none"> 1. Computer Fundamentals by Pradeep K. Sinha & Priti Sinha 2. Computer Fundamentals by Larry Long 3. Computer System Architecture, M. Morris Mano, PHI Publications 4. Computer Organization and Architecture Designing for Performance, Eight Edition, William Stallings, Pearson Publication 		

DSC-4	Practical based on DSC-3 (Allied Forensic Science-I)	Credit:02	Contact Hours:60	Marks:50
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The students need to select one of the four options as per their selection of theory courses:

SN	Code	Name of the course	Credit	Contact Hours	Marks
1	DSC-4A	Practical based on DSC-3A	02	60	50
OR					
2	DSC-4B	Practical based on DSC-3B	02	60	50
OR					
3	DSC-4C	Practical based on DSC-3C	02	60	50
OR					
4	DSC-4D	Practical based on DSC-3D	02	60	50

DSC-4A: Practical based on DSC-3A (Forensic Physics-I)		
Total Credits: 02		Total Contact Hours: 60 Hrs.
Maximum Marks: 50		
Learning objectives and outcomes of the course:		
This is a laboratory course based on Forensic Physics-I (DSC-3A) . The course objectives and outcomes of this laboratory course have been added to the theory course. A minimum of 10 practical has to be covered in the semester for successful completion of the course.		
ModuleNo.	List of Practical	Contact Hours
I	<ol style="list-style-type: none"> 1. Standard operation procedure for Vernier caliper, micrometer screw and travelling microscope. 2. Determine the combined focal length of the given lens system. 3. Determine the angle of the prism using a spectrometer. 4. Determine the refractive index of the material of prism using spectrometer. 5. Determine the magnification of given microscopes. 6. Determine the resolving power of the microscope. 7. Determine the radius of the capillary using a travelling microscope. 	60 Hrs.

	<ol style="list-style-type: none">8. Determine the radius of curvature of the plano convex lens by Newton's Rings.9. Determine the thickness of thin foil using an air wedge10. Determine the wavelength of light using plane transmission gratings.11. Any other practical designed by the faculty member based on recent advances/latest trends	
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DSC-4B: Practical based on DSC-3B (Forensic Chemistry-I)

Total Credits: 02

Total Contact Hours: 60 Hrs.

Maximum Marks: 50

Learning objectives and outcomes of the course:

This is a laboratory course based on **Forensic Chemistry-I (DSC-3B)**. The course objectives and outcomes of this laboratory course have been added to the theory course. A minimum of 10 practical has to be covered in the semester for successful completion of the course.

ModuleNo.	List of Practical	Contact Hours
I	<ol style="list-style-type: none">1) To determine quantity of Fe (II) ions from the given solutions by titrating it with 0.1N K₂Cr₂O₇ solution by using internal indicator2) To estimate amount of Cu (II) ions by Iodometric titration by using Na₂S₂O₃ solution.3) To prepare standard 0.1 N KMnO₄ solution and to determine the strength of given oxalic acid solution.4) Estimation of amount of Acetic acid from the given vinegar sample by titrimetric method5) To standardize supplied EDTA solution by titrating with 0.01 M ZnSO₄ solution and to estimate amount of calcium from given solution by using Erio- T as an indicator.6) Quality control-To determine percentage purity of the given sample of soda ash (Na₂CO₃) by titrimetric method.7) Chromatography: Separation and identification of cations by Paper Chromatography technique from the following mixtures: a) Ni²⁺ + Cu²⁺ b) Ni²⁺ + Co²⁺8) Spot Test: Identify the following metal ions by spot test method (Minimum Five): Cu²⁺, Ni²⁺, Co²⁺, Fe³⁺, Al³⁺, Pb²⁺, Zn²⁺, Hg⁺², Mg⁺², Mn⁺²9) Any other practical designed by the faculty member based on recent advances/ latest trends	60 Hrs.

DSC-4C: Practical based on DSC-3C (Forensic Biology-I)

Total Credits: 02

Total Contact Hours: 60 Hrs.

Maximum Marks: 50

Learning objectives and outcomes of the course:

This is a laboratory course based on **Forensic Biology-I (DSC-3C)**. The course objectives and outcomes of this laboratory course have been added to the theory course. A minimum of 10 practical has to be covered in the semester for successful completion of the course.

ModuleNo.	List of Practical	Contact Hours
I	<ol style="list-style-type: none">1) Introduction to the instrument and Glassware of the laboratory2) To Study the calibration of laboratory equipment3) Use of micropipettes4) Qualitative analysis of sugar5) Qualitative analysis of Proteins6) Qualitative analysis of Lipids7) Qualitative analysis of nucleic acids8) Separation of amino acids and Protein or sugar using paper Chromatography techniques (Radial/Ascending)9) Separation of chloroplast pigments using paper Chromatography techniques10) To study the cytochemical distribution of nucleic acids and mucopolysaccharides within cells/tissues from permanent slides11) Determination of pH of any fluid and iso-electric point of protein12) Determination of saponification value and rancidity of fats13) Any other practical designed by the faculty member based on recent advances/ latest trends	60 Hrs.

DSC-4D: Practical based on DSC-3D (Digital Forensics-I)

Total Credits: 02

Total Contact Hours: 60 Hrs.

Maximum Marks: 50

Learning objectives and outcomes of the course:

This is a laboratory course based on **Digital Forensics-I (DSC-3D)**. The course objectives and outcomes of this laboratory course have been added to the theory course. A minimum of 10 practical has to be covered in the semester for successful completion of the course.

ModuleNo.	List of Practical	Contact Hours
I	<ol style="list-style-type: none">1. Hands-on on Computer hardware2. Study of various commands in windows3. Study of various commands in Linux4. Installation of VirtualBox5. Installation of OS/ Windows6. Installation of OS/ Linux7. Working with MS-Office-Word8. Working with MS-Office-Excel9. Working with MS-Office-PowerPoint10. Understanding use of E –mail11. Tracing and analyzing E – mail senders IP Address of received e–mail12. Use of Internet – Visiting websites, searching information using search engine.13. Any other practical designed by the faculty member based on recent advances/ latest trends	60 Hrs.

DSC-5: Forensic Psychology-I

Total Credits: 02

Total Contact Hours: 30 Hrs.

Maximum Marks: 50

Learning Objectives of the Course:

The learning objectives of the course are as follows:

- Students will gain an idea of psychology
- Students will learn and analyze the concepts of perception
- Students will have an understanding of criminal behaviour

Course Outcomes (COs):

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

- CO1: Define psychology
- CO2: Explain sensation attention and perception
- CO3: Explain offenses affecting the human body

ModuleNo.	Topics / actual contents of the syllabus	Contact Hours
I	The Science of Psychology <ul style="list-style-type: none"> • What is Psychology –Nature, Definition, and its goals • History of Psychology • Psychology: The Science, early schools of Psychology, modern perspectives • Scientific methods of study in Psychology- Naturalistic Observation, Experimental, Case Studies, and Survey 	10 Hrs.
II	Sensation Attention and Perception <ul style="list-style-type: none"> • Definition, Perceptual constancies, Gestalt Principle of Perception-perceptual organization and Grouping of Stimuli in Perceptual Organization, Depth Perception • Errors in Perception-Illusion, Hallucination, Individual Factors in Perception. Attention, Factors Influencing Attention, Types of Attention. • Offence of cheating with punishments. • Criminal behavior: classical and non-classical theories, biological theories, physiological theories, psychogenic theory, economic theory, 	10 Hrs.

	geographical theories, sociological and multi-factor theories	
III	<p>Cognition and Intelligence</p> <ul style="list-style-type: none"> • Attention, Factors Influencing Attention, Types of Attention, Thinking-mental images, concepts, prototypes, Problem Solving and Decision Making, Problems with Problem Solving. • Definition of Intelligence, Measuring Intelligence-concept in measuring intelligence (C.A., M.A., I.Q), Theories of Intelligence, Emotional intelligence, Individual Differences in Intelligence- mental retardation, giftedness, What is Psychological Tests? Types of Tests, Characteristics of a good test 	10 Hrs.
<p>Suggested Readings/Reference Books:</p> <ol style="list-style-type: none"> 1. Psychology, (2006) Ciccarelli, S. K. & Meyer G. E. New Delhi; Perason Education 2. Introduction to Psychology, (1986) Morgan C.T., King R.A., Weisz J.R., Schopler J., McGraw-Hill Book Co. 3. Principles of General Psychology, 3rd ed. Kimble G.A., Garnezy, , New York. 4. Psychology, (2001), Baran R.A. New Delhi; Person Education Pvt.Ltd. 5. Cognitive Psychology Mind and Brain', Edward E. Smith, Stephen M. Kosslyn, New Delhi, Pearson Education. 6. Introduction to Psychology, Parameswaran, E.G., BeenaC.Tata McGraw-Hil, New Delhi. 7. Manashatra-EkParichay, (2004), Dr. PadhyeV.S.Aurangabad; RenukaPrakashan. 8. Psychology-An Introduction, Thakkar P., Dr. Ambekar A., 		

DSC-6: Practical based on DSC-5 (Forensic Psychology-I)

Total Credits: 02

Total Contact Hours: 60 Hrs.

Maximum Marks: 50

Learning objectives and outcomes of the course:

This is a laboratory course based on **Forensic Psychology-I (DSC-5)**. The course objectives and outcomes of this laboratory course have been added to the theory course. A minimum of 10 practical has to be covered in the semester for successful completion of the course.

ModuleNo.	List of Practical	Contact Hours
I	<ol style="list-style-type: none">1. Mental health inventory2. Recall-Recognition3. Bilateral Transfer4. Maze learning5. Span of Attention6. IPAT anxiety scale7. Type A/B behavior patterns- UpinderDhar& Jain8. Sinha's Comprehensive Anxiety Test – A.K.P. Sinha& L.N.K. Sinha9. Facial expression10. Illusion (Muller-Lyre)11. Psychological analysis of personality (any character from book)12. Self-expression inventory13. Mental health battery14. Mobile phone addiction test15. Assertiveness inventory	60 Hrs.

Skill Enhancement Courses (SEC)

SEC-1A: Basic Instrumentation Skills in Physics-I		
Total Credits: 01 Maximum Marks: 50		Total Contact Hours: 15 Hrs.
<p>Learning Objectives of the Course: The learning objectives of the course are as follows:</p> <ul style="list-style-type: none"> • Students will gain an idea of the measurement process, the design, and operation of the electronic circuit, and the systems that enable it. • Students will learn the operations of cathode Ray Oscilloscope (CRO) • Students will have an understanding of the use of CRO for the measurement of voltage <p>Course Outcomes (COs): After completion of the course, students will be able to:</p> <ul style="list-style-type: none"> • CO1: Explain various concepts of the measurement process • CO2: Explain the construction and use of CRO • CO3: Apply CRO for the measurement of voltage 		
ModuleNo.	Topics / actual contents of the syllabus	Contact Hours
I	<p>Basic of Measurement:</p> <ul style="list-style-type: none"> • Instruments accuracy, precision, sensitivity, resolution range, etc. Errors in measurements and loading effects. • Multimeter: Principles of measurement of dc voltage and dc current, ac voltage, ac current and resistance. Specifications of a multimeter and their significance • Electronic Voltmeter: Advantage over conventional multimeter for voltage measurement with respect to input impedance and sensitivity. Principles of voltage, measurement (block diagram only). Specifications of an electronic Voltmeter/ Multimeter and their significance. AC millivoltmeter: Type of AC millivoltmeters: Amplifier- rectifier, and rectifier- amplifier. Block diagram ac millivoltmeter, specifications and their significance 	07 Hrs.

II	<p>Cathode Ray Oscilloscope:</p> <ul style="list-style-type: none"> • Block diagram of basic CRO. Construction of CRT, Electron gun, electrostatic focusing and acceleration (Explanation only– no mathematical treatment), brief discussion on screen phosphor, visual persistence and chemical composition. Time base operation, synchronization. Front panel controls. Specifications of a CRO and their significance. (6 Lectures, 8 Marks) <p>Use of CRO for the measurement of voltage (dc and ac frequency, time period. Special features of dual trace, introduction to digital oscilloscope, probes. Digital storage Oscilloscope: Block diagram and principle of working.</p>	08 Hrs.
<p>Suggested Readings/Reference Books:</p> <ol style="list-style-type: none"> 1. A text book in Electrical Technology - B L Theraja - S Chand and Co. 2. Performance and design of AC machines - M G Say ELBS Edn. 3. Digital Circuits and systems, Venugopal, 2011, Tata McGraw Hill. 4. Logic circuit design, Shimon P. Vingron, 2012, Springer. 5. Digital Electronics, Subrata Ghoshal, 2012, Cengage Learning. 6. Electronic Devices and circuits, S. Salivahanan & N. S.Kumar, 3rd Ed., 2012, Tata Mc-Graw Hill 7. Electronic circuits: Handbook of design and applications, U.Tietze, Ch.Schenk, 2008, Springer 8. Electronic Devices, 7/e Thomas L. Floyd, 2008, Pearson India 		

SEC-1B: Chemical Laboratory Techniques

Total Credits: 01

Total Contact Hours: 15 Hrs.

Maximum Marks: 50

Learning Objectives of the Course:

The learning objectives of the course are as follows:

- Students will gain an idea of a chemical laboratory
- Students will learn the apparatus in the chemical laboratory
- Students will have an understanding of reagents, solvents, and solutions in the chemical laboratory

Course Outcomes (COs):

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

- CO1: Differentiate among various apparatus in the chemical laboratory
- CO2: Classify various reagents available in the chemical laboratory
- CO3: Prepare solutions of various concentration

ModuleNo.	Topics / actual contents of the syllabus	Contact Hours
I	Chemistry Laboratory and Apparatus <ul style="list-style-type: none">• A general introduction to the Chemistry laboratory, Standard safety guidelines for safe operations within chemical laboratories, Proper storage methods for chemicals• Apparatus in the chemical laboratory: Glass Apparatus, Volumetric apparatus, Heating Apparatus, and other miscellaneous apparatus such as Buchner funnel, burner, test tube stand, tong, burette stand, clamp, retort clamp, Mohr clip, china dish, wire gauze, cork, vacuum pumps, crucibles, clay pipe triangle, pestle and mortar, spatulas, thermometer, pH meter/pH paper, laboratory centrifuge	07 Hrs.
II	Reagents, solvents and solutions <ul style="list-style-type: none">• Reagents: Classification of reagents according to their action; (i) acids (ii) bases (iii) salts (iv) complexing agents (v) oxidizing and reducing agents (vi) precipitating agents (vii) chelating agents• Primary and secondary standards: Definition, characteristics, uses examples for different types of reactions.	08 Hrs.

	<ul style="list-style-type: none"> • Solvents: Solute, Solvent & Solution, classification of solvents (i) Protic and aprotic (ii) Acidic, basic amphiprotic and neutral (iii) Aqueous and non-aqueous (iv) Polar and nonpolar • Solutions, components of a solution, types of solution, solubility, concentration terms - percentage, ppm, ppb, g/L, molarity, normality, molality, calculation of masses and volumes for preparation of solutions and their practical approach. 	
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Suggested Readings/Reference Books:

1. Vogel, Arthur I: A Test book of Quantitative Inorganic Analysis (Rev. by GH Jeffery and others) 5th Ed. The English Language Book Society of Longman
2. Willard, Hobert H. et. al: Instrumental Methods of Analysis, 7th Ed. Wardsworth Publishing Company, Belmont, California, USA, 1988.
3. Christian, Gary D; Analytical Chemistry, 6th Ed. New York- John Willy, 2004.
4. Harris, Daniel C, Quantitative Chemical Analysis, 3 rd Edition, W.H. Freeman and Company, New York, 2001.
5. Khopkar, S.M. Basic Concepts of Analytical Chemistry New Age, International Publisher, 2009.
6. Koogs, West and Holler, Fundamentals of Analytical Chemistry, 6th Edition, Sauders College Publishing, New York. 1991

SEC-1C: General Laboratory Practices in Life Sciences

Total Credits: 01

Total Contact Hours: 15 Hrs.

Maximum Marks: 50

Learning Objectives of the Course:

The learning objectives of the course are as follows:

- Students will gain an idea of general safety measures in laboratories related to life sciences
- Students will learn to make standard solutions
- Students will have an understanding the principles and precautions of using various instruments/apparatus used in life sciences laboratories

Course Outcomes (COs):

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

- CO1: Describe safety measures in laboratory
- CO2: Explain principles and precautions of instruments/apparatus used in life sciences laboratories
- CO3: Formulate standards of various concentration

ModuleNo.	Topics / actual contents of the syllabus	Contact Hours
I	Good Laboratory Practices <ul style="list-style-type: none">• General safety measures, chemical, physical and biological hazards, Spillage and waste disposal, First-aid measures, general lab etiquettes.• Maintenance of Distillation Apparatus, Washing of Glassware, Washing of Plastic Apparatus, Dry Sterilization, Handling of Pipette, Molecular, Empirical and Formula Weight, planning a solution of a particular molarity, making solutions from hydrated compounds, Measurement of Liquids with Normality/Molarity, Numbers Found on Chemical Bottles, Accuracy and Calibration, SI units, simple biochemical calculations, measurement, report writing	07 Hrs.
II	Principle and Precautions of Instruments/Apparatus <ul style="list-style-type: none">• Principle and precautions of Weighing Balance, Laminar Flow Hood, Autoclave, Centrifuge, pH Meter, Incubator, Hot Air Oven, Compound Microscope, ELISA Reader	08 Hrs.

Suggested Readings/Reference Books:

- 1) Jyoti Saxena , Mamta Baunthiyal and Indu Ravi, Comprehensive Laboratory Manual of Life Sciences, Scientific Publishers, 2020

SEC-1D: Data Analysis using Excel

Total Credits: 01

Total Contact Hours: 15 Hrs.

Maximum Marks: 50

Learning Objectives of the Course:

The learning objectives of the course are as follows:

- Students will gain an idea of data analysis concepts
- Students will learn and analyze the working of Excels for various functions
- Students will have an understanding of visualization and data analysis tools

Course Outcomes (COs):

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

- CO1: Describe safety measures in laboratory
- CO2: Explain principles and precautions of instruments/apparatus used in life sciences laboratories
- CO3: Formulate standards of various concentration

ModuleNo.	Topics / actual contents of the syllabus	Contact Hours
I	Introduction to Data Analysis <ul style="list-style-type: none">• Introduction to data analysis concepts, Excel's interface and its features, data entry, formatting, and basic calculations on the worksheet, introduction to simple Excel functions (SUM, AVERAGE, COUNT, date formats etc.), various forms of storing and excel file, managing worksheets and workbooks, storing workbooks• Importing data from various sources (CSV, text, databases), data cleaning techniques (removing duplicates, handling missing values), Text-to-column and data splitting, data validation, and conditional formatting	07 Hrs.
II	Visualization and Data Analysis tools <ul style="list-style-type: none">• Creating basic charts (bar, line, pie, etc.), customizing charts (label, titles, legends), using advanced chart types (scatter plots, histograms), adding trend lines and data labels, creating dynamic charts with slicers, probability distributions and its graphical representation, pivot tables: creating, modifying and summarizing data,	08 Hrs.

	<p>pivot charts: visualizing pivot table data, introduction to what-if analysis</p> <ul style="list-style-type: none"> • Introduction to basic statistical functions (STDDEV, MIN, MAX), Using Excel's built-in analysis tools (correlation, regression), introduction to power query for data transformation, user-defined formulae, data analysis tool pack, preparation of correlation matrix, fitting multiple regression equation, generating random numbers 	
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Suggested Readings/Reference Books:

1. Manisha Nigam, Data Analysis with Excel, BPB Publications, 2019
2. Paul McFedries, Excel Data Analysis For Dummies, 2022
3. George Mount, Modern Data Analytics in Excel, O'Reilly Media, 2024

SEC-1E: Forensic Photography

Total Credits: 01

Total Contact Hours: 15 Hrs.

Maximum Marks: 50

Learning Objectives of the Course:

The learning objectives of the course are as follows:

- Students will gain an idea of forensic photography
- Students will be able to explain various terms of photography
- Students will be able to perform photography in various forensic setups

Course Outcomes (COs):

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

- CO1: Define fundamentals in economic offences
- CO2: Explain and interpret various offenses
- CO3: Explain forensic accounting

ModuleNo.	Topics / actual contents of the syllabus	Contact Hours
I	Basics of Photography <ul style="list-style-type: none">• Electromagnetic radiation• Image formation through lenses• Analog and digital photography• Analog Camera and its component• Digital camera and sensors• Terms related to photography: aperture, shutter speed, film speed, etc.	07 Hrs.
II	Photography in forensic setup <ul style="list-style-type: none">• Crime Scene Photography: Overall, mid-range and close-up• Evidence photography• Document photography• Photography of evidence on challenging surface	08 Hrs.

Suggested Readings/Reference Books:

1. Nick Marsh, Forensic Photography: A Practitioner's Guide.
2. Keith Mancini, Fundamentals of Forensic Photography: Practical Techniques for Evidence Documentation on Location and in the Laboratory (Applications in Scientific Photography).
3. David R. Redsicker, The Practical Methodology of Forensic Photography (Practical Aspects of Criminal and Forensic Investigations).
4. Edward M. Robinson, Crime Scene Photography.
5. Sanford Weiss, Handbook of Forensic Photography

SEC-1F: Basic Criminal Drafting

Total Credits: 01

Total Contact Hours: 15 Hrs.

Maximum Marks: 50

Learning Objectives of the Course:

The learning objectives of the course are as follows:

- Students will gain an idea of criminal procedure
- Students will be able to explain various terms of criminal procedure
- Students will be able to perform drafting of criminal complaints and other drafting

Course Outcomes (COs):

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

- CO1: Define fundamentals in economic offences
- CO2: Explain and interpret various offenses
- CO3: Explain forensic accounting

ModuleNo.	Topics / actual contents of the syllabus	Contact Hours
I	Introduction to Criminal procedure and Drafting <ul style="list-style-type: none">• Introduction to criminal proceedings, stages of criminal proceedings, hierarchy of criminal courts, compoundable and non-compoundable offenses, cognizable and non-cognizable offences, authorities and role of police in investigation of a case• Introduction of FIR, process to lodge and FIR, format of FIR, role of an advocate in FIR, Search of already registered FIR, Quashing of FIR	07 Hrs.
II	Criminal Complaints and other Drafting <ul style="list-style-type: none">• Introduction to complaints and difference between FIR and Complaints, Applications under Section 125 CrPC, 156 (3) CrPC, 256 and 317 CrPC, Section 12 of Domestic Violence Act• Trial: procedure before court, stages of trial, chargesheet, framing of chargesheet, evidence in trial process: examination, cross-examination, burden of proof	08 Hrs.

Suggested Readings/Reference Books:

1. The Criminal Procedure Code: Takwani
2. The Criminal Procedure Code: Ratanlal and Dhirajlal

SEC-2A: Practical based on SEC-1A (Basic Instrumentation Skills in Physics-I)

Total Credits: 01

Total Contact Hours: 30 Hrs.

Maximum Marks: 50

Learning objectives and outcomes of the course:

This is a laboratory course based on **Basic Instrumentation Skills in Physics-I (SEC-1A)**. The course objectives and outcomes of this laboratory course have been added to the theory course. A minimum of 10 practical has to be covered in the semester for successful completion of the course.

ModuleNo.	List of Practical	Contact Hours
I	<ol style="list-style-type: none">1. To handle multimeter, voltmeter and electronic voltmeter2. To measure the loading effect of a multimeter while measuring voltage across a low resistance and high resistance.3. To observe the limitations of a multimeter for measuring high-frequency voltage and currents.4. To Measure voltage using CRO.5. To Measure frequency using CRO.6. To Measure time-period using CRO.7. To Measure phase angle using CRO.8. Measurement of time period, frequency, average period using universal counter/ frequency counter.9. Measurement of rise, fall, and delay times using a CRO.10. Using a Dual Trace Oscilloscope11. Converting the range of a given measuring instrument (voltmeter, ammeter)12. Any other practical designed by the faculty member based on recent advances/latest trends	30 Hrs.

SEC-2B: Practical based on SEC-1B (Chemical Laboratory Techniques)

Total Credits: 01

Total Contact Hours: 30 Hrs.

Maximum Marks: 50

Learning objectives and outcomes of the course:

This is a laboratory course based on **Chemical Laboratory Techniques (SEC-1B)**. The course objectives and outcomes of this laboratory course have been added to the theory course. A minimum of 10 practical has to be covered in the semester for successful completion of the course.

ModuleNo.	List of Practical	Contact Hours
I	<ol style="list-style-type: none">1. Perform the calibration of volumetric and graduated glassware equipment while providing an explanation of temperature standards.2. Perform thermometer calibration.3. Carry out exploration and investigations of working protocol for various heating equipment in laboratory: Burners, Hot Plates, Electrical Heating Mantles, Electric Oven, Microwave Oven, Muffle Furnace, Infrared lamps, Crucible and Beaker Tongs and Emersion heaters4. Investigate and distinguish various types of water suitable for laboratory applications, including Distilled (Grade I to III), De-ionized, and tap water.5. Perform conductance measurements and other analytical assessments to distinguish between them.6. Distinguish between different types of filter paper and investigate their uses7. Understanding the proper handling and operation of Analytical balances8. Prepare solutions of various concentrations in (i) ppm (ii) ppb (iii) Normal (iv) Molar (v) percentage9. Utilization of a melting point instrument for the experimental determination of the melting points through diverse techniques10. Experimental determination of the boiling point using various methods11. Purification of given solid organic compounds by crystallisation method12. Recrystallization of given non-volatile organic solids	30 Hrs.

	13. Any other practical designed by the faculty member based on recent advances/latest trends	
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**SEC-2C: Practical based on SEC-1C
(General Laboratory Practices in Life Sciences)**

Total Credits: 01

Total Contact Hours: 30 Hrs.

Maximum Marks: 50

Learning objectives and outcomes of the course:

This is a laboratory course based on **General Laboratory Practices in Life Sciences (SEC-1C)**. The course objectives and outcomes of this laboratory course have been added to the theory course. A minimum of 10 practical has to be covered in the semester for successful completion of the course.

ModuleNo.	List of Practical	Contact Hours
I	<ol style="list-style-type: none"> 1) Perform the calibration of volumetric and Preparation of Molar solutions of solid and liquid 2) Preparation of Normal solutions of solid and liquid 3) Preparation of different stains. 4) Sterilization methods. 5) Use of disinfectants. 6) Preparation of SOP for instrument 7) Acid-base titration 8) Calibration of weighing balance, etc. 9) Working in the biosafety cabinet 10) Acid value of fat 11) Micropipette handling 12) Any other practical designed by the faculty member based on recent advances/latest trends 	30 Hrs.

SEC-2D: Practical based on SEC-1D (Data Analysis using Excel)

Total Credits: 01

Total Contact Hours: 30 Hrs.

Maximum Marks: 50

Learning objectives and outcomes of the course:

This is a laboratory course based on **Data Analysis using Excel (SEC-1D)**. The course objectives and outcomes of this laboratory course have been added to the theory course. A minimum of 10 practical has to be covered in the semester for successful completion of the course.

ModuleNo.	List of Practical	Contact Hours
I	<ol style="list-style-type: none">1) Basic operations in Excel and formatting2) Applying basic functions3) Data handling: sorting, creating filters4) Importing data from various sources and data cleaning5) Plotting bar, line and pie charts6) Drawing scatter plot with trend lines7) Finding mean, median and mode of the given data8) Creating pivot table and pivot charts9) Finding standard deviation and plotting mean with standard deviation10) Fitting the line of best fit using the method of least squares11) Using power query for various operations12) Any other practical designed by the faculty member based on recent advances/latest trends	30 Hrs.

SEC-2E: Practical based on SEC-1E (Forensic Photography)

Total Credits: 01

Total Contact Hours: 30 Hrs.

Maximum Marks: 50

Learning objectives and outcomes of the course:

This is a laboratory course based on **Forensic Photography (SEC-1E)**. The course objectives and outcomes of this laboratory course have been added to the theory course. A minimum of 10 practical has to be covered in the semester for successful completion of the course.

ModuleNo.	List of Practical	Contact Hours
I	<ol style="list-style-type: none">1. To perform photography in various optical settings2. To perform photography in various lighting conditions3. To perform crime scene photography4. To perform photography of fingerprints5. To perform photography of other impression evidence (minimum three)6. To perform photography of documents7. To perform oblique light photography8. To perform photography in arson cases9. To perform photography of charred documents10. To perform photography of tool marks11. To perform photography of evidence on challenging surfaces12. Any other practical designed by the faculty member based on recent advances/latest trends	30 Hrs.

SEC-2F: Practical based on SEC-1F (Basic Criminal Drafting)

Total Credits: 01

Total Contact Hours: 30 Hrs.

Maximum Marks: 50

Learning objectives and outcomes of the course:

This is a laboratory course based on **Basic Criminal Drafting (SEC-1F)**. The course objectives and outcomes of this laboratory course have been added to the theory course. A minimum of 10 practical has to be covered in the semester for successful completion of the course.

ModuleNo.	List of Practical	Contact Hours
I	<ol style="list-style-type: none">1. Classify the powers of various courts with illustrations2. Take 10 cases and classify them as (1) cognizable and non-cognizable offenses (2) compoundable and non-compoundable evidence3. Demonstration on how to lodge an FIR online4. Draft a police complaint address to SHO if the police refuse to lodge an FIR5. Draft and file a quashing petition6. Draft an application under Section 156(3) of CrPC7. Draft an application under Section 125 of CrPC8. Draft a complaint under Section 12 of Domestic Violence Act9. Draft applications under Sections 256 and 317 of CrPC10. Draft applications under Parole and Furlough11. Read a chargesheet and summarize the charge framed12. Any other practical designed by the faculty member based on recent advances/latest trends	30 Hrs.

Generic/Open Elective for Other Faculty than Science and Technology (GE/OE)

GE/OE-1: Introduction to Forensic Science		
Total Credits: 02		Total Contact Hours: 30 Hrs.
Maximum Marks: 50		
<p>Learning Objectives of the Course: The learning objectives of the course are as follows:</p> <ul style="list-style-type: none"> • Students will gain an idea of forensic science and its applications • Students will learn and analyze the various crime scenes for their reconstruction • Students will have an understanding of various physical evidence • Students will understand various bloodstain patterns <p>Course Outcomes (COs): After completion of the course, students will be able to:</p> <ul style="list-style-type: none"> • CO1: Define and explain forensic science, the criminal justice system, crime and related organizations of forensic science • CO2: Explain and interpret criminal behavior and its connections with the crime scenario • CO3: Interpret laws and principles of forensic science • CO4: Classify and evaluate crime and its connections with victim and perpetrator • CO5: Analyze various crime scenario and apply it into a case study 		
ModuleNo.	Topics / actual contents of the syllabus	Contact Hours
I	<p>Introduction to Forensic Science</p> <ul style="list-style-type: none"> • Introduction to Forensic Science • Laws and principles of forensic science • Criminal justice system in India • Organizational set-up and functions of police, prosecution, and courts in India • Domains of Forensic Science • Ethics in forensic science 	10 Hrs.

II	<p>Crime and criminal behavior</p> <ul style="list-style-type: none"> • Crime and its elements • Classification of crime • Victim and its classification • Criminal and its classification • Criminology: definition and historical development • Criminal behavior: classical and non-classical theories, biological theories, physiological theories, psychogenic theory, economic theory, geographical theories, sociological and multi-factor theories 	10 Hrs.
III	<p>Organization related to Forensic Science</p> <ul style="list-style-type: none"> • Forensic Science Laboratory in India • Regulatory bodies: Directorate of Forensic Science Services, Bureau of Police Research and Development, National Crime Record Bureau • Intelligence agencies: Intelligence Bureau and Research and Analysis wing • Law enforcement agencies: CID, CBI, NIA, Interpol • Research Organizations: CDFD, CCMB, DRDO • Training Institutions: CDTI, NPA • Drug testing organizations: World/National Anti-doping Agency, National Drug Testing Laboratory 	10 Hrs.
<p>Suggested Readings/Reference Books:</p> <ol style="list-style-type: none"> 1. Richard Saferstien, Forensic Science: From the Crime Scene to the Crime Lab, 4th edition, Pearson, USA. 2. Suzane Bell, Forensic Science: An Introduction to Scientific and Investigative Techniques, Fifth Edition, CRC Press. 3. Max M. Houck and Jay A. Siegel, Fundamental of Forensic Science 4. Richard Saferstein, Handbook of Forensic Science, Volume-I, II and III 5. Forensic Science in Criminal Investigation and Trial, 4th edn.: B.R. Sharma 6. Criminology By Ram Ahuja 		

Semester-II

Detailed Curriculum of Semester-II

Discipline-Specific Core Courses (Major)

DSC-7: Forensic Science-II		
Total Credits: 02 Maximum Marks: 50		Total Contact Hours: 30 Hrs.
<p>Learning Objectives of the Course: The learning objectives of the course are as follows:</p> <ul style="list-style-type: none"> • Students will gain an idea of physical evidence and their forensic examination • Students will learn and analyze the fingerprints and other impressions • Students will get an idea of forensic ballistics and related concepts • Students will have an understanding of way to restore erased numbers <p>Course Outcomes (COs): After completion of the course, students will be able to:</p> <ul style="list-style-type: none"> • CO1: Define and explain physical evidence, fingerprint and impression evidence and forensic ballistics • CO2: Explain and interpret the results of physical evidence like glass, paint, and soil • CO3: Classify and evaluate the fingerprint impressions • CO4: Analyze various pieces of evidence including firearms and ammunition 		
ModuleNo.	Topics / actual contents of the syllabus	Contact Hours
I	<p>Physical evidence and their analysis</p> <ul style="list-style-type: none"> • Classification of physical evidence • Glass: composition, types, and forensic examination • Paint: composition, types, and forensic examination • Soil: composition, types, and forensic examination • Restoration of an erased number 	10 Hrs.

II	<p>Fingerprint and impression evidence</p> <ul style="list-style-type: none"> • Fingerprints: Definition, history, and development, terms related to fingerprint: Type line, core, delta, fingerprint patterns, fingerprint at the crime scene, the composition of sweat, development of fingerprints, comparison of fingerprints • Other impressions: footprint, shoeprint, tire marks, and tool marks: introduction, collection, and preservation, forensic examination 	10 Hrs.
III	<p>Forensic Ballistics</p> <ul style="list-style-type: none"> • Introduction to forensic ballistics and its classification • Firearms: definition, types and working mechanism • Ammunitions: definition, types, nomenclature, composition, and constituents • Estimation of the range of fire • Gun Shot residue and its examination 	10 Hrs.

Suggested Readings/Reference Books:

1. Richard Saferstien, Forensic Science: From the Crime Scene to the Crime Lab, 4th edition, Pearson, USA.
2. Suzane Bell, Forensic Science: An Introduction to Scientific and Investigative Techniques, Fifth Edition, CRC Press.
3. Max M. Houck and Jay A. Siegel, Fundamental of Forensic Science
4. Richard Saferstein, Handbook of Forensic Science, Volume-I, II and III
5. Hatcher, Jury and Weller, Firearm Investigation, Identification and Evidence, Stackpole Books
6. Brain J Heard, Handbook of Firearms and Ballistics, John Willey.
7. Hawthorne, Mark R., Fingerprints: analysis and understanding, CRC Press, 2009.
8. Henry C. Lee and R.E. Gaensslen, Advances in fingerprint technology, Second Edition, CRC Press, 2001.

DSC-8: Practical based on DSC-7 (Forensic Science-II)

Total Credits: 02

Total Contact Hours: 60 Hrs.

Maximum Marks: 50

Learning objectives and outcomes of the course:

This is a laboratory course based on **Forensic Science-II (DSC-7)**. The course objectives and outcomes of this laboratory course have been added to the theory course. A minimum of 10 practical has to be covered in the semester for successful completion of the course.

ModuleNo.	List of Practical	Contact Hours
I	<ol style="list-style-type: none">1. To examine fracture patterns in the glass2. To examine and compare given glass samples based on density3. To examine and compare given glass samples based on refractive indices4. To perform microscopic examination of soil samples5. To examine and compare given soil samples based on density gradient6. To examine and compare given soil samples based on particle size distribution7. To examine and compare given soil samples on ignition8. To perform a microscopic examination of paint samples9. To perform the micro-chemical examination of paint samples10. To examine paint samples under FTIR11. To record fingerprint samples12. To identify given fingerprint patterns13. To perform ridge counting of the given fingerprints14. To perform ridge tracing of the given fingerprints15. To compare the given fingerprint for their origin16. To develop a given latent fingerprint using the powder method17. To develop a given latent fingerprint using the iodine fuming method18. To develop a given latent fingerprint using the ninhydrin method19. To develop a given latent fingerprint using the silver nitrate method20. To develop a given latent fingerprint using DFO21. To examine the given firearms	60 Hrs.

	22. To compare the given bullets 23. To compare the given cartridge cases 24. Any other practical designed by the faculty member based on recent advances/latest trends	
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DSC-9	Allied Forensic Science-II	Credit:02	Contact Hours:30	Marks:50
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As forensic science is an application of natural and applied sciences. The students need to select one of the four options:

SN	Code	Name of the course	Credit	Contact Hours	Marks
1	DSC-9A	Forensic Physics-II	02	30	50
OR					
2	DSC-9B	Forensic Chemistry-II	02	30	50
OR					
3	DSC-9C	Forensic Biology-II	02	30	50
OR					
4	DSC-9D	Digital Forensics-II	02	30	50

DSC-9A: Forensic Physics-II		
Total Credits: 02		Total Contact Hours: 30 Hrs.
Maximum Marks: 50		
Learning Objectives of the Course:		
The learning objectives of the course are as follows:		
<ul style="list-style-type: none"> • Students will gain an idea of the basic concepts of mechanics • Students will learn fluid dynamics • Students will have an understanding of thermodynamics 		
Course Outcomes (COs):		
After completion of the course, students will be able to:		
<ul style="list-style-type: none"> • CO1: Define and explain concepts of mechanics • CO2: Differentiate between various types of engines • CO3: Execute the principles to determine coefficient of viscosity • CO4: Calculate the Young modulus 		
ModuleNo.	Topics / actual contents of the syllabus	Contact Hours
I	Mechanics <ul style="list-style-type: none"> • Interpretation and applications of Newton's laws of motion, Pseudo forces, Speed and velocity • Acceleration: equation of uniformly accelerated motion, speed time graph, equation of motion for freely falling bodies, distance covered by the body in nth second • Collision, Coefficient of restitution 	10 Hrs.

	<ul style="list-style-type: none"> • M.I. of flywheel, bending of beam, bending of moment of beam, Cantilever loaded at the free end, Cantilever supported at its ends and loaded in the middle, Determination of Y by bending of beam 	
II	Fluid Dynamics <ul style="list-style-type: none"> • Streamline and turbulent flow, Viscosity and coefficient of viscosity, Temperature dependence of viscosity, Stoke's law and terminal velocity, Determination of coefficient of viscosity by falling sphere method and Poiseuille's method. 	10 Hrs.
III	Thermodynamics <ul style="list-style-type: none"> • Laws of thermodynamics, Thermodynamic process (reversible and irreversible), Cycles, • Heat engine, Thermal efficiency of heat engines, Carnot's cycle and Carnot's engine, Efficiency of Carnot's cycle, Otto cycle, • Thermodynamic variables, Thermal equilibrium and temperature, • Zeroth law of thermodynamic, Entropy • Two stroke and four stroke engine principle and their comparison, • Types of engines: Petrol, Diesel and CNG 	10 Hrs.

Suggested Readings/Reference Books:

- 1) Engineering Physics Seventh Enlarged Revised Edition 2004 M.N. Avadhanulu and P.G. Kshirsagar, S. Chand and Company Ltd.
- 2) Engineering Physics R.K. Gaur and S.L. Gupta, Dhanpat Rai Publication
- 3) Advanced Crime Scene Photography Christopher D. Duncan, 2010, CRC Press
- 4) Crime Scene Photography, 2010, Elsevier, Edward M. Robinson,
- 5) Perspective of modern Physics by Arthur Beiser
- 6) Atomic and nuclear Physics by Gupta and Ghosh, 2nd Edition
- 7) Introduction to Atomic and Nuclear Physics by H. Semat and Albrought
- 8) Modern Physics by H.E. White New York, NY: McGraw-Hill, 1934
- 9) Heat, Thermodynamics and Statistical Physics; Singhal, Agrawal
- 10) Heat and Thermodynamics; Brijlal, Subramanyam

DSC-9B: Forensic Chemistry-II

Total Credits: 02

Total Contact Hours: 30 Hrs.

Maximum Marks: 50

Learning Objectives of the Course:

The learning objectives of the course are as follows:

- Students will gain an idea of the basic concepts of organic chemistry
- Students will understand spatial arrangement of atoms of organic molecule and types of stereoisomers
- Students will have knowledge of general properties and fundamental reactions of aromatic compounds
- Students will understand the basic knowledge of heterocyclic compounds

Course Outcomes (COs):

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

- CO1: Define and explain concepts of organic chemistry
- CO2: Understand spatial arrangement of atoms of organic molecule and types of stereoisomers
- CO3: Differentiate general properties and fundamental reactions of aromatic compounds
- CO4: Classify heterocyclic compounds

ModuleNo.	Topics / actual contents of the syllabus	Contact Hours
I	Fundamentals of Organic Chemistry <ul style="list-style-type: none">• Introduction, Curved arrow notations, Cleavage of Bonds: Homolysis and Heterolysis. Organic molecular species: Nucleophiles and electrophiles. Electronic Displacements: Inductive Effect, Electrometric Effect, Resonance and Hyper conjugation effect, Reactive Intermediates: Generation, Structure, Stability and Reactions of Carbocations, Carbanions, Carbon free radicals, Carbene and Nitrene.	10 Hrs.
II	Stereochemistry <ul style="list-style-type: none">• Introduction, Types of Stereoisomerism, Representation of organic molecules using Wedge, Fischer, Sawhorse and Newman formula, Optical Isomerism: Concept of Chirality, Elements of Symmetry, Optical Isomerism in tartaric acid, 2, 3 Dihydroxybutanoic acid, Enantiomerism,	10 Hrs.

	Diastereomerism and Meso compounds, Geometrical isomerism in C=C, C=N and alicyclic compounds. Nomenclature of stereoisomers: D and L, Erythro and Threo, R and S, E and Z.	
III	<p>Aromaticity and Heterocyclic Compounds</p> <ul style="list-style-type: none"> • Introduction, Characteristics properties of aromatic compounds, Meaning of terms: Aromatic, Non aromatic, Antiaromatic, Pseudoaromatic, Classification of aromatic compounds, Structure of Benzene: Kekule structure, Resonance structure, M.O. picture, Modern theory of Aromaticity, Mechanism of Electrophilic substitution reactions: Nitration, Sulphonation, Halogenation and Friedel - Crafts reaction. • Introduction, Classification and Nomenclature of heterocyclic compounds. Nitrogen Heterocycles: <ul style="list-style-type: none"> a) Pyrrole: - Introduction, Synthesis, Physical and chemical properties. b) Pyridine: - Introduction, Synthesis, Physical and chemical properties. 	10 Hrs.
<p>Suggested Readings/Reference Books:</p> <ol style="list-style-type: none"> 1) Graham Solomon, T. W., Fryhle, C. B. & Snyder, S. A. Organic Chemistry, John Wiley & Sons (2014). 2) McMurry, J. E. Fundamentals of Organic Chemistry, 7th Ed. Cengage Learning India Pvt Ltd, 2013. 3) Sykes, P. A Guidebook to Mechanism in Organic Chemistry, Orient Longman, New Delhi (1988). 4) Eliel, E. L. Stereochemistry of Carbon Compounds, Tata McGraw Hill education, 2000. 5) Finar, I. L. Organic Chemistry (Vol. I & II), E.L.B.S. 6) Morrison, R. T. & Boyd, R. N. Organic Chemistry, Pearson, 2010. 7) Bahl, A. & Bahl, B. S. Advanced Organic Chemistry, S. Chand, 2010. 8) Nasipuri, D. Stereochemistry of Organic compounds: Principles and Applications. 9) Madan, R. L. Chemistry for Degree Students (B. Sc. First Year), S. Chand Publication. 10) Heterocyclic chemistry, J.A. Joule and K. Mills, 4th ed., Blackwell Publishing 2000 11) John A. Joule, Keith Mills.; Heterocyclic Chemistry, 5th Edition, April 2010, Wiley Blackwell, 12) Gilchrist, T. L. Heterocyclic chemistry; 3rd ed.; Addison Wesley Longman: Edinburgh Gate, 1997. 13) Joule, J. A.; Mills, K.; Heterocyclic chemistry; 4th ed.; Blackwell Science: Oxford, 2000. 		

DSC-9C: Forensic Biology-II

Total Credits: 02

Total Contact Hours: 30 Hrs.

Maximum Marks: 50

Learning Objectives of the Course:

The learning objectives of the course are as follows:

- Students will gain an idea of the basic concepts of the diversity of life forms, procaryotes, eucaryotes, and immunology
- Students will understand the general structure and classification of viruses
- Students will be able to understand immune systems
- Students will get an idea of the cytoskeleton

Course Outcomes (COs):

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

- CO1: Define and explain concepts of procaryotes and eucaryotes
- CO2: Understand the concept of cytoplasm, mitochondria, and cytoskeleton
- CO3: Classify immunity and immune system
- CO4: Analyze the factors influencing antigenicity

ModuleNo.	Topics / actual contents of the syllabus	Contact Hours
I	Diversity of life forms and procaryotes <ul style="list-style-type: none">• Systematics: general scheme, Binomial nomenclature. Plant, animal and microbial diversity,• Carl Woese 16S-rRNA classification.• Prokaryotic cell structure: cell wall, slime layer, cell membrane, flagella, cytoplasmic content, plasmids.• General structure and classification of viruses. Lytic and lysogenic life cycle.	10 Hrs.
II	Eucaryotes <ul style="list-style-type: none">• Cell Theory, Ultrastructure of a typical eukaryotic cell• Plasma membrane: chemical composition, fluid-mosaic model, functions of the plasma membrane, transport across the membrane.• Composition of cytoplasm, Cell organelles: Nucleus, ER, Golgi apparatus, Ribosomes,	10 Hrs.

	<ul style="list-style-type: none"> • Mitochondria, Chloroplasts, Lysosomes, peroxisomes • Cytoskeleton: Microfilaments, Intermediate filaments and Microtubules 	
III	<p>Immunology</p> <ul style="list-style-type: none"> • Immunity: Definition, types- natural, acquired, active, passive. • Antigens-Definition, properties, antigenic determinants, incomplete antigen, adjuvants, factors influencing antigenicity. • Antibody-Definition, structure, types, properties and functions of Immunoglobulin, • Immune system: - Organs (Primary and secondary lymphoid organs) and cells (T and B cells) 	10 Hrs.
<p>Suggested Readings/Reference Books:</p> <ol style="list-style-type: none"> 1. Edward O. Wilson, Diversity of Life, Penguin Books Ltd, 2001 2. David Freifelder, Molecular Biology: A Comprehensive Introduction to Prokaryotes and Eukaryotes, ones and Bartlett Publishers, Inc, 1983 3. Leslie Favor, Eukaryotic and Prokaryotic Cell Structures, The Rosen Publishing Group, 2004 4. Abul K. Abbas MBBS and Andrew H. Lichtman, Basic Immunology: Functions and Disorders of the Immune System, 2019. 		

DSC-9D: Digital Forensics-II

Total Credits: 02

Total Contact Hours: 30 Hrs.

Maximum Marks: 50

Learning Objectives of the Course:

The learning objectives of the course are as follows:

- Students will gain a basic idea of C-programming
- Students will understand functions and pointers in C programming
- Students will be able to perform string, structure and file handling in C programming

Course Outcomes (COs):

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

- CO1: Define and explain concepts of C-programming
- CO2: Understand the operators and control structure
- CO3: Apply functions and pointers of C-programming
- CO4: Apply structure, string and file handling of C-programming

ModuleNo.	Topics / actual contents of the syllabus	Contact Hours
I	Introduction to C Programming <ul style="list-style-type: none">• Problem-solving using computers: Algorithms and Flowcharts History, Structure of a C program, Functions as building blocks , Tokens Keywords, Identifiers, Variables, Constants ,Types of Data types• Operators and Expressions Operator types (arithmetic, relational, logical, assignment, bitwise, conditional, other operators), precedence and associativity rules. Input output functions,• Control structure: Branching (if, if else, switch), Looping (for, do-while, while)	10 Hrs.
II	Functions and pointers <ul style="list-style-type: none">• Function: What is a function, Advantages of Functions, Standard library functions• User defined functions: Declaration, definition, function call, parameter passing (by value), return keyword, Scope of variables, storage classes, Recursion,• An Introduction to Pointers, Pointer Notation, Call by Reference.	10 Hrs.

	<ul style="list-style-type: none"> • Arrays: Array declaration, initialization, Types – one, two and multidimensional, Passing arrays to functions. 	
III	<p>String, structure, and file handling</p> <ul style="list-style-type: none"> • String: What are Strings, More about Strings, pointers, and strings, standard library string functions: strlen(), strcpy(), strcat(), strcmp(), Two-Dimensional Array of Characters, Array of Pointers to Strings • Structures: Why to use Structures, declaring a Structure, Accessing Structure Elements, How Structure Elements are Stored • File handling: Data Organization, file operations, opening a file, reading from a file, trouble in opening a file, closing the file, counting characters, tabs, spaces, a file-copy program, writing to a file, file opening modes, string (line) I/O in files 	10 Hrs.
<p>Suggested Readings/Reference Books:</p> <ol style="list-style-type: none"> 1) Let Us C, Fifth edition Yashavant P. Kanetkar. 2) Programing in ANSI C , E- Balagurusamy 		

DSC-10	Practical based on DSC-9	Credit:02	Contact Hours:60	Marks:50
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The students need to select one of the four options as per their selection of theory courses:

SN	Code	Name of the course	Credit	Contact Hours	Marks
1	DSC-10A	Practical based on DSC-9A	02	60	50
OR					
2	DSC-10B	Practical based on DSC-9B	02	60	50
OR					
3	DSC-10C	Practical based on DSC-9C	02	60	50
OR					
4	DSC-10D	Practical based on DSC-9D	02	60	50

DSC-10A: Practical based on DSC-9A (Forensic Physics-II)		
Total Credits: 02		Total Contact Hours: 60 Hrs.
Maximum Marks: 50		
Learning objectives and outcomes of the course:		
This is a laboratory course based on Forensic Physics-II (DSC-9A) . The course objectives and outcomes of this laboratory course have been added to the theory course. A minimum of 10 practicals has to be covered in the semester for successful completion of the course.		
ModuleNo.	List of Practical	Contact Hours
I	<ol style="list-style-type: none"> 1. To determine the Coefficient of Linear Expansion of Metals. 2. To determination of the specific heat of a metal by the method of mixtures 3. To calibrate and determine the temperature of body using thermocouple (K-type and R-type). 4. Calibration of thermometers and pressure gauges. 5. To Study the 2-stroke Petrol Engine. 6. To Study the 4-stroke Petrol Engine. 7. To Study the 4-stroke Diesel Engines 8. Determination of the moment of Inertia of the flywheel 9. Sample calculations- application of collision theory to accidental cases 	60 Hrs.

	<ol style="list-style-type: none">10. Sample calculations- velocity of freely falling bodies in air and ponds11. Determination of Young's Modulus by bending of beam.12. Determination of coefficient of viscosity by Poiseuille's method.13. Demonstration of terminal velocity and coefficient of viscosity by falling sphere.14. Any other practical designed by the faculty member based on recent advances/latest trends	
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DSC-10B: Practical based on DSC-9B (Forensic Chemistry-II)

Total Credits: 02

Total Contact Hours: 60 Hrs.

Maximum Marks: 50

Learning objectives and outcomes of the course:

This is a laboratory course based on **Forensic Chemistry-II (DSC-9B)**. The course objectives and outcomes of this laboratory course have been added to the theory course. A minimum of 10 practicals has to be covered in the semester for successful completion of the course.

ModuleNo.	List of Practical	Contact Hours
I	<ol style="list-style-type: none">1) Estimations (minimum four):<ol style="list-style-type: none">a. Estimation of Aniline. (by Bromination method)b. Estimation of Phenolc. Estimation of Acetamide.d. Estimation of Glucosee. Estimation of Aspirin tablet.2) Organic Qualitative Analysis: Detection of physical constant, type, elements, functional group, and Confirmatory test. Identification of Organic Compounds (at least eight) (four containing at least one extra element- N, S, Cl) [Minimum one from each group]<ol style="list-style-type: none">a. Acids: Oxalic acid, Benzoic acid, Cinnamic acidb. Phenols: Beta-Naphthol, p-Nitrophenolc. Base: Aniline, p-Nitroanilined. Neutral: Acetone, Acetanilide, Chloroform, m-Dinitrobenzene, Thiourea, Bromobenzene3) Purification of organic compounds by crystallization (from water and alcohol) and distillation.4) Any other practical designed by the faculty member based on recent advances/latest trends	60 Hrs.

DSC-10C: Practical based on DSC-9C (Forensic Biology-II)

Total Credits: 02

Total Contact Hours: 60 Hrs.

Maximum Marks: 50

Learning objectives and outcomes of the course:

This is a laboratory course based on **Forensic Biology-II (DSC-9C)**. The course objectives and outcomes of this laboratory course have been added to the theory course. A minimum of 10 practicals has to be covered in the semester for successful completion of the course.

ModuleNo.	List of Practical	Contact Hours
I	<ol style="list-style-type: none">1. Study of plant-materials2. Study of microscope and its parts3. Study of conducting tissue, xylem, and phloem elements in angiosperms and Gymnosperms as seen in L.S. and T. S from monocot and dicot root and stem4. Microscopic study of Mitosis5. Microscopic study of Meiosis6. Microscopic study of cell organelles7. Identification of parts of flower and isolation along with identification of pollen grain8. Determination of GOD /POD activity in serum/plasma9. To study the cytochemical distribution of nucleic acids and mucopolysaccharides within cells/tissues from permanent slides10. Detection of HCG by latex agglutination inhibition test.11. Haemagglutination tests for identification of human blood groups12. Any other practical designed by the faculty member based on recent advances/ latest trends	60 Hrs.

DSC-10D: Practical based on DSC-9D (Digital Forensics-II)

Total Credits: 02

Total Contact Hours: 60 Hrs.

Maximum Marks: 50

Learning objectives and outcomes of the course:

This is a laboratory course based on **Digital Forensics-II (DSC-9D)**. The course objectives and outcomes of this laboratory course have been added to the theory course. A minimum of 10 practicals has to be covered in the semester for successful completion of the course.

ModuleNo.	List of Practical	Contact Hours
I	<ol style="list-style-type: none">1. C Programming for Basic program2. C programming for Variable and Mathematical Operations3. C programming for simple Condition4. C programming for Compound condition5. C programming for Loop (For, While, do-while)6. C programming on array7. C programming on Functions8. C programming on Structures9. C Programming on Pointer10. C programming on File handing11. Any other practical designed by the faculty member based on recent advances/ latest trends	60 Hrs.

DSC-11: Forensic Psychology-II

Total Credits: 02

Total Contact Hours: 30 Hrs.

Maximum Marks: 50

Learning Objectives of the Course:

The learning objectives of the course are as follows:

- Students will gain an idea of psychology
- Students will learn and analyze the concepts of learning and memory
- Students will have an understanding of motivation and emotion
- Students will understand various aspects of personality

Course Outcomes (COs):

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

- CO1: Define various concepts of learning and memory
- CO2: Explain concepts of motivation and emotion
- CO3: Explain various aspects of personality
- CO4: Apply various approaches for testing of personality

ModuleNo.	Topics / actual contents of the syllabus	Contact Hours
I	<p>Learning and Memory</p> <ul style="list-style-type: none">• Learning: Definition of Learning, Types of Learning, Theories of Learning-Classical Conditioning, Operant Conditioning, Trial-Error Learning, Insight Learning, Cognitive Learning Theory-Tolman's Latent Learning, Bandura's Observation Learning Theory.• Definition of Memory, Memory process, Models of Memory-Level Processing Model, Parallel Distribution Processing Model, Information Processing Model sensory memory, short-term Memory and long-term memory, Retrieval Cues, Forgetting, Forgetting Curve, Causes of Forgetting.	10 Hrs.

II	<p>Motivation and Emotion</p> <ul style="list-style-type: none"> • Motivation: Definition of Motivation, Types of Motives, Approaches of Motivation-instinct approach, drive-reduction approach, arousal approach, incentive approach, Humanistic approach; Maslow's hierarchy of needs, Frustration and Conflicts. • Emotion: Definition of Emotion, Elements of Emotion, Theories of Emotion- James- Lange's theory, Cannon-Bard's theory, Schachter-Singer's theory. 	10 Hrs.
III	<p>Personality</p> <ul style="list-style-type: none"> • Definition of Personality, Theories of Personality- Psychoanalytic Theory- Sigmund Freud, Jung and Adler, Behavioural Model, Social Cognitive model-Bandura's reciprocal determinism and self-efficacy, Humanistic Model-Carl Roger and self-concept, Trait theories of Personality- Allport's Theory, Cattell's Theory, The Big Five Model, Biological Model, Assessment of Personality. 	10 Hrs.
<p>Suggested Readings/Reference Books:</p> <ol style="list-style-type: none"> 1. Psychology, (2006) Ciccarelli, S. K. & Meyer G. E. New Delhi; Perason Education 2. Introduction to Psychology, (1986) Morgan C.T., King R.A., Weisz J.R., Schopler J., McGraw-Hill Book Co. 3. Principles of General Psychology, 3rd ed. Kimble G.A., Garnezy, , New York. 4. Psychology, (2001), Baran R.A. New Delhi; Person Education Pvt.Ltd. 5. Cognitive Psychology Mind and Brain', Edward E. Smith, Stephen M. Kosslyn, New Delhi, Pearson Education. 6. Introduction to Psychology, Parameswaran, E.G., BeenaC.Tata McGraw-Hil, New Delhi. 7. Manashatra-EkParichay, (2004), Dr. PadhyeV.S.Aurangabad; RenukaPrakashan. 8. Psychology-An Introduction, Thakkar P., Dr. Ambekar A., 		

DSC-12: Practical based on DSC-11 (Forensic Psychology-II)

Total Credits: 02

Total Contact Hours: 60 Hrs.

Maximum Marks: 50

Learning objectives and outcomes of the course:

This is a laboratory course based on **Forensic Psychology-II (DSC-11)**. The course objectives and outcomes of this laboratory course have been added to the theory course. A minimum of 10 practical has to be covered in the semester for successful completion of the course.

ModuleNo.	List of Practical	Contact Hours
I	<ol style="list-style-type: none">1. Mental health inventory2. Recall-Recognition3. Bilateral Transfer4. Maze learning5. Span of Attention6. IPAT anxiety scale7. Type A/B behavior patterns- Upinder Dhar& Jain8. Sinha's Comprehensive Anxiety Test – A.K.P. Sinha & L.N.K. Sinha9. Facial expression10. Illusion (Muller-Lyre)11. Psychological analysis of personality (any character from book)12. Self-expression inventory13. Mental health battery14. Mobile phone addiction test15. Assertiveness inventory16. Any other practical designed by the faculty member based on recent advances/ latest trends	60 Hrs.

Vocational Skill Courses (VSC)

VSC-1A: Basic Instrumentation Skill in Physics-II		
Total Credits: 01		Total Contact Hours: 15 Hrs.
Maximum Marks: 50		
<p>Learning Objectives of the Course: The learning objectives of the course are as follows:</p> <ul style="list-style-type: none"> • Students will gain an idea to analyze the physics of the operation of sensors and their interfaces to analog and digital electronic circuits electronic circuits, and the systems that enable it. • Students will learn the principles and workings of digital instruments • Students will have an understanding of the principles and workings of digital multimeter <p>Course Outcomes (COs): After completion of the course, students will be able to:</p> <ul style="list-style-type: none"> • CO1: Explain various concepts of signal generators and analysis instruments • CO2: Explain the principles and workings of digital instruments • CO3: Apply Q meter for measurements of Q 		
ModuleNo.	Topics / actual contents of the syllabus	Contact Hours
I	<p>Signal Generators and Analysis Instruments</p> <ul style="list-style-type: none"> • Signal Generators and Analysis Instruments: Block diagram, explanation and specifications of low frequency signal generators. pulse generator, and function generator. Brief idea for testing, specifications. Distortion factor meter, wave analysis. • Impedance Bridges & Q-Meters: Block diagram of bridge. working principles of basic (balancing type) RLC bridge. Specifications of RLC bridge. Block diagram & working principles of a Q-Meter. Digital LCR bridges. 	07 Hrs.
II	<p>Digital Instruments</p> <ul style="list-style-type: none"> • Digital Instruments: Principle and working of digital meters. Comparison of analog and digital instruments. Characteristics of a digital meter. Working principles of digital voltmeter. • Digital Multimeter: Block diagram and working of a digital multimeter. Working principle of time interval, frequency, and period measurement 	08 Hrs.

	using universal counter/ frequency counter, time-based stability, accuracy, and resolution.	
Suggested Readings/Reference Books:		
<ol style="list-style-type: none">1. A text book in Electrical Technology - B L Theraja - S Chand and Co.2. Performance and design of AC machines - M G Say ELBS Edn.3. Digital Circuits and systems, Venugopal, 2011, Tata McGraw Hill.4. Logic circuit design, Shimon P. Vingron, 2012, Springer.5. Digital Electronics, Subrata Ghoshal, 2012, Cengage Learning.6. Electronic Devices and circuits, S. Salivahanan & N. S.Kumar, 3rd Ed., 2012, Tata Mc-Graw Hill7. Electronic circuits: Handbook of design and applications, U.Tietze, Ch.Schenk, 2008, Springer8. Electronic Devices, 7/e Thomas L. Floyd, 2008, Pearson India		

VSC-1B: Chemical and Laboratory Safety

Total Credits: 01

Total Contact Hours: 15 Hrs.

Maximum Marks: 50

Learning Objectives of the Course:

The learning objectives of the course are as follows:

- Students will gain an idea of good laboratory practice
- Students will learn and handle chemicals and instruments
- Students will have an understanding of various hazards

Course Outcomes (COs):

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

- CO1: Explain good laboratory practices
- CO2: Differentiate various chemical and other hazards
- CO3: Execute various guidelines in cases of hazards

ModuleNo.	Topics / actual contents of the syllabus	Contact Hours
I	Introduction to Chemical and Laboratory Safety <ul style="list-style-type: none">• Introduction to Good laboratory practice (GLP) History, Scope, fundamental Points of GLP, Four Principles of safety-RAMP, The Student Safety Ethics, Safety rules, Role as a Student• Chemical Hazards: corrosive acids, bases, gases, oxidizers, flammables, fire triangle, water reactive compounds, pyrophoric chemicals and reactions, peroxides, cryogens.• Radiation Hazards: ionizing, nonionizing radiations and electric and magnetic field.• Biological Hazards: hazards of biological agents and some general approaches to prevent exposures.• Electrical Hazards: electric shock and burns from contact with live parts, explosion• Fire-fighting in Chemical Lab: Fire Safety in Chemical Lab, Classification and Use of Fire Extinguishers, Introduction of Fire-fighting Equipment and Fire Safety Symbols)• Responses: chemical spills (acids, bases and other chemicals) and fire, classes of fires and types of fire extinguishers. First aid in chemical lab, emergency safety equipment	07 Hrs.

II	<p>Handling Chemicals/instruments and Minimizing Hazards in Laboratory</p> <ul style="list-style-type: none"> • Introduction to handling hazardous chemical waste, storing flammable and corrosive liquids, maintaining a safe and secure laboratory, managing chemicals in the laboratory. • Safety measures for common laboratory operations. Managing risk- decision about safety, eye and face, skin protection- clothes, gloves and tools, chemical hoods, contamination and ventilation, safety measures for common laboratory operations, radiation, laser and biological safety cabinets. Lab waste management. Instruments handling: Heating Devices and thermal safety, Ovens, Hot plates, heating mantles, Oil, salt and sand baths, High pressure vessels, vacuum pumps, rotary evaporators, refrigerators and freezers. 	08 Hrs.
<p>Suggested Readings/Reference Books:</p> <ol style="list-style-type: none"> 1) Laboratory safety for Chemistry students, second edition, Robert H. Hill, Jr. David C. Finster, John Wiley & Sons. 2) Handbook of Good laboratory practice (GLP), UNDP/World Bank/WHO Special Program for Research and Training in Tropical Diseases (TDR) https://fetc.who.int/publications/i/item/handbook-good-laboratory-practice-%28-glp%29 3) Solid Waste Management, Principles and Practice, Ramesha Chandrappa, Diganta Bhusan Das, Springer. 4) Production-Integrated Environmental Protection and Waste Management in the Chemical Industry, Claus Christ, WILEY-VCH. 5) Laboratory safety Handbook, FENS Laboratory safety Team, 1st edition 2016. https://fens.sabanciuniv.edu/sites/fens.sabanciuniv.edu/files/2021-08/labsafety_web.pdf 6) Fundamentals of Industrial Safety and Health Dr. K.U. Mistry, Siddharth Prakashan. 7) Hazardous waste management rules-2016, 1st edition, Ministry of environment, forest & climate change, govt. of India 		

VSC-1C: Laboratory Techniques in Life Sciences

Total Credits: 01

Total Contact Hours: 15 Hrs.

Maximum Marks: 50

Learning Objectives of the Course:

The learning objectives of the course are as follows:

- Students will gain an idea of compound microscope and its component
- Students will learn staining techniques
- Students will have an understanding of pH and Buffers

Course Outcomes (COs):

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

- CO1: Describe compound microscope and its component
- CO2: Explain different staining techniques
- CO3: Formulate buffer solutions of various pH

ModuleNo.	Topics / actual contents of the syllabus	Contact Hours
I	Staining Techniques <ul style="list-style-type: none">• Principle and working of compound microscope, parts of compound microscope, magnification power and resolution power. Stains and dyes, Microbial staining techniques, plant specimen• Preparation of Bacterial Smear and Fixation, simple Staining of Bacteria, Negative Staining of Bacteria, Gram Staining of Bacteria, Acid-fast Staining, Endospore Staining, Capsule Staining to Detect the Capsule or Slime Layer in Bacteria, Flagella Staining, To Test the Viability of Bacteria by Staining, Staining of Fungi, Staining of Arbuscular Mycorrhiza (AM)	07 Hrs.
II	pH and Buffer <ul style="list-style-type: none">• Acid, base, dissociation of water, weak acid and bases Principles and procedures of determination of pH, buffers, pH and life, pKa, Henderson-Hasselbach equation, buffer capacity, buffering capacity of amino acids	08 Hrs.

Suggested Readings/Reference Books:

- 1) Jyoti Saxena , Mamta Baunthiyal and Indu Ravi, Comprehensive Laboratory Manual of Life Sciences, Scientific Publishers, 2020

VSC-1D: HTML Programming

Total Credits: 01

Total Contact Hours: 15 Hrs.

Maximum Marks: 50

Learning Objectives of the Course:

The learning objectives of the course are as follows:

- Students will gain an idea of basics of HTML Programming
- Students will able to create HTML Pages with various links
- Students will able to create HTML Pages with table, images and other kind of inputs

Course Outcomes (COs):

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

- CO1: Describe terms related to HTML Programming
- CO2: Create HTML Pages with various links
- CO3: Create HTML Pages with table, images and other kind of inputs

ModuleNo.	Topics / actual contents of the syllabus	Contact Hours
I	HTML Programming-I <ul style="list-style-type: none">• Introduction, The Basics: The Head, the Body, Colors, Attributes, Lists, ordered and unordered• Links: Introduction, Relative Links, Absolute Links, Link Attributes, Using the ID Attribute to Link Within a Document• Images: Putting an Image on a Page, Using Images as Links, Putting an Image in the Background	07 Hrs.
II	HTML Programming-II <ul style="list-style-type: none">• Tables: Creating a Table, Table Headers, Captions, Spanning Multiple Columns, Styling Table• Forms: Basic Input and Attributes, Other Kinds of Inputs, Styling forms with CSS, Where to Go From Here	08 Hrs.

Suggested Readings/Reference Books:

1. Introduction to HTML and CSS -- O'Reilly, 2010
2. Jon Duckett, HTML and CSS, John Wiley, 2012

VSC-1E: Blood Pattern Analysis

Total Credits: 01
Maximum Marks: 50

Total Contact Hours: 15 Hrs.

Learning Objectives of the Course:

The learning objectives of the course are as follows:

- Students will gain an idea of various terms related to bloodstains
- Students will be able to explain the mechanism of bloodstain formation
- Students will be able to determine parameters related to bloodstain patterns

Course Outcomes (COs):

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

- CO1: Describe terms related to HTML Programming
- CO2: Create HTML Pages with various links
- CO3: Create HTML Pages with table, images and other kind of inputs

ModuleNo.	Topics / actual contents of the syllabus	Contact Hours
I	Introduction <ul style="list-style-type: none">• Introduction and objectives of Blood Pattern Analysis (BPA)• History of BPA• Classification of Bloodstains and bloodstain pattern• Biological and Physical properties of human blood• Determination of the angle of impact	07 Hrs.
II	Dynamics of BPA <ul style="list-style-type: none">• Impact of height and surface on the shape and size of bloodstains• Spatter associated with secondary and projection mechanism• Altered bloodstain patterns• Determination of area of convergence and area of origin• Detection and Enhancement of latent bloodstains	08 Hrs.

Suggested Readings/Reference Books:

1. Stuart H. James, Paul E. Kish, T. Paulette Sutton, Principles of Bloodstain Pattern Analysis: Theory and Practice, CRC Press
2. Tom Bevel and Ross M. Gardner, Bloodstain pattern analysis with an introduction to crime scene reconstruction, CRC Press.

VSC-1F: Intellectual Property Right

Total Credits: 01

Total Contact Hours: 15 Hrs.

Maximum Marks: 50

Learning Objectives of the Course:

The learning objectives of the course are as follows:

- Students will gain an idea of IPR
- Students will able to explain the concepts of patent
- Students will able to draft the patent

Course Outcomes (COs):

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

- CO1: Define terms related to IPR
- CO2: Explain the mechanism of patenting
- CO3: Implement patent drafting mechanism

ModuleNo.	Topics / actual contents of the syllabus	Contact Hours
I	<p>Introduction and need for IPR</p> <ul style="list-style-type: none"> • Intellectual property: Definition • Types of Intellectual Property Rights: Patent, Copyright, Trade Mark, Design, Geographical Indication, Plant Varieties and Layout Design – Genetic Resources and Traditional Knowledge– Trade Secrets • IPR in India: Genesis and development • IPR in abroad - Major International Instruments concerning Intellectual Property Rights: Paris Convention, 1883, the Berne Convention, 1886, the Universal Copyright Convention, 1952, the WIPO Convention, 1967, the Patent Co-operation Treaty, 1970, the TRIPS Agreement, 1994 	07 Hrs.
II	<p>Patents and Patent Filing</p> <ul style="list-style-type: none"> • Patents - Elements of Patentability: Novelty, Non-Obviousness (Inventive Steps) • Industrial Application - Non - Patentable Subject Matter – Registration Procedure, Rights and Duties of Patentee, Assignment and license, Restoration of lapsed Patents, Surrender and Revocation of Patents • Patent Infringement, Remedies & Penalties – Patent Office and Appellate Board. • Patent/Prior art search: Types and tools of patent search 	08 Hrs.

	<ul style="list-style-type: none"> • Patent drafting: Elements in patent drafting 	
<p>Suggested Readings/Reference Books:</p> <ol style="list-style-type: none"> 1) B.L. Wadera, Patents, trademarks, copyright, Designs and Geographical Judications. 2) P. Narayanan (Eastern Law House), Intellectual Property Law. 3) Nithyananda, K V. (2019). Intellectual Property Rights: Protection and Management. India, IN: Cengage Learning India Private Limited. 4) Neeraj, P., & Khusdeep, D. (2014). Intellectual Property Rights. India, IN: PHI learning Private Limited. 5) Ahuja, V K. (2017). Law relating to Intellectual Property Rights. India, IN: Lexis Nexis. 		

VSC-2A: Practical based on VSC-1A (Basic Instrumentation Skill in Physics-II)
 Total Credits: 01 Total Contact Hours: 30 Hrs.
 Maximum Marks: 50

Learning objectives and outcomes of the course:

This is a laboratory course based on **Basic Instrumentation Skill in Physics-II (VSC-1A)**. The course objectives and outcomes of this laboratory course have been added to the theory course. A minimum of 10 practical has to be covered in the semester for successful completion of the course.

ModuleNo.	List of Practical	Contact Hours
I	<ol style="list-style-type: none"> 1. To perform troubleshooting a circuit. 2. To perform balancing of bridges 3. To measure Q of a coil and its frequency dependence, using a Q- meter. 4. Measurement of time period, frequency, average period using universal counter/ frequency counter. 5. Measurement of distortion of a RF signal generator using a distortion factor meter. 6. Measurement of R, L and C using a LCR bridge/ universal bridge. 7. To perform circuit tracing of Laboratory electronic equipment. 8. To use a digital multimeter/VTVM for measuring voltages. 9. To perform circuit tracing of laboratory electronic equipment. 10. To perform winding a coil / transformer. 11. To study the layout of receiver circuit. 12. Any other practical designed by the faculty member based on recent advances/latest trends 	30 Hrs.

VSC-2B: Practical based on VSC-1B (Chemical and Laboratory Safety)

Total Credits: 01

Total Contact Hours: 30 Hrs.

Maximum Marks: 50

Learning objectives and outcomes of the course:

This is a laboratory course based on **Chemical and Laboratory Safety (VSC-1B)**. The course objectives and outcomes of this laboratory course have been added to the theory course. A minimum of 10 practical has to be covered in the semester for successful completion of the course.

ModuleNo.	List of Practical	Contact Hours
I	<ol style="list-style-type: none">1. (a) Identify and list the Incompatible Chemicals from a given set of chemicals available in the laboratory, b) Carry out preparation of the indicative MSDS (Material Safety Data Sheet) of given set of chemicals as per Standard MSDS format c) Carry out Classification and labelling of the given set of chemicals based upon the Globally Harmonized System.2. Demonstration of fire extinguisher, fuming hood and First aid box (any two).3. Preparation of solutions and Standardization of solutions (any two).4. Purification of Binary organic liquid mixture (one volatile and one non-volatile liquid).5. Calibration of pH meter & measurement of pH of solutions of different concentrations.6. Calibration of conductometer & measurement of conductivity of solutions of different concentrations.7. Estimation of Hardness of Water by EDTA Method8. Determination of chloride concentration in a sample of water9. Determination of Saponification value of oil.10. Perform the crystallization of organic solids (two examples)11. Determination of equivalent weight of Mg by eudiometer.12. Green Chemistry experiments (any one)13. Any other practical designed by the faculty member based on recent advances/latest trends	30 Hrs.

VSC-2C: Practical based on VSC-1C (Chemical and Laboratory Safety)

Total Credits: 01

Total Contact Hours: 30 Hrs.

Maximum Marks: 50

Learning objectives and outcomes of the course:

This is a laboratory course based on **Laboratory Techniques in Life Sciences (VSC-1C)**. The course objectives and outcomes of this laboratory course have been added to the theory course. A minimum of 10 practical has to be covered in the semester for successful completion of the course.

ModuleNo.	List of Practical	Contact Hours
I	<ol style="list-style-type: none">1. Handling of microscope2. Monochrome staining3. Plant specimen staining4. Fungal staining5. Simple staining of bacteria6. Negative staining of bacteria7. Staining of Arbuscular Mycorrhiza (AM)8. Use of pH paper9. Use of pH meter10. Determination of isoelectric point11. Preparation of buffers (Minimum Two)12. pKa determination13. Titration curve of amino acid14. Any other practical designed by the faculty member based on recent advances/latest trends	30 Hrs.

VSC-2D: Practical based on VSC-1D (HTML Programming)

Total Credits: 01

Total Contact Hours: 30 Hrs.

Maximum Marks: 50

Learning objectives and outcomes of the course:

This is a laboratory course based on **HTML Programming (VSC-1D)**. The course objectives and outcomes of this laboratory course have been added to the theory course. A minimum of 10 practical has to be covered in the semester for successful completion of the course.

ModuleNo.	List of Practical	Contact Hours
I	<ol style="list-style-type: none"> 1. Create an HTML document with the following formatting options (minimum two): <ol style="list-style-type: none"> a) Bold b) Italic c) Underline d) Headings (Using H1 to H6 heading styles) e) Font (Type, Size and Color) f) Background (Colored background/Image in background) g) Paragraph h) Line Break i) Horizontal Rule j) Pre-tag 2. Create an HTML document which consists of (Minimum Two Combinations): <ol style="list-style-type: none"> a) Ordered List b) Unordered List c) Nested List d) Image 3. Create an HTML document which implements Internal linking as well as External linking. 4. Create a table using HTML which consists of columns for Roll No., Student's name and grade. 5. Create a table using HTML which consists of three rows and three columns, insert image in the box of third row and third column. 6. Create a form using HTML which has the following types of controls (Minimum Two combinations): <ol style="list-style-type: none"> a) Text Box b) Option/radio buttons c) Check boxes d) Reset and Submit buttons 	30 Hrs.

	<ol style="list-style-type: none">7. Create HTML documents having multiple frames (Minimum Two Combinations)8. Any other practical designed by the faculty member based on recent advances/latest trends	
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VSC-2E: Practical based on VSC-1E (Blood Pattern Analysis)

Total Credits: 01

Total Contact Hours: 30 Hrs.

Maximum Marks: 50

Learning objectives and outcomes of the course:

This is a laboratory course based on **Blood Pattern Analysis (VSC-1E)**. The course objectives and outcomes of this laboratory course have been added to the theory course. A minimum of 10 practical has to be covered in the semester for successful completion of the course.

ModuleNo.	List of Practical	Contact Hours
I	<ol style="list-style-type: none">1. To document bloodstain patterns2. To collect sample from bloodstain patterns3. To determine the origin of the blood4. To classify the bloodstain patterns5. To determine angle of impact from the bloodstain6. To study influence of angle on formation of bloodstain pattern7. To study influence of height on formation of bloodstain pattern8. To study influence of surface on formation of bloodstain pattern9. To study influence of volume on formation of bloodstain pattern10. To study influence of time on bloodstain patterns11. To study influence of temperature on bloodstain patterns12. To study influence of humidity on bloodstain patterns13. To determine area of convergence and area of origin14. To study bloodstain pattern using computer software program like Hemospat or BackTrack15. Any other practical designed by the faculty member based on recent advances/latest trends	30 Hrs.

VSC-2F: Practical based on VSC-1F (Intellectual Property Rights)

Total Credits: 01

Total Contact Hours: 30 Hrs.

Maximum Marks: 50

Learning objectives and outcomes of the course:

This is a laboratory course based on **Intellectual Property Rights (VSC-1F)**. The course objectives and outcomes of this laboratory course have been added to the theory course. A minimum of 10 practical has to be covered in the semester for successful completion of the course.

ModuleNo.	List of Practical	Contact Hours
I	<ol style="list-style-type: none">1. To classify the intellect work/patentable work in various IPR2. To perform detailed study on Paris Convention, 18833. To perform detailed study on Berne Convention, 18864. To perform detailed study on the Universal Copyright Convention, 19525. To perform detailed study on the WIPO Convention, 19676. To perform detailed study on the Patent Co-operation Treaty, 19707. To perform detailed study on the TRIPS Agreement, 19948. To study the registration process of Patentable Subject Matter in India9. To study the registration process of Patentable Subject Matter in the USA10. To study the tools for patent search11. To perform case study on Restoration of lapsed Patents12. To perform case study on Patent Infringement13. To perform case study on surrender and revocation of Patents14. To perform case study on Rights and Duties of Patentee15. To study the elements of patent drafting16. Any other practical designed by the faculty member based on recent advances/latest trends	30 Hrs.

Generic/Open Elective for Other Faculty than Science and Technology (GE/OE)

GE/OE-2: Forensic Handwriting Identification		
Total Credits: 02		Total Contact Hours: 30 Hrs.
Maximum Marks: 50		
<p>Learning Objectives of the Course: The learning objectives of the course are as follows:</p> <ul style="list-style-type: none"> • Students will gain an idea of important features in handwriting identification • Students will learn the basis of handwriting characteristics • Students will have an understanding of significance of forensic documentation <p>Course Outcomes (COs): After completion of the course, students will be able to:</p> <ul style="list-style-type: none"> • CO1: Define and explain important features in handwriting identification • CO2: Explain and interpret basis of handwriting characteristics • CO3: Explain the significance of forensic documentation 		
ModuleNo.	Topics / actual contents of the syllabus	Contact Hours
I	<p>Handwriting Identification</p> <ul style="list-style-type: none"> • Basis of handwriting identification. • Characteristics of handwriting, scope and application. • Class and individual characteristics. Arrangement, alignment, margin, slant, speed, pressure, spacing, line quality, embellishments, movement and pen lifts. • Factors influencing handwriting-physical, mechanical, genetic and physiological 	10 Hrs.
II	<p>Handwriting Examination</p> <ul style="list-style-type: none"> • Basis of handwriting comparison. • Collection of handwriting samples. • Forgery detection. • Counterfeiting. • Examination of altered and erased documents. Tools used in handwriting examination. 	10 Hrs.

III	Handwriting Recognition <ul style="list-style-type: none"> • Basis of handwriting recognition. • Off-line and on-line handwriting recognition. • Steps involved in handwriting recognition – pre-processing, feature extraction and classification. • Applications of handwriting recognition 	10 Hrs.
Suggested Readings/Reference Books: <ol style="list-style-type: none"> 1. O. Hilton, Scientific Examination of Questioned Documents, CRC Press, Boca Raton (1982). 2. A.A. Moenssens, J. Starrs, C.E. Henderson and F.E. Inbau, Scientific Evidence in Civil and Criminal Cases, 4th Edition, Foundation Press, New York (1995). 3. R.N. Morris, Forensic Handwriting Identification: Fundamental Concepts and Principles, Academic Press, London (2000). 4. E. David, The Scientific Examination of Documents – Methods and Techniques, 2nd Edition, Taylor & Francis, Hants (1997). 5. Z. Liu, J.H. Cai and R. Buse, Handwriting Recognition: Soft Computing and Probabilistic Approach (Volume 133), Springer Science and Business Media (2003) 		

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