RIMT
UNIVERSITY

SCHEME & SYLLABUS
(Choice Based Credit System)
for
B.Sc. Forensic Science
1st TO 6th SEMESTER

(w.e.f. Session 2017-22)

Program Code: FORS301

DEPARTMENT OF FORENSIC SCIENCE

RIMT UNIVERSITY, MANDI GOBINDGARH, PUNJAB

TABLE OF CONTENTS

SECTION 1
Vision & Mission of the University

VISION

To become one of the most preferred learning places a centre of excellence to promote and nurture future leaders who would facilitate in desired change in the society

MISSION

- To impart teaching and learning through cutting edge technologies supported by the world class infrastructure

- To empower and transform young minds into capable leaders and responsible citizens of India instilled with high ethical and moral values

SECTION 2
Vision and Mission of the Department

VISION

The department of forensic science stands out as an Institute that envisions a bright future by imparting Quality Professional Education of very high Standards with special emphasis of Research and Development (R & D) and continuous updating the curricula in consonance with local and Global needs. We see higher aspirations and better results with professional Excellence combined with Perfection and absolutely relentless collective efforts.

MISSION

- To prepare learners for world class Professionals empowered with competitive knowledge, skill ethical values and confidence to lead in the fields of forensic science.

- To provide students a stimulating and intellectual environment conducive to personality development and confident decision making.

- To sharpen India's young talent and helping them discover the true meaning of global education for true success.

SECTION 3
About the Program

Forensic science is the application of all sciences to law. The field of forensic science is undoubtedly expanding as global crime and fraud rates continue to rise. In order to define and uphold these regulations, forensic science utilizes scientific knowledge and technology. The three-year B. Sc. Forensic Science curriculum equips students with the knowledge and abilities needed to complete autonomous projects in the fields of Biology, Chemistry, Law, and Forensic Investigation.

The curriculum provides theoretical and practical expertise in all facets of Criminalistics, demonstrating proficiency in areas including forensic chemistry, questioned documents and toxicology. This curriculum focuses on forensic science, where students learn about crimes, crime scenes, and the related methods and equipment needed to solve crimes, in addition to all laboratory methods and methods for gathering evidence. They research how to investigate different types of crime scenes and how to use lab analysis to find the primary offender.

Eligibility criteria for BSc. : 10+2 Medical/Non-Medical

Bachelor of Forensic Science includes 6 semesters with the practical exposure.

SECTION 4
Program Educational Objectives (PEOs), Program Outcomes (POs) and Program Specific Outcomes (PSOs)

PROGRAMME EDUCATION OBJECTIVES (PEOs)

The PEOs are general statements that outline the career and professional achievements that the programme is preparing its alumni to attain in the few years after the receipt of their degree. The PEOs for the programme in forensic science are as follows:

PEO1	**PEO-1: Graduates of RIMT forensic programme will be well-prepared for successful jobs in the field of forensic science, as well as in research and innovation at businesses, in the public sector, and/or in related subfields.**
PEO2	**PEO-2: RIMT forensic graduates will be proficient in using cutting-edge and established software and technology for the discovery, analysis, and assessment of forensic evidence.**
PEO3	**Graduates from RIMT forensic programme will be effective in managing interdisciplinary teams with professional capabilities to expand their knowledge, skills, and dexterity in conducting scientific research and providing objective, dependable scientific conclusions in court.**
PEO4	**By educating the public about the various tactics used by criminals to commit crimes, RIMT forensic graduates will serve society in a way that goes beyond their expertise as forensic experts.**

PROGRAMME OUTCOMES (POs)

PO 1	Problem Solving Attitude**: Be proficient in integrating knowledge and applying their understanding in identifying problems and producing powerful solutions.**
PO 2	Professional Competence**: Attain professional competence, intellectual maturity and personal growth along with a commitment for ethical development of the industry.**
PO 3	Critical Analysis & Decision Making: **ability to analyze a problem, and identify and define the computing requirements appropriate to its solution.**
PO 4	Environment and Sustainability**: To develop understanding of environment impact of businesses and be able to apply forensic knowledge to develop sustainable crime solving methods.**
PO 5	Ethics & Values**: To learn and apply Forensic ethics principles and be committed to professional ethics and responsibilities and norms of the crime scene management.**
PO 6	Individual & Team Work**: To develop team skills and be able to lead various cross functional team with members from different background. An ability to function effectively on teams to accomplish a common goal.**
PO 7	Life Long Learning**: Aptitude to acquire newer knowledge and skills, assimilate and adapt them to be ready to confront uncharted environment scientifically and confidently.**
PO 8	Global Orientation and Cross-Cultural Appreciation: **Ability to face any issues related to forensic science especially related to DNA, Fingerprints and Handwriting examination from a global perspective with confidence, positivity and exhibit an understanding of Cross Cultural perspective of science and technology.**

PROGRAMME SPECIFIC OUTCOMES (PSOs)

PSO 1	**Students will understand the basic concepts, fundamental principles, scientific theories related to forensic science and their respective applications in day-to-day life.**
PSO 2	**Students will be able to design & demonstrate the use of tools and techniques required to provide solutions based on the available data. They will develop scientific outlook not only with respect to the science subjects but also in all aspects related to life.**
PSO 3	**Students will become familiar with the various disciplines of forensic science like forensic toxicology, forensic ballistics, fingerprint examination, questioned documents, etc. They will also learn to apply appropriate tests and techniques for the qualitative as well as quantitative analysis of various evidences in laboratories as well as industries.**

SECTION 5
Curriculum / Scheme with Examination Grading Scheme

SEMESTER WISE SUMMARY OF THE PROGRAMME: BSc.
(Forensic Science)

S. No.	Semester	No. of Contact Hours	Marks	Credits
1.	I	31	1000	25
2.	II	31	900	25
3	III	30	900	23
4	IV	30	800	23
5	V	30	900	23
6	VI	30	900	23
	Total	**182**	**5400**	**153**

EXAMINATION GRADING SCHEME

Marks Percentage Range	Grade	Grade Point	Qualitative Meaning
80-100	O	10	Outstanding
70-79	A+	9	Excellent
60-69	A	8	Very Good
55-59	B	7	Good
50-54	B	6	Above Average
45-49	C	5	Average
40-44	P	4	Pass
0-39	F	0	Fail
ABSENT	AB	0	Fail

Percentage Calculation: CGPA *10

FIRST SEMESTER

Code	Course Title	L	T	P		INTERNAL	EXTERNAL	Total	
BFPH-1101	Basic Physics-I	3	1	0	4	24	60	100	3
BFPH-1102	Basic Physics Laboratory-I	0	0	4	2	-	40	100	3
BFBO-1103	Fundamentals of Biology-I	3	0	0	3	24	60	100	3
BFBO-1104	Biology Laboratory-I	0	0	2	1	24	60	100	3
BFCH-1105	Organic Chemistry-I	2	0	0	2	24	60	100	3
BFCH-1106	Physical Chemistry-I	4	0	0	4	24	60	100	3
BFCH-1107	Chemistry Laboratory-I	0	0	6	3	-	40	100	3
BHUM-1101	Communication Skills	2	0	0	2	24	60	100	3
BHUM-1102	Communication Skills Lab	0	0	2	1	-	40	100	3
BFFF-1108	Fundamentals of Forensic science and crime scene investigation	3	0	0	3	24	60	100	3
Total					**25**				

SECOND SEMESTER

COURSE		Contact Hours/Week			Credit	% of Total Marks			Exam Duration (Hours)
Code	Course Title	L	T	P		INTERNAL	EXTERNAL	Total	
BFPH-1201	Basic Physics-II	3	1	0	4	24	60	100	3
BFPH-1202	Basic Physics Laboratory-II	0	0	4	2	-	40	100	3
BFBO-1203	Fundamentals of Biology-II	3	0	0	3	24	60	100	3
BFBO-1204	Biology Laboratory-II	0	0	2	1	24	60	100	3
BFCH-1205	Organic Chemistry-II	2	0	0	2	24	60	100	3
BFCH-1206	Inorganic-Chemistry-I	4	0	0	4	24	60	100	3
BFCH-1207	Chemistry Laboratory-II	0	0	6	3	-	40	100	3
BEVS-1201	Environmental Science	3	0	0	3	24	60	100	3
BFFF-1208	Fundamentals of forensic science and Physical evidence	3	0	0	3	24	60	100	3
Total					**25**				

THIRD SEMESTER

COURSE		Contact Hours/Week			Credit	% of Total Marks			Exam Duration (Hours)
Code	Course Title	L	T	P		INTERNAL	EXTERNAL	Total	
BFPH-1301	Advanced Physics-I	3	1	0	4	24	60	100	3
BFPH-1302	Advanced Physics Laboratory-I	0	0	4	2	24	60	100	3
BFBO-1303	Advanced Biology-I	3	0	0	3	24	60	100	3
BFBO-1304	AdvancedBiology Laboratory-I	0	0	2	1	-	60	100	3
BFCH-1305	Organic Chemistry-III	2	0	0	2	24	60	100	3
BFCH-1306	Physical Chemistry-II	4	0	0	4	24	60	100	3
BFCH-1307	Chemistry Laboratory-III	0	0	6	3	-	60	100	3
BFFF-1308	Elements of Law and criminology	3	0	0	3	24	60	100	3
BFFL-1309	Forensic Laboratory-I	0	0	2	1	-	60	100	
Total					**23**				

FOURTH SEMESTER

COURSE		Contact Hours/Week			Credit	% of Total Marks			Exam Duration (Hours)
Code	Course Title	L	T	P		INTERNAL	EXTERNAL	Total	
BFPH-1401	Advanced Physics-II	3	1	0	4	24	60	100	3
BFPH-1402	Advanced Physics Laboratory-II	0	0	4	2	-	40	100	3
BFBO-1403	Advanced Biology-II	3	0	0	3	24	60	100	3
BFBO-1404	Advanced Biology Laboratory -II	0	0	2	1				
BFCH-1405	Organic Chemistry-IV	2	0	0	2	24	60	100	3
BFCH-1406	Inorganic-Chemistry-II	4	0	0	4	24	60	100	3
BFCH-1407	Chemistry Laboratory-IV	0	0	6	3	24	60	100	3
BFFF-1408	Questioned document examination and Finger Print analysis	3	0	0	3	24	60	100	3
BFFL-1409	Forensic Laboratory-II	0	0	2	1	-	60	100	3
Total					**23**				

FIFTH SEMESTER

COURSE		Contact Hours/Week			Credit	% of Total Marks			Exam Duration (Hours)
Code	Course Title	L	T	P		INTERNAL	EXTERNAL	Total	
BFPH-1501	Applied Physics-I	4	0	0	4	24	60	100	3
BFPH-1502	Applied Physics Laboratory-I	0	0	4	2	-	40	100	3
BFBO-1503	Applied Biology-I	3	0	0	3	24	60	100	3
BFBO-1504	Applied Biology Laboratory -I	0	0	2	1	24	60	100	3
BFCH-1505	Organic Chemistry-V	2	0	0	2	24	60	100	3
BFCH-1506	Physical Chemistry-III	4	0	0	4	24	60	100	3
BFCH-1507	Chemistry Laboratory-V	0	0	6	3	-	40	100	3
BFFF-1508	Fundamentals of computer forensic and biometrics	3	0	0	3	24	60	100	
BFFL-1509	Forensic Laboratory -III	0	0	2	1	-	40	100	3
Total					**23**				

SIXTH SEMESTER

COURSE		Contact Hours/Week			Credit	% of Total Marks			Exam Duration (Hours)
Code	Course Title	L	T	P		INTERNAL	EXTERNAL	Total	
BFPH-1601	Applied Physics-II	4	0	0	4	24	60	100	3
BFPH-1602	Applied Physics Laboratory-II	0	0	4	2	-	40	100	3
BFBO-1603	Applied Biology-II	3	0	0	3	24	60	100	3
BFBO-1604	Applied Biology Laboratory - II	0	0	2	1	24	60	100	3
BFCH-1605	Organic Chemistry-VI	2	0	0	2	24	60	100	3
BFCH-1606	Inorganic Chemistry-III	4	0	0	4	24	60	100	3
BFCH-1607	Chemistry Laboratory-VI	0	0	6	3	-	40	100	3
BFFF-1608	Forensic Psychology	3	0	0	3	24	60	100	
BFFL-1609	Forensic Lab-IV	0	0	2	1	-	40	100	3
Total					**23**				

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SECTION 6
Detailed Syllabus with Course Outcomes

SYLLABUS

SEMESTER-I

MAPPING OF PROGRAMME SPECIFIC OUTCOME (PSOs) WITH PROGRAMME OUTCOME (POs)

Program Specific Outcome (PSO)	Program Outcome							
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
PSO 1	3	3	2	1	3	3	1	2
PSO 2	2	3	3	1	3	2	2	2
PSO 3	2	3	3	2	3	2	1	2

Contribution: "1" Slight (Low) Correlation
 "2" Moderate (Medium) Correlation]
"3" Substantial Correlation
"-" Indicates there is no correlation

COURSE TITLE: BASIC PHYSICS I
SUBJECT CODE: BFPH-1101
SEMESTER: I
CONTACT HOURS/WEEK:

Lecture (L)	Tutorial (T)	Practical (P)	Credit (C)
4	0	0	4

UNIT-I (15 Lectures)
Vector algebra, Scalar and vector products, Derivatives of a vector with respect to a parameter, Cartesian and spherical polar co–ordinate systems, area, volume, velocity and Acceleration in these systems, Solid angle, Relationship of conservation laws and symmetries of space and time. Centre of Mass, equivalent one body problem, central forces, Motion of a particle in a central force field (motion is in a plane, angular momentum is conserved, areal velocity is constant), equation of orbit & turning points, Kepler's Laws, Satellite in circular orbit and applications, Geosynchronous orbits, Weightlessness, Basic idea of global positioning system (GPS).

UNIT–II   (15 Lectures)
Elastic collision in Lab and C.M system, velocities, angles and energies in these sysstem, cross-section of elastic scattering, Rutherford scattering, Rotational motion: Angular velocity and angular momentum, Torque, Conservation of angular momentum, principal moments and Axes, Euler's equations, precession and elementary gyroscope.

UNIT-III (15 Lectures)
Frame of refrence, Inertial frame of reference, Galilean transformation and Invariance, Non Inertial frames, coriolis force and its applications, Variation of acceleration due to gravity with latitude,Focault pendulum.
Special Theory of Relativity: Concept of Ether and Michelson–Morley experiment, Constancy of speed of light, Postulates of Special Theory of Relativity, Lorentz transformations, Length contraction, Time dilation, Relativistic addition of velocities, Relativistic Doppler effect, Variation of Mass with velocity, Mass-energy relation,Relativistic momentum & energy, Transformation of momentum and energy, Concept of Minkowski space

UNIT–IV (15 Lectures)
Elasticity: Hooke's law - Stress-strain diagram - Elastic moduli-Relation between elastic constants - Poisson's Ratio-Expression for Poisson's ratio in terms of elastic constants - Work done in stretching and work done in twisting a wire - Twisting couple on a cylinder - Determination of Rigidity modulus by static torsion ,Torsional pendulum, Determination of Rigidity modulus and moment of inertia - q, η and Vby Searles method

 Books Recommended:
1. Mechanics, Berkeley Physics, vol.1,C.Kittel, W.Knight, et.al., Tata McGraw-Hill, 2007
2. Mechanics, D.S. Mathur, S. Chand and Company Limited, 2000
3. Physics for scientists and Engineers with Modern Phys., J.W. Jewett, R.A. Serway, Cengage Learning, 2010
4. The Special Theory of Relativity, S. Banerji& A. Banerji, Prentice Hall India, 2012

COURSE TITLE: BASIC PHYSICS LAB-I
SUBJECT CODE: BFPH-1102
SEMESTER: I
CONTACT HOURS/WEEK:

Lecture (L)	Tutorial (T)	Practical (P)	Credit (C)
0	0	4	2

Note: Students will be required to perform at least 10 experiments from the given list of experiments

1. Measurements of length (or diameter) using vernier caliper, screw gauge and Travelling microscope.
2. To study the random error in observations.
3. To determine the height of a building using a Sextant.
4. To study the Motion of Spring and calculate (a) Spring constant, (b) g and (c) Modulus of rigidity.
5. To determine the Moment of Inertia of a Flywheel.
6. To establish relationship between torque and angular acceleration using flywheel.
7. To determine Coefficient of Viscosity of water by Capillary Flow Method (Poiseuille's method).
8. To determine the Young Modulus of a Wire by bending of beam Method.
9. To determine the Modulus of Rigidity of a Wire by Maxwell's needle.
10. To determine the elastic Constants of a wire by Searle's method.
11. To determine the value of g using Bar Pendulum.
12. To determine the value of g using Kater's Pendulum.
13. To determine g and velocity for a freely falling body using Digital Timing Technique
14. To study the Motion of a Spring and calculate (a) Spring Constant (b) Value of g

Books Recommended:
1. A Text Book of Practical Physics, I.Prakash& Ramakrishna, KitabMahal, 2011
2. B.Sc Practical Physics, C L Arora, S. Chand & Company, 2010
3. Advanced Practical Physics for students, B. L. Flint and H.T. Worsnop, Asia Publishing House, 1971

SUBJECT TITLE:Basic Biology-I
SUBJECT CODE: BFBO-1103
SEMESTER: I
CONTACT HOURS/WEEK:

Lecture (L)	Tutorial (T)	Practical (P)	Credit (C)
3	0	0	3

Internal Assessment: 40
End Term Exam: 60
Duration of Exam: 3 Hrs

Instruction of Question Paper setter: The question paper consist of three sections A,B and C.Section-A is compulsory consisting of 6 short answer type questions(2 marks) from the whole syllabus.Total marks to this section are 12. There will be no choice in this section.Section-B consists of 8 questions.Each question carries 4 marks. Section-C consists of 4 questions. Students will attempt any three questions. Each carries 8 marks.

Course Objective: To impart knowledge of microbesand their biological functions.

Section-A

Viruses: Discovery, General characters, General structure, classification and replication; General account of DNA virus (T- phage) and RNA virus (TMV); Economic importance of viruses. A brief account of Mycroplasma.
Bacteria: Discovery, general characteristics, ultra-structure, classification,reproductionvegetative, asexual and recombination (Conjugation, transformation and transduction), nutritional types and economic importance.

Section-B

Fungi: General characters and classification. Economic importance of Fungi.General characteristics and life cycle of Albugo and Phytophthora (Kingdom Chromista); Rhizopus (Zygomycota); Saccharomyces, Pencillium; Puccinia, Ustilago; Cercospora
Lichens: Structure, morphology, reproduction and economic importance. Mycorrhiza: General account, ectomycorrhiza and endomycorrhiza and their significance.

Section-C

Protozoa a. Classification upto orders with brief ecological note and economic importance of the following: Entamoeba, Trypanosoma, Giardia, Noctiluca, Eimeria, Opalina, Vorticella, Balantidium and Nyctotherus. b. Detailed study of the following animal types: Amoeba, Paramecium and Plasmodium. Introduction to Parasitic Protozoa
Porifera: Classification upto orders with brief ecological note and economic importance of the following: Grantia, Euplectella, Hyalonema and Spongilla.

Books Recommended:

1. Alexopolous, J. and W. M. Charles. 1988. Introduction to Mycology. Wiley Eastern, New Delhi.

2. Mckane, L. and K. Judy. 1996. Microbiology – Essentials and Applications. McGraw Hill, New   York.

3. Pandey, B. P. 2001. College Botany, Vol. I: Algae, Fungi, Lichens, Bacteria, Viruses, Plant Pathology, Industrial Microbiology and Bryophyta. S. Chand & Company Ltd, New Delhi.

SUBJECT TITLE: Biology Laboratory-I
SUBJECT CODE: BFBO-1104
SEMESTER: I
CONTACT HOURS/WEEK:

Lecture (L)	Tutorial (T)	Practical (P)	Credit (C)
0	0	2	1

Internal Assessment: 40
End Term Exam: 60
Duration of Exam: 3 Hrs

Course Objective: To impart knowledge of microscopy& identification of microbes.

1. Microscopy – Light microscopy: principles, parts & function, Operation.

2. Image analysis of different classes of Microbes.

3. Preparation of Microbial media (bacteria, yeast, mold, algae, protozoa)

4. Sampling and quantification of microorganisms in air, soil and water.

5. Isolation of bacteria [Streak plate, spread plate, pour plate, serial dilution.

6. Identification of microorganisms from the habitats [simple staining, differential staining, acid fast staining, capsule staining, spore and motility]

7. Observation of morphology - shape and arrangement of cells.

8. Microscopic study of phytoplanktons & zooplanktons.

9. Staining of Slides.

10. Image analysis & Karyotyping

Books Recommended:

1. Alexopolous, J. and W. M. Charles. 1988. Introduction to Mycology. Wiley Eastern, New Delhi.

2. Mckane, L. and K. Judy. 1996. Microbiology – Essentials and Applications. McGraw Hill, New   York.

3. Pandey, B. P. 2001. College Botany, Vol. I: Algae, Fungi, Lichens, Bacteria, Viruses, Plant Pathology, Industrial Microbiology and Bryophyta. S. Chand & Company Ltd, New Delhi.

COURSE TITLE: ORGANIC CHEMISTRY-I
SUBJECT CODE: BFCH-1105
SEMESTER: I
CONTACT HOURS/WEEK:

Lecture (L)	Tutorial (T)	Practical (P)	Credit (C)
2	0	0	2

Internal Assessment: 40
End Term Exam: 60
Duration of Exam: 3 Hrs

Course Objective: To impart knowledge of basics of organic chemistry & Stereochemistry of organic compounds.

Section A (10 hrs)

Basics of organic chemistry

Hybridization, shapes of molecules, bond lengths and bond angles, bond energy, localized and delocalized chemical bond, van der Waals interactions, resonance, hyperconjugation, aromaticity, inductive and field effects, hydrogen bonding(applications of all these effects);organic acids & bases, and their relative strengths; dipole moment, Curved arrow notation, drawing electron movements with arrows, half-headed and double headed arrows, homolytic and heterolytic bond breaking. Types of reagents-electrophiles and nucleophiles.Nucleophilicity& basicity; Types of organic reactions & their mechanisms, Energy considerations. Reactive intermediates-carbocations, carbanions, free radicals, carbenes, and nitrenes (their types, shapes & relative stability). Methods of determination of reaction mechanism (product analysis, intermediates, isotope effects, kinetic and stereochemical studies).

Section B (10 hrs)

Stereochemistry-I

Concept of isomerism.Types of isomerism. Optical isomerism - elements of symmetry, molecular chirality, enantiomers, stereogenic center, optical activity, specific rotation, properties of enantiomers, Chiral and achiral molecules with two stereogenic centers, diastereomers, threo and erythrodiastereomers, meso compounds, resolution of enatiomers, inversion, retention and racemization. Relative and absolute configuration, sequence rules, D & L and R & S systems of nomenclature.

Section C (10 hrs)

Stereochemistry-II

Geometric isomerism - determination of configuration of geometric isomers.Syn-anti & E & Z notations with C.I.P. rules, geometric isomerism in oximes and alicyclic compounds. Optical isomerism, Conformational isomerism - conformational analysis of ethane and n-butane; conformations of cyclohexane, axial and equatorial bonds, conformation of mono substituted cyclohexane derivatives.Difference between conformation and configuration, Fischer and flying wedge formulae Newman projection and Sawhorse formulae & their interconversion.

Recommended Books:

1. Robert Thornton Morrison and Robert Neilson Boyd, Organic Chemsitry, Dorling Kindersley (India) Pvt. Ltd. (Pearson Education).

2. I.L. Organic Chemistry (Volume I), Darling Kindersley (India) Pvt. Ltd.(Pearson Education).

3. I.L. Finar, Organic Chemistry (Volume II): Stereochemistry & the chemistry of natural products, Darling Kindersley (India) Pvt. Ltd. (Pearson Education).

COURSE TITLE: PHYSICAL CHEMISTRY-I
SUBJECT CODE: BFCH-1106
SEMESTER: I
CONTACT HOURS/WEEK:

Lecture (L)	Tutorial (T)	Practical (P)	Credit (C)
4	0	0	4

Internal Assessment: 40
End Term Exam: 60
Duration of Exam: 3 Hrs

Course Objective: To impart knowledge of basics of physical chemistry

Section – A (15 hrs)

Mathematical Concepts

Logarithmic relations, differentiation of functions like Kx, e^x, x^n, sin x, log x, maxima and minima, partial differentiation and reciprocity relations.Integration of some useful relevant functions.

Liquid State

Intermolecular forces, differences between solids, liquids and gases states, Physical properties of liquid-vapour pressure, surface tension, surface active agents, viscosity, effects of temperature on viscosity, Liquid crystals: Difference between liquid crystal, LCDs & the seven segment cell, Classification of thermotropic, liquid crystal, semetic liquid crystal, nematic liquid crystals, cholestric liquid crystal, disc shaped liquid crystals, polymer liquid crystals.

Section- B (15 hrs)

Gaseous State

The kinetic molecular theory of gases, deviation from ideal behaviour, van der Waals equation of states, kinetic energy & temperature, Maxwell distribution of molecular velocities & energies, types of molecular velocities, collision parameters (diameter, cross section, number frequency), mean free path , the critical phenomena P-V isotherm of $CO2$, the vander Waal's equation of critical state, principal of corresponding states, reduced equation of state, molar masses & density of real gases, liquefaction of gases, viscosity, diffusion.

Chemical Equilibrium

Irreversible & reversible reactions, chemical equilibrium, law of mass action, thermodynamic treatment of law of mass action, Van't Hoff reaction isotherm, relation between K_p, K_c & K_x,

homogenous &heterogenouseuilibria, Le Chatelier's principle, applications of Le Chatelier's principle, Clausius-Claperyron equation.

Section- C (15 hrs)

Chemical Kinetics-I

Rate of a reaction, rate law & rate constant, factors influencing the rate of a reaction,

Units of rate constant, integration of rate exoressions, order &molecularity of reactions, zero order, first order, second order & third order reactions, pseudo order reactions, half life time of a reaction, methods of determining order of a reaction,Radioactive decay as a first order phenomenon, kinetics of complex reactions: opposing, consecutive & chain reactions.

Chemical Kinetics-II

Erying equation, Lindnann theory unimolecular gaseous reactions, effect of temperature & pressure on reaction rate, theories of reaction rates. Catalysis Introduction, Homogeneous &heterogenous catalysis, enzyme catalysis, kinetics of enzyme catalyzed reaction-MichaelisMenten equation.

Recommended Books:

1. Physical Chemistry by Gurdeep Raj; Krishna Prakashan Media (P) Ltd.

2. Physical Chemistry by Puri Sharma Pathania; Vishal Publishing Co.

3. Physical Chemistry by Atkins; W.H. Freeman & Company, New York.

4. Advanced Physical Chemistry by Gurthu; PraghatiPrakashan.

5. Physical Chemistry by K L kapoor; Rajiv Beri for Macmillan india Ltd.

COURSE TITLE: CHEMISTRY LABORTARY-I
SUBJECT CODE: BFCH-1107
SEMESTER: I
CONTACT HOURS/WEEK:

Lecture (L)	Tutorial (T)	Practical (P)	Credit (C)
0	0	6	3

Internal Assessment: 40
End Term Exam: 60
Duration of Exam: 3 Hrs

Course Objective: To impart knowledge of basics principles of chemistry phenomenons

INORGANIC

Semi-micro analysis: Cation analysis, separation and identification of Groups I, II, III, IV, V and VI. Anion analysis (2 cation and 2 anion with no interference).

ORGANIC

1. (a) Determination of melting point of following solids: naphthalene, benzoic acid, acetanilide & urea.

   (b) Determination of boiling point of following liquids: ethanol, cyclohexane, propanol, toluene.

2. Purification of organic compounds by crystallization:

(a) Phthalic acid from hot water.

(b) Acetanilide from boiling water.

(c) Benzoic acid from water.

Recommended Books:

1. Vogel's book on Inorganic Qualitative Analysis

2. Vogel's book on Organic Qualitative Analysis

SUBJECT TITLE: Fundamentals of Forensic Science and Crime Scene Investigation
SUBJECT CODE: BFFF-1108
SEMESTER: I
CONTACT HOURS/WEEK:

Lecture (L)	Tutorial (T)	Practical (P)	Credit (C)
3	**0**	**0**	**3**

Internal Assessment: 40
End Term Exam: 60
Duration of Exam: 3 Hrs

Instruction of Question Paper setter: The question paper consists of three sections A, B and C. Section-A is compulsory consisting of 6 short answer type questions (2 marks) from the whole syllabus. Total marks to this section are 12. There will be no choice in this section. Section-B consists of 8 questions. Each question carries 4 marks. Section-C consists of 4 questions. Students will attempt any three questions. Each carries 8 marks.

Objective and outcome of course: To impart knowledge of Forensic Science and Crime Scene Investigation.

Section-A

Forensic Science: History of Forensic Sciences, Definitions of Forensic science given by different authors, Nature, Scope, Need and Functions.

Principles of forensic science: Law of individuality, principle of exchange, law of progressive exchange, principle of comparison, Principle of analysis, law of probability. Tools and techniques in forensic science, Set up of Forensic Science Laboratory, Hierarchy of experts in Forensic Science Laboratories.

Section-B

Ethics in Forensic Science, Duties of Forensic Scientist.

Various Police Organizations, Organization of Police Station, Role & Functions of Police in crime scene investigation, Modus Operandi, Crime Record.

Types of Forensic Science Laboratories: CFSLs, State Forensic Science Laboratory, Regional Forensic Science Laboratory, Mobile Forensic Science Laboratory.

Definitions, concepts of crime, causes of crime, prevention of crime.

Section-C

Crime Scene Investigation: Types of crime scene, Understanding and purposes of crime scene examination, First responding officers, Protection of the crime Scene, documentation of Crime scene, methods of search for physical clue materials, Reconstruction of Crime scene.

Physical Evidences: Definition, its collection, packing and transportation, chain of custody.

Role of Forensic Scientist in Collection of Physical evidence, role of investigating officers in collection of Physical evidence**.**

1. Siegel J. A. and Mirakovits K: **Forensic Science: The Basics,** CRC Press, 3rd Edition, 2016.

2. Siegel J. A. and Saukko P. J.: **Encyclopedia of Forensic Sciences,** Academic Press, 2nd Edition, 2013.

3. Saferstein R: **Forensic Science Hand Book**, Vol I, CRC Press, 3rd Edition. 2020.

4. Saferstein R: **Forensic Science Hand Book**, Vol II, Pearson, 2nd Edition. 2005.

5. Saferstein R: **Forensic Science Hand Book**, Vol III, Pearson, 2nd Edition. 2010.

6. Saferstein, R: **Criminalistics: An Introduction to Forensic Science**, Pearson, 12th Edition, 2018.

7. Sharma B. R.: **Forensic Science in Criminal Investigation & Trials**, Universal Law Publishing, 6th Edition, 2020

SYLLABUS

SEMESTER-II

COURSE TITLE: BASIC PHYSICS II

SUBJECT CODE: BFPH-1201
SEMESTER: II
CONTACT HOURS/WEEK:

Lecture (L)	Tutorial (T)	Practical (P)	Credit (C)
4	0	0	4

UNIT-I Electostatics   (**20 Lectures**)

Scalar and vector product, Gradient, divergence, Curl and their significance, Vector Integration, Line, surface and volume integrals of Vector fields, Gauss-divergence theorem and Stoke's theorem of vectors (statement only), Electrostatic Field, electric flux, Gauss's theorem of electrostatics and its application to plane charged sheet, charged conductor. Differential form of Gauss Law, Electric potential as line integral of electric field, potential due to a point charge, electric dipole, uniformly charged spherical shell and solid sphere, Calculation of electric field from potential,curl of electrostatic field, Capacitance of an isolated spherical conductor, Parallel plate, spherical and cylindrical condenser, Energy per unit volume in electrostatic field, Dielectric medium, Dielectric Polarisation, Displacement vector, Gauss's theorem in dielectrics.

UNIT-II (13 Lectures)

Magnetostatics : Biot-Savart's law & its applications to straight conductor, circular coil and solenoid carrying current. Ampere's circuital law, Divergence and curl of magnetic field, Magnetic vector potential

Magnetic Properties of Matter: Magnetization vector (M). Magnetic Intensity(H), Magnetic Susceptibility and permeability, Relation between B, H, M

Electromagnetic Induction: Faraday's laws of electromagnetic induction, Lenz's law, curl of electric field, self and mutual inductance, L of single coil, M of two coils, Reciprocity Theorem, Energy stored in magnetic field.

UNIT-III   (**15 Lectures**)

Electrical Circuits: AC Circuits: Kirchhoff's laws for AC circuits, Complex Reactance and Impedance, Series LCR Circuit: (1) Resonance, (2) Power Dissipation and (3)Quality Factor, and (4) Band Width, Parallel LCR Circuit

Network theorems: Ideal Constant-voltage and Constant-current Sources, Network Theorems: Thevenin theorem, Norton theorem, Superposition theorem, Reciprocity theorem, Maximum Power Transfer theorem, Applications to dc circuits

UNIT-IV (12 Lectures)

Maxwell`s equations and Electromagnetic wave propagation: Equation of continuity of current, Displacement current, Modified Ampere's law, Maxwell's equations, Poynting Theorem & Poynting vector, energy density in electromagnetic field, electromagnetic wave propagation through vacuum and isotropic dielectric medium, transverse nature of EM waves, polarization.

Books Recommended:
1. Electricity and Magnetism, Edward M. Purcell, 1986, McGraw-Hill Education.
2. Electricity and Magnetism, J.H. Fewkes& J. Yarwood. Vol. I, 1991, Oxford Univ. Press.
3. Electricity and Magnetism, D C Tayal, 1988, Himalaya Publishing House.
4. University Physics, Ronald Lane Reese, 2003, Thomson Brooks/Cole. 12
5. D.J. Griffiths, Introduction to Electrodynamics, 3rd Edn, 1998, Benjamin Cummings

COURSE TITLE: BASIC PHYSICS LAB-II
SUBJECT CODE: BFPH-1202
SEMESTER: II
CONTACT HOURS/WEEK:

Lecture (L)	Tutorial (T)	Practical (P)	Credit (C)
0	**0**	**4**	**2**

Note: Students will be required to perform at least 10 experiments from the given list of experiments

1. To use a Multimeter for measuring (a) Resistances, (b) AC and DC Voltages, (c) DC Current, and (d) checking electrical fuses.
2. Ballistic Galvanometer: (i) Measurement of charge and current sensitivity (ii) Measurement of CDR (iii) Determine a high resistance by Leakage Method (iv) To determine Self Inductance of a Coil by Rayleigh's Method.
3. To compare capacitances using De'Sauty's bridge.
4. Measurement of field strength B and its variation in a Solenoid (Determine dB/dx).
5. To study the Characteristics of a Series RC Circuit.
6. To study the a series LCR circuit and determine its (a) Resonant Frequency, (b) Quality Factor
7. To study a parallel LCR circuit and determine its (a) Anti-resonant frequency and (b) Quality factor 8. To determine a Low Resistance by Carey Foster's Bridge.
9. To verify the Thevenin and Norton theorem
10. To verify the Superposition, and Maximum Power Transfer Theorem

Books Recommended:
1. A Text Book of Practical Physics, I.Prakash& Ramakrishna, KitabMahal, 2011
2. B.Sc Practical Physics, C L Arora, S. Chand & Company, 2010
    3. Advanced Practical Physics for students, B. L. Flint and H.T. Worsnop, Asia Publishing House, 1971

SUBJECT TITLE:Basic Biology-II
SUBJECT CODE: BFBO-2203
SEMESTER: II
CONTACT HOURS/WEEK:

Lecture (L)	Tutorial (T)	Practical (P)	Credit (C)
3	0	0	3

Internal Assessment: 40
End Term Exam: 60

Duration of Exam: 3 Hrs

Instruction of Question Paper setter: The question paper consists of three sections A,B and C. Section-A is compulsory consisting of 6 short answer type questions(2 marks) from the whole syllabus. Total marks to this section are 12. There will be no choice in this section. Section-B consists of 8 questions. Each question carries 4 marks. Section-C consists of 4 questions. Students will attempt any three questions. Each carries 8 marks.

Course Objective: To impart knowledge of Forensic Importance of Body fluids.
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Section A

Forensic Importance of Body fluids
Common body fluids.Composition and functions of blood. Collection and preservation of blood evidence. Distinction between human and non-human blood. Determination of blood groups. Antigens and antibodies.
Forensic characterization of bloodstains.Typing of dried stains.Blood enzymes and proteins. Semen.Forensic significance of semen. Composition, functions and morphology of spermatozoa. Collection, evaluation and tests for identification of semen. Individualization on the basis of semen examination.
Composition, functions and forensic significance of saliva, sweat, milk and urine. Tests for their identifications.

Section B

Genetic Marker Analysis
Cellular antigens.ABO blood groups.Extracellular proteins and intracellular enzymes. Significance of genetic marker typing data.Sexual assault investigations.

Section C

Bloodstain Pattern Analysis
Bloodstain characteristics. Impact bloodstain patterns.Cast-off bloodstain patterns. Projected bloodstain patterns. Contact bloodstain patterns. Blood trails. Bloodstain drying times. Documentation of bloodstain pattern evidence. Crime scene reconstruction with the aid of bloodstain pattern analysis.

Books Recommended:

1. Cappuccino, J.G and Sherman, N. (1992). Microbiology: Laboratory manual 3rd Edition, Benjimin/Cummings Publishing Company.
2. W.G. Eckert and S.H. James, Interpretation of Bloodstain Evidence at Crime Scenes, CRC Press, Boca Raton (1989).
3. G.T. Duncan and M.I. Tracey in Introduction to Forensic Sciences, 2nd Edition, W.G. Eckert (Ed.), CRC Press, Boca Raton (1997).
4. R. Saferstein, Criminalistics, 8th Edition, Prentice Hall, New Jersey (2004).
5. T. Bevel and R.M. Gardner, Bloodstain Pattern Analysis, 3rd Edition, CRC Press, Boca Raton (2008).

SUBJECT TITLE: Biology Laboratory-II
SUBJECT CODE: BFBO-2204
SEMESTER: II
CONTACT HOURS/WEEK:

Lecture (L)	Tutorial (T)	Practical (P)	Credit (C)
0	0	2	1

Internal Assessment: 40
End Term Exam: 60
Duration of Exam: 3 Hrs

1. To determine blood group from fresh blood samples.
2. To determine blood group from dried blood sample.
3. To carry out the crystal test on a blood sample.
4. To identify blood samples by chemical tests.
5. To identify the given stain as sliva.
6. To identify the given stain as urine.
7. To carry out cross-over electrophoresis.
8. To study the correlation between impact angle and shape of bloodstain.
9. To identify the point of convergence from the bloodstain patterns.

Books Recommended:
1. W.G. Eckert and S.H. James, Interpretation of Bloodstain Evidence at Crime Scenes, CRC Press, Boca Raton (1989).
2. G.T. Duncan and M.I. Tracey in Introduction to Forensic Sciences, 2nd Edition, W.G. Eckert (Ed.), CRC Press, Boca Raton (1997).
3. R. Saferstein, Criminalistics, 8th Edition, Prentice Hall, New Jersey (2004).
4. T. Bevel and R.M. Gardner, Bloodstain Pattern Analysis, 3rd Edition, CRC Press, Boca Raton (2008).

COURSE TITLE: ORGANIC CHEMISTRY-II
SUBJECT CODE: BFCH-1205
SEMESTER: II
CONTACT HOURS/WEEK:

Lecture (L)	Tutorial (T)	Practical (P)	Credit (C)
2	0	0	2

Internal Assessment: 40
End Term Exam: 60
Duration of Exam: 3 Hrs

Section- A (10 hrs)

Alkanes & Cycloalkanes

IUPAC nomenclature of branced&unbranched alkanes, the alkyl group, classification of carbon atoms in alkanes, Isomerism in alkanes, sources, methods of formation (with special reference to Wurtz reaction, Kolbe reaction, Corey-House reaction and decarboxylation of carboxylic acids), physical properties and chemical reactions of alkanes.

Mechanism of free radical halogenation of alkanes: orientation, reactivity and selectivity.

Cycloalkanes--nomenclature,method of formation, chemical reactions, Baeyer's strain theory and its limitations. Ring strain in small rings (cyclopropane and cyclobutane), theory of strain less rings. The case of cyclopropane ring: banana bonds.

Alkenes

Nomenclature of alkenes-methods of formation, mechanisms and dehydration of alcohols, dehydrohalogenation of alkyl halides regioselectivity in alcohol dehydration.TheSaytzeff's rule, Hofmann elimination, physical properties and relative stabilities of alkenes. Chemical reactions of alkenes-mechanisms involved in hydrogenation, electrophilic and free radical additions

Markownikoff's rule, Antimarkownikoff's rule, hydroboration-oxidation, oxymercuration reduction. Epoxidation, ozonolysis, hydration, hydroxylation and oxidation with $KMnO_4$.Polymerization of alkenes. Substitution at allylic and vinylic positions of alkenes

Cycloalkenes Methods of formation, conformation and chemical reactions of Cycloalkenes.

Section-B (10 hrs)

Dienesand Alkynes

Nomenclature and classification of dienes: isolated, conjugated and cumulated dienes. Structure of allenes and butadiene, methods of formation, polymerization of dienes, Chemical reactions-I,2 and l,4 additions, Diels-Alder reaction. Nomenclature of alkynes, Methods of

formation.Chemical reactions of alkynes, acidity of alkynes.Mechanism of electrophilic and nucleophilic addition reactions, hydroboration-oxidation.metal-ammonia reductions, oxidation and polymerization.

Alkyl halides

Nomenclature and classes of alkyl halides, methods of formation including Finkelstein &Hundsdieker reaction, chemical reactions. Mechanisms of nucleophilic substitution reactions of alkyl halides, $S_N2$and S_N1 mechanism with streo-chemical aspects & effect of solvent, nucleophilicsubstitution verses elimination, haloform reaction with mechanistic details.

Section-C (10 hrs)

Aromatic Hydrocarbons

Aromaticity: Huckel's rule, aromatic character of arenes, cyclic carbocations/carbanions& heterocyclic compounds with suitable examples, antiaromaticity&nonaromaticity; structure & stability of benzene, Electrophilic aromatic substitutions- nitration, halogenation, sulphonation and Friedel-Crafts alkylation/acylation with their mechanism, stability of Wheland intermediates (sigma complex), activation/deactivation of the aromatic ring & directing effects of the groups.

Aryl halides

Nomenclature and classes of alkyl halides, methods of formation, Nucleophilic aromatic substitution, The addition elimination and the elimination-additional mechanisms of nucleophilic aromatic substitution reactions. Relative reactivities of alkyl halides, allyl, benzyl, vinyl and aryl halides towards the nucleophilic substitutions.

Recommended Books:

1. Robert Thornton Morrison and Robert Neilson Boyd, Organic Chemsitry, Dorling Kindersley (India) Pvt. Ltd. (Pearson Education).
2. I.L. Organic Chemistry (Volume I) , Darling Kindersley (India) Pvt. Ltd.(Pearson Education).
3. I.L. Finar, Organic Chemistry (Volume II): Stereochemistry & the chemistry of natural products, Darling Kindersley (India) Pvt. Ltd. (Pearson Education).

COURSE TITLE: INORGANIC CHEMISTRY-I

SUBJECT CODE: BFCH-1206
SEMESTER: II
CONTACT HOURS/WEEK:

Lecture (L)	Tutorial (T)	Practical (P)	Credit (C)
4	0	0	4

Internal Assessment: 40
End Term Exam: 60
Duration of Exam: 3 Hrs

Course Objective: To impart knowledge of basics of inorganic chemistry i.e. atomic structure and bonding

Section- A (15 hrs)

Atomic Structure

Idea of de Broglie matter waves, Heisenberg uncertainty principle, atomic orbitals, Schrodinger wave equation, significance of, Ψ and , Ψ^2, quantum numbers, radial and angular wave functions and probability distribution curve, shapes of s, p, d orbitals. Aufbau and Pauli exclusion principles, Hund's multiplicity rule. Electronic configurations of the elements and ions.

Chemistry of Noble gases

Chemical properties of the noble gases, chemistry of xenon, structure and bonding in xenon compounds.

Chemical Bonding - I

Covalent Bond-Valence bond theory and its limitations, directional characteristics of covalent bond, various types of hybridization and shapes of simple inorganic molecules and ions. BeF_2 , BF_3 , CH_4, PF_5, SF_6, IF_7, $Sncl_2$, XeF_4, BF_4^-, PF_6^-, $Sncl_6^{-2}$.

Section – B (15 hrs)

Chemical Bonding - II

Valence shell electron pair repulsion (VSEPR) theory to NH_3, H_3O^+, SF_4, CIF_3, ICl_2, and H_2O.MO theory, homonuclear (elements and ions of 1st and 2nd row), and heteronuclear (BO, CN, CO^+, NO^+, CO, CN), diatomic molecules, multicenter bonding in electron deficient molecule (Boranes) percentage ionic character from dipole moment and eIectronegativity difference.

Ionic Solids-

Concept of close packing, Ionic structures, (NaCl type, Zinc blende, Wurzite, CaF_2, and antifluorite), radius ratio rule and coordination number, Limitation of radius ratio rule, lattice defects, semiconductors, lattice energy and Born-Haber cycle, solvation energy and solubility of ionic solids, polarizing power and polarisability of ions, Fajan's rule. Metallic bond-free electron, valence bond and bond theories.

Weak Interactions-

Hydrogen bonding, van der Walls forces.

Section – C (15 hrs)

Periodic Properties

Position of elements in the periodic table, effective nuclear charge and its calculations.Atomic and ionic radii, ionization energy, electron affinity and electronegativity-definition, methods of determination or evaluation, trends in periodic table and applications in predicting and explaining the chemical behavious.

S-Block Elements

Comparative study, diagonal relationships, salient features of hydrides, solvation and complexation tendencies including their function in biosystems, an introduction to alkyls and arys.

Group No. 13

Comparative study (including diagonal relationship) of groups 13 elements, compounds like hydrides, oxides, oxyacids and halides of groups 13; hydrides of boron-diborane and higher boranes, borazine, borohydrides.

p - Block Elements

Comparative study (including diagonal relationship) of groups 14-l7 elements, compounds like hydrides, oxides, oxyacids and halides of groups 14-17; fullerenes, carbides, fluorocarbons, silicates (structural principle), tetrasulphurtetranitride, basic properties of halogens, interhalogens and polyhalides.

Recommended Books

1. D.F.C. Shriver, P.W. Atkins and C.H. Langford, Inorganic Chemistry, ELBS Oxford,1991.

2.J.E. Huheey, E.A. Keiter, R.L. Keiter, Inorganic Chemistry, 4th Ed, Pearson Education,Singapore, 1999

3.J.D.Lee, Concise Inorganic Chemistry, ELBS, Oxford 1994.

4.Puri Sharma Kalia Principles of Inorganic Chemistry

COURSE TITLE: CHEMISTRY LABORTARY-II
SUBJECT CODE: BFCH-1207
SEMESTER: II
CONTACT HOURS/WEEK:

Lecture (L)	Tutorial (T)	Practical (P)	Credit (C)
0	0	6	3

Internal Assessment: 40
End Term Exam: 60
Duration of Exam: 3 Hrs

Course Objective: To impart knowledge of basics of titrations and kinetics, potentiometry and colorimetry

Inorganic Experiments

Iodometry and Iodimetry Titrations:

(i) Standardisation of sodium thiosphate with K2Cr2O7 / KIO3

(ii) Determination of Cu(II)

(iii) Determination of H2O2

(iv) Determination of available chlorine in bleaching powder.

Precipitation Titrations

(i) AgNO3 – standardisation by Mohr's method / by using absorption indicator.

(ii) Determination of chloride.

(iii) Volhard's method for chloride determination.

Physical Chemistry Experiments

Chemical Kinetics

1. To determine the specific reaction rate of the hydrolysis of methyl   acetate/ethyl   acetate catalyzed by hydrogen ions at room temperature.

2. To study the effect of acid strength on the hydrolysis of an ester.

3. Viscosity& Surface Tension of pure liquids.

To determine the viscosity and surface tension of C_2H_5OH and glycerin solution in water

4. Molecular weight determined by Part method.

Colorimetry

5. To test the validity of Beer Lambert law.

Potentiometry

6. Titration of strong acid solution (HCl) with NaOH solution using quinhydrone electrode.

7. Titration of a mixture of strong and weak acids (HCl + CH3COOH) and hence thecomposition of the mixture.

Recommended Books:

1. Vogel's book on Inorganic Qualitative Analysis

2. Advanced Practical Physical Chemistry By J. B. Yadav

SUBJECT TITLE: Fundamentals of Forensic Science and Physical Evidences
SUBJECT CODE: BFFF-1208
SEMESTER: II
CONTACT HOURS/WEEK:

Lecture (L)	Tutorial (T)	Practical (P)	Credit (C)
3	0	0	3

Internal Assessment: 40
End Term Exam: 60
Duration of Exam: 3 Hrs

Instruction of Question Paper setter: The question paper consists of three sections A, B and C. Section-A is compulsory consisting of 6 short answer type questions (2 marks) from the whole syllabus. Total marks to this section are 12. There will be no choice in this section. Section-B consists of 8 questions. Each question carries 4 marks. Section-C consists of 4 questions. Students will attempt any three questions. Each carries 8 marks.

Objective and outcome of course: To impart knowledge of Forensic Science and Physical Evidences.

Section-A

Physical Evidences, their classification and role in criminal investigation.
Tool marks: Importance, location, nature, collection and evaluation.
Track marks: Importance, nature, location, collection and evaluation.
Road accidents: Methods of investigation.

Section-B

Trace evidences: Collection, packaging, transportation and analysis of Trace evidence: cosmetics, Detective dyes, paint, soil, glass, GSR.
Detective dyes: Collection, Sampling and analysis.
Fingerprints: Definition, types and location.
Computer and cybercrimes: Introduction, types, investigation and limitations.

Section-C

Forensic Ballistics: Nature, scope and definitions, classification and characteristics of modern and country made firearms. Determination of Range of fire, Concept of bullets and cartridge cases examinations, reconstruction of shooting incidents.
Photography: Introduction, Basics of Photography, Crime scene photography, Role of photography in crime scene investigation, modern photographic techniques.

Note: Lab. visits (State or Center Forensic Science Laboratory) compulsory for all the students. Lab visit to forensic laboratory may vary in number from 1 to 2 depending upon the permissions granted by the respective laboratory/institution

Books Recommended:

1. Hess A.K. and Weiner I.B. (2nd Edition) (1999), Handbook of Forensic Psychology, Wiley, John & Sons, Incorporated.
2. Barak G. (1998), Integrative Criminology, Ashgate Pub Ltd.
3. Adler F. (5th Edition) (2004), Criminology, McGraw-Hill.
4. Reid S.T. (12th Edition) (2008), Crime and Criminology, Oxford University Press, USA.
5. Johnson E.H. (4th Edition) (1978), Crime, Correction and Society, Dorsey Press.
6. Gilbert N. (3rd Edition) (1993), Criminal Investigation, Macmillan Publishing company.
7. Nicharrs J. (1999), Investigative Forensic Hyponsis. CRC Press LLC.
8. Bodziak W.M (1989), Footwear Impression Evidence, Elsevier Science Publishing Co. New York.
9. Sharma B.R. (1974), Forensic Science in Criminal Investigation and Trials, Central Law Agency, Allahabad.
10. Lundquest and Curry (1963), Forensic Science, Thomas, Illinosis, USA.
11. Saferstein R. (8th Edition) (2011): Forensic Science Handbook, Prentice Hall Inc. USA.
12. Saferstein R. (1976), Criminalistics, Prentice Hall Inc. USA.
13. Kirk (1953), Criminal Investigation, Interscience Publisher Inc. New York.
14. Nickolas P. and Sherman H. (2006), Illustrated guide to Crime Scene Investigation, CRC press.

SYLLABUS

SEMESTER-III

COURSE TITLE: ADVANCE PHYSICS I
SUBJECT CODE: BFPH-2301
SEMESTER: III
CONTACT HOURS/WEEK:

Lecture (L)	Tutorial (T)	Practical (P)	Credit (C)
4	0	0	4

UNIT-I   (10 Lectures)
Basic ideas of Statistical Physics, Scope of Statistical Physics, basic ideas about probability, distribution of four distinguishable particles in two compartments of equal size. Concept of macrostates, microstates, thermodynamic probability, effects of constraints on the system, distribution of n particles in two compartments, deviation from the state of maximum probability, equilibrium state of dynamic system, distribution of distinguishable n particles in k compartments of unequal sizes.

UNIT-I I   (20 Lectures)
Phase space and its division into elementary cells, three kinds of statistics. The basic approach in the three statistics. Maxwell-Boltzman statistics applied to an ideal gas in equilibrium,

experimental verification of Maxwell-Boltzman's law of distribution of molecular speeds. Need of quantum statistics--B.E. statistics, derivation of Planck's law of radiation, deduction of Wien's displacement law, Rayleigh Jeans Law and Stefan's law from Planck's law, F.D. statistics, Electron gas Comparison of M.B., B.E. and F.D. statistics

UNIT-III (15 Lectures)
Simple harmonic motion, energy of a SHM, Compound Pendulum, Torsional Pendulum, Electrical Oscillations, Transverse Vibrations of a mass on a string, composition of two perpendicular SHM of same period and of period in ratio 1: 2. Decay of free vibrations due to damping, differential equation of motion, types of damping, determination of damping co-efficient; Logarithmic decrement, relaxation time and Q- Factor, Electromagnetic damping (Electrical oscillator)

UNIT-IV (15 Lectures)
Differential equation for forced mechanical and electrical oscillators, Transient and steady state behavior, Displacement and velocity variation with driving force frequency, variation of phase with frequency, resonance. Power supplied to an oscillator and its variation with frequency, Q-value and band width, Q-value as an amplification factor. Stiffness, coupled oscillators, Normal co-ordinates and normal modes of vibration, Inductance coupling of electrical oscillators.

Books Recommended:
1. Thermodynamics, Kinetic Theory & Statistical Thermodynamics, Sears & Salinger, Narosa Publications, 1988
2. Thermal & statistical Physics, R. B Singh, New academic Science, 2011
3. Heat and Thermodynamics, M.W. Zemansky, Richard Dittman, Tata McGraw Hill, 2007
4. 1. S P Puri, Vibrations and Waves, Macmillan India Ltd., 2004.
5. 2. H.J Jain, The Physics of Vibrations and Waves, John Wiley and Sons. 2013
6. 3.N. K Bajaj, The Physics of Waves and Oscillations, Tata McGraw Hill, 1998

COURSE TITLE: ADVANCE PHYSICS LAB-I
SUBJECT CODE: BFPH-2302
SEMESTER: III
CONTACT HOURS/WEEK:

Lecture (L)	Tutorial (T)	Practical (P)	Credit (C)
0	0	4	2

Note: Students will be required to perform at least 10 experiments from the given list of experiments
1. To determine Mechanical Equivalent of Heat, J, by Callender and Barne's constant flow method.
2. Measurement of Planck's constant using black body radiation.
3. To determine Stefan's Constant.
4. To determine the coefficient of thermal conductivity of copper by Searle's Apparatus.
5. To determine the Coefficient of Thermal Conductivity of Cu by Angstrom's Method.
6. To determine the coefficient of thermal conductivity of a bad conductor by Lee and Charlton's disc method.

7. To determine the temperature co-efficient of resistance by Platinum resistance thermometer. 8. To study the variation of thermo emf across two junctions of a thermocouple with temperature.
9. To record and analyze the cooling temperature of an hot object as a function of time using a thermocouple and suitable data acquisition system
10. To calibrate Resistance Temperature Device (RTD) using Null Method/Off-Balance Bridge

Books Recommended:
   1. Advanced Practical Physics for students, B.L.Flint&H.T.Worsnop Asia Publishing House., 1971
   2. B.Sc Practical Physics, C L Arora, S. Chand & Company, 2010
   3. A Text Book of Practical Physics, InduPrakash and Ramakrishna, KitabMahal, 2011
   4. A Laboratory Manual of Physics for Undergraduate Classes, D.P. Khandelwal, vani Publication, 1985

SUBJECT TITLE:Advanced Biology-I
SUBJECT CODE: BFBO-2303
SEMESTER: III
CONTACT HOURS/WEEK:

Lecture (L)	Tutorial (T)	Practical (P)	Credit (C)
3	0	0	3

Internal Assessment: 40
End Term Exam: 60

Duration of Exam: 3 Hrs

Instruction of Question Paper setter: The question paper consists of three sections A,B and C. Section-A is compulsory consisting of 6 short answer type questions(2 marks) from the whole syllabus. Total marks to this section are 12. There will be no choice in this section. Section-B consists of 8 questions. Each question carries 4 marks. Section-C consists of 4 questions. Students will attempt any three questions. Each carries 8 marks.

Course Objective: To impart knowledge of metabolism,molecular biology and their applications.

Section-A

Metabolism, biochemical techniques Basic concepts of Metabolism: Concept of catabolism and anabolism: metabolic strategies, organization, clustering of enzymes. Regulation of Metabolic Pathways: energy charge, phosphorylation potential etc.Carbohydrate metabolism Glycolysis, glycogenolysis, gluconeogenesis, pentose phosphate pathway, Lipid metabolism β oxidation of unsaturated and saturated fatty acid and its regulation.Metabolism of chloesterol: lipoprotein metabolism, chylomicrons, LDL, HDL, VLDHL. Transamination, deamination, Fate of amino acid skeleton, urea cycle, precursors for compounds other than proteins, Genetic diseases.Formation of deoxyribonucleotides, origin of thymine.

Section-B

Nucleotide degradation: catabolism of purines and pyrimidines, fate of uric acid. Vitamins: Types, structure .deficiencies Affinity chromatography, gel exclusion, Immunoelectrophoresis, complement fixation, RIA, ELISA & Types, Fluorescence immunoassay, flow cytometry, immunohistochemical techniques, Immunoprecipitation, Elispot assay, immunoelectron microscopy, isoelectric focusing techniques.

Molecular Biology: Central dogma of Molecular biology, process of DNA replication, properties of DNA polymerases, chromosome replication initiation at ori C & termination at ter C, concept of replicon, replicating linear DNA in eukaryotes, multiple origins of replication eukaryotic chromosomes

Section-C

Non-PCR DNA Fingerprinting Techniques with Applicability in Forensic Studies- Restriction Fragment Length Polymorphisms (RFLP) and Ribotyping. Forensic Interpretation of DNA Data, Isotopic Testing and Correlation to Contaminant Source Microbes of forensic importance:Bacillusanthracis, Yersinia pestis, Francisellatularensis, Brucella spp., BurkholderiaPseudomallei, Clostridium botulinum, Listeria monocytogenes and their morphological & biochemical studies.DNA of microbes in soil for crime detectionFungi of forensic importance: Opportunistic mycoses, Chytridiomycotazygomycota, Aspergillusfumigates, microsporidum, pneumocytosisjiroveci, Asp.flavus& Candida sp, epidemiology, Antifungal agents. Microbial Forensic Analysis of Trace and Unculturable Specimens

Books Recommended:

1. Principles of gene manipulation - An introduction to genetic engineering, Old R.W., Primrose S.B., Blackwell Scientific Publications, 1993.
2. Nelson, D.L., Cox, M.M. Lehninger Principles of Biochemistry (2005). 4th edition Pub WH Freeman Co.
3. Elliott, W.H., Elliott, D.C. Biochemistry and Molecular Biology 3rd Indian edition, Pub. Oxford.
4. Mathews, Van Holde, Ahern, Biochemistry by 3rd edition, Pub Pearson education.
5. Alberts, B., Bray, D., Lewis, J., Raf, M., Roberts, K. and Watson, J.D. (1994). Molecular Biology of the Cell.
6. Cooper, G.M. (1997).The Cell: A molecular approach, ASM Press, USA.
7. Garrett, R.H. and Gresham, C.M. (1995). Molecular aspects of Cell Biology, International edition, Saunders College Pub.
8. Karp, G. (1996). Cell and Molecular Biology concepts and experiments, John Wiley and Sons Inc. NY.
9. Lodish, H., Baltimore, D., Berk, A., Zipursky, B.L., Mastsydaira, P., Darnell, J. (2004).

Molecular Cell Biology, Scientific American Books Inc. NY.

SUBJECT TITLE: Advanced Biology Laboratory-I
SUBJECT CODE: BFBO-2304
SEMESTER: III
CONTACT HOURS/WEEK:

Lecture (L)	Tutorial (T)	Practical (P)	Credit (C)
0	0	2	1

Internal Assessment: 40
End Term Exam: 60
Duration of Exam: 3 Hrs

Course Objective: To impart knowledge of Basic sterilization techniques & Isolation techniques of DNA.

1. Basic sterilization techniques required for Media preparation & Cytological techniques
2. Media preparation technique
3. Culture of Human, Plant & Animal cells
4. DNA isolation - from Plant cell (leaf of cabbage / mustard), Animal cell (goat liver),
5. Human Blood (Fresh / Stored / Frozen) & Microbes
6. Plasmid DNA isolation
7. Gel electrophoresis
8. Polymerase Chain Reaction

Books Recommended:

1. Biotechnology B D Singh, Kalyani Publication.
2. Introduction to Applied Biology and Biotechnology. K Vaidyanath, K Pratap Reddy, K Satya Prasad.

COURSE TITLE: ORGANIC CHEMISTRY-III
SUBJECT CODE: BFCH-2305
SEMESTER: III
CONTACT HOURS/WEEK:

Lecture (L)	Tutorial (T)	Practical (P)	Credit (C)
2	0	0	2

Internal Assessment: 40
End Term Exam: 60
Duration of Exam: 3 Hrs

Course Objective: To impart knowledge of basics of organic chemistry i.e. alcohols, aldehydes and ketones

Section – A

Alcohols(10 hrs)

Classification and nomenclature.

Monohydric Alcohols-nomenclature, methods of formation by reduction of aldehydes, ketone, carboxylic acids and esters.Hydrogen bonding, Acidic nature, Reactions of alcohols.

Dihydric alcohols-nomenclature, methods of formation, chemical reactions of vicinal glycols-nomenclature, methods of formation chemical reaction of vicinal glycols, oxidative cleavage with [Pb (OAc) and HIO_4] and Pinacol-Pinacolone rearrangement.

Trihydric alcohol-nomenclature, methods off formation and chemical reactions of glycerol.

Section – B

Phenols (10 hrs)

Nomenclature, structure and bonding.Preparation of Phenols, physical properties and acidic character.Comperative acidic strengths of alcohols and phenols, resonanace stabilization of phenoxideion.Reaction of phcnols-electrophilic aromatic subsititution, acylation and carboxylation Mechanisms of Fries rearrangement.Gatterman synthesis, Hauben.Heeschreaction.Lederer-Mianasse reaction and Reimer-Tiemann reaction.

Section – C

Aldehydes and Ketones (10 hrs)

Nomenclature and structure of the carbonyl group, Synthesis of aldehydes and ketones with particular reference to the synthesis of aldehydes from acid chlorides, synthesis of aldehyes and ketones using 1,3- dithianes, synthesis of ketones from nitrites and from carboxylic acids. Physical properties and Mechanism of nucleophillic addition to carbonyl group with particular emphasis ofBenzoin, Aldol, Perkin and Knoevenagel condensations, Condensation with ammonia and its derivatives, Wittig reaction, and Mannich reaction.

Use of acetals as protecting group.Oxidation of aldehydes, Baeyer-Villiger oxidation of ketones, Cannizzaro reaction, MPV, Clemmensen, Wolff-Kishner, $LiAIH_4$ and $NaBH_4$reductions.Halogenation of enolizable ketones.

An Introduction to unsaturated aldehydes and ketones, Michael addition.

Recommended Books :

1. OrganicChemsitry, Morrison and Boyd, Prentice- Hall.

2. Fundamentals of Organic Chemistry, Solomons, John Wiley.

3. Organic Chemistry. F.A. Carey, McGraw Hill, Inc.

4. Organic ChemistryVol. I, II & III, S.M. Mukherji, S.P. Singh and R.P.Kapoor, Wiley

5. Eastern Ltd (New Age International).

6. Jarry March Mechanisms of Organic Chemistry, Wiley

COURSE TITLE: PHYSICAL CHEMISTRY-II
SUBJECT CODE: BFCH-2306
SEMESTER: III
CONTACT HOURS/WEEK:

Lecture (L)	Tutorial (T)	Practical (P)	Credit (C)
4	0	0	4

Internal Assessment: 40
End Term Exam: 60
Duration of Exam: 3 Hrs

Course Objective: To impart knowledge of basics of thermodynamics, phase equilibria and electro chemistry

Section – A

Thermodynamics-I (15 hrs) Definition of thermodynamics terms: system, surroundings etc. Types of systems, intensive and extensive properties.State and path functions and their differentials, Thermodynamic processes, Concept of heat and work, elementry idea of thermochemistry.

First Law of Thermodynimcs : statement, definition of internal energy and enthalpy. Heat capacity, heat capacities at constant volume and pressure and their relationship.Joule's law. Joule Thomson coefficient and inversion temperature, Calculation of w, q, dU&dH for the expansion of ideal gases under isothermal and adiabatic conditions for reversible process.

Theromodynamics-II- (Part-a)

Second law of thermodynamics: need for the law, different statements of the law. Carnot cycle and its efficiency, Carnot theorem.Themodynamic scale of temperature.

Theromodynamics-II- (Part-b)

Concept of entropy as a state function, entropy as a function of V & T, entropy as a function of P & T, entropy change in physical change, Clausius inequality, entropy as a criterion of

spontaneity and equilibrium. Entropy change in ideal gases mixing of gases.

<div align="center">

Section – B

</div>

Thermodynamics-III (15 hrs)

Third law of thermodynamics, Nernst heat theorem, statement and concept of residual entropy, evaluation of absolute entropy from heat capacity data, Gibbs and Helmholtz functions; Gibbs function (G) and Helmhotz function (A) as thermodynamic quantities. A &G as criteria for thermodynamic equilibrium and spontaneity, their advantage over entropy change. Variation of G and A with P, V and T.

Phase Equilibrium

Statement and meaning of the terms-phase, component and degree of freedom, derivation of Gibbs phase rule; phase equilibria of one component system-water and S systems. simple eutectic Pb-Ag sytems, desilverisation of lead. Liquid-Liquid mixtures-ideal liquid mixtures, Raoult's and Henry's law.Non-ideal system-azeotropes-HCl-HP and ethanol-water systems.

Lower and upper consolute temperature, Effect of impurity on consolute temperature, immiscible liquids, steam distillation.Nernst distribution law, thermodynamic derivation & applications.

<div align="center">

Section –C

</div>

Electrochemistry-l (a) (15 hrs)

Electrical transport-conduction in metals and in electrolyte solutions, specific conductance and equivalent conductance with dilution.

Migration of ions and Kohlrauschlaw.Arrhenius theory of electrolyte dissociation and its limitations, weak and strong electrolytes, Ostwald's dilution law, its uses and limitations.Debye-Huckel-Onsagar's equation for strong electrolytes (elementa treatment only).

Electrochemistry-I (b)

Transport number, definition and deterriilfiafion by Hittorf method and moving boundary method. Applications of conductance measurements: determination of degree of dissociation, determination of K. of acids, determination of solubility product of a sparingly soluble salts, conductometric titrations.

Electrochemistry-II

Types of reversible electrodes--gas-metal ion, metal-metal ion, metal-insoluble salt-anion and redox electrodes.Electrode reactions, Nernst equation, derivation of cell E.M.F. and single

electrode potential, standard hydrogen electrode-reference electrodes-standard electrode.potential, sign conventions, electrochemical series and its significance.

Electrolyte and Galvanic cells-reversible and irreversible cells, conventional representation of electrochemical cells.

EMF of a cell and its measurements, Computation of cell EMF.Calculation of thermodynamic quantities of cell reaction (G, H and K), polarization, over potential and hydrogen over voltage.

Concentration cell with and without transport, liquid junction potential, application of concentration cells, valency of ions, solubility product and activity coefficient potentiometric titrations. Definition of pH and pK., determination of pH using hydrogen, quinhydrone and glass electrodes by potentiomentric methods.

Buffers--mechanism of buffer action, Henderson-Hazel equation, Hydrolysis of salts, Corrosion-types, theories and methods of combating it.

Recommended Books:

1. Thermodynamics for Chemists, S. Glasstone.

2 Chemical thermodynamics, P.A. Rock.

3. Principles of Physical Chemistry, S.H. Maron& C.F. Prutton.

4. Physical Chemistry, P.W. Atkins.

5. Physical Chemistry, Vol.2, K.L. Kapoor.

6. Physical Chemistry, K.J. Laidler.

COURSE TITLE: CHEMISTRY LABORTARY-III
SUBJECT CODE: BFCH-2307
SEMESTER: III
CONTACT HOURS/WEEK:

Lecture (L)	Tutorial (T)	Practical (P)	Credit (C)
0	0	6	3

Internal Assessment: 40
End Term Exam: 60
Duration of Exam: 3 Hrs

Course Objective: To impart knowledge of basics of volumetric analysis and chromatography

Volumetric Analysis and TLC

Volumetric Analysis

(a) Determination of acetic acid in commercial vinegar using NaOH, Alakanity of water sample.

(b) Determination of alkali content of antacid.

(c) Estimation of calcium content in chalk as calcium oxalate by permanganometry .

(d) Estimation of hardness of water by EDT A.

(e) Estimation of ferrous and ferric by dichromate method.

(f) Estimation of copper using sodium thiosulphate.

Organic Chemistry

Laboratory Techniques

Thin Layer Chromatography

Determination of R, values and identification of organic compounds.

(a) Separation of green leaf pigments (spinach leaves may be used)

(b) Preparation and separation of 2, 4-dinitrophenylhydrazones of acetone, benzophenonecyclohexanone using toluene and light petroleum (40 : 60).

(c) Separation of a mixture of dyes

Recommended Books :

1.Vogel's book on Inorganic Qualitative Analysis

SUBJECT TITLE: Elements of Law and criminology
SUBJECT CODE: BFFF-2308
SEMESTER: III
CONTACT HOURS/WEEK:

Lecture (L)	Tutorial (T)	Practical (P)	Credit (C)
3	0	0	3

Internal Assessment: 40
End Term Exam: 60
Duration of Exam: 3 Hrs

Instruction of Question Paper setter: The question paper consists of three sections A, B and C. Section-A is compulsory consisting of 6 short answer type questions (2 marks) from the whole syllabus. Total marks to this section are 12. There will be no choice in this section. Section-B consists of 8 questions. Each question carries 4 marks. Section-C consists of 4 questions. Students will attempt any three questions. Each carries 8 marks.
Course Objective: To impart knowledge of Criminology and criminal laws and their role in Criminal Investigation.

Section A

Crime

Criminal Profiling: Introduction, Importance, Profile of the victim and culprit, criminal behavior on the internet, limitations.

Criminology and criminal anthropology

Aim and scope of criminology; Criminal behavior and theories of criminal behavior: classic, Positivist, sociological. Role of correctional institutions analysis.

Meaning and Scope of Victimology.

Special Forms of Crime: Organized Crime: Gangs/Criminal Networks, Socio-Eonomic Crime, Custodial Crime, White-Collar Crime, Crime against Women/Children, Sex Offences.

Correctional Therapy: Probation, Parole, Furlough, Remission and Pardon.

Section B

Criminal Law

Definitions: bailable/non-bailable offences, cognizable/ non-cognizable, summon case and warrant cases.

Criminal Procedure Code: sections- 291,292,293.

Indian Evidence Act: Section 32, 45, 46, 47, 57, 58, 60, 73, 135, 136, 137, 138, 141.

Indian Penal Code sections pertaining offence against property offences against person.

Offences against the person-Sections:- 299, 300, 302, 304B, 307, 309, 319, 320, 324, 326, 351, 354, 359, 362, 375, 376, 377.

Offences against property- Sections:-378, 383, 390, 391, 420, 463, 497, 499, 503 and 511.

Expert testimony.

Section C

Police Administration

History and development of police administration; Police duties, responsibilities and powers.

Organization and structure of police station.

People and society: Custodial deaths, Police and Human Rights.

Acts

Introduction to offences and Penalties of following acts: Narcotic Drugs & Psychotropic Substances Act, Drugs & Cosmetics Act, Explosive Substances Act, Dowry Prohibition Act, Prevention of Corruption Act, Arms Act, Wild Life Protection Act, I.T. Act 2000-

Books Recommended:

1.   Arrigo (2002) : Introduction to forensic Psychology.
2.   Cooke, G. (1980) : The role of Forensic Psychologist. Chanles C. Thomas.
3.   Howitt D : 2002 Forensic and Criminal Psycholgy. Prentic Hall Publications
4.   Constitution of India
5.   Indian Evidence Act
6.   Criminal Procedure code.
7.   Indian Penal Code.
8.   Bare Acts with short notes on the following : Narcotic Drugs & Psychotropic Substances Act, Drugs & Cosmetics Act, Explosive Substances Act, Dowry Prohibition Act, Prevention of Food Adultration Act, Prevention of Corruption Act, Arms Act, Wild Life Protection Act.

9. Hess, A.K. and Weiner, I.B. (1999) Handbook of Forensic Psychology 2nd Ed. John wiley & sons.
10. Barak, Gregg : Integrative Criminology.

SUBJECT TITLE: Forensic Laboratory -I
SUBJECT CODE: BFFL-2309
SEMESTER: III
CONTACT HOURS/WEEK:

Lecture (L)	Tutorial (T)	Practical (P)	Credit (C)
0	0	2	1

Internal Assessment: 40
End Term Exam: 60
Duration of Exam: 3 Hrs

Course Objective: To impart knowledge of criminal cases and criminal behavior of the accused.

1. To review past criminal cases and elucidate which theory best explains the criminal behavior of the accused.
2. To review crime cases where criminal profiling assisted the police to apprehend the accused.
3. To cite examples of crime cases in which the media acted as a pressure group.
4. To evaluate the post-trauma stress amongst victims of racial discrimination.
5. To correlate deviant behavior of the accused with criminality (take a specific example).
6. To evaluate victimology in a heinous crime.
7. To evaluate how rising standards of living affect crime rate.
8. To prepare a schedule of five cognizable and five non-cognizable offences.
9. To study a crime case in which an accused was punished on charge of rape under Section 375.
10. To cite example of a case in which the opinion of an expert was called for under Section 45 of the Indian Evidence Act.
11. To cite a case under Article 14 of the Constitution of India wherein the Right to Equality before Law was allegedly violated.
12. To prepare a report on interrogation cells and suggest improvements.
13. To list the restrictions imposed on Right to Freedom of Worship under the Constitution of India.
14. In light of Section 304B of the Indian Penal Code, cite a case involving dowry death.
15. To study a case wherein the Untouchability Offences Act was invoked on the basis of Article 15 of the Constitution of India.
16. To prepare a schedule of persons convicted under Narcotics, Drugs and Psychotropic Act statistically analyze the age group to which they belonged.

Books Recommended:

1. S.H. James and J.J. Nordby, Forensic Science: An Introduction to Scientific and Investigative Techniques, 2nd Edition, CRC Press, Boca Raton (2005).

2. D.E. Zulawski and D.E. Wicklander, Practical Aspects of Interview and Interrogation, CRC Press, Boca Raton (2002).

3. R. Saferstein, Criminalistics, 8th Edition, Prentice Hall, New Jersey (2004).

4. J.L. Jackson and E. Barkley, Offender Profiling: Theory, Research and Practice, Wiley, Chichester (1997).

5. R. Gupta, Sexual Harassment at Workplace, LexisNexis, Gurgaon (2014).

6. D.A. Bronstein, Law for the Expert Witness, CRC Press, Boca Raton (1999).

7. Vipa P. Sarthi, Law of Evidence, 6th Edition, Eastern Book Co., Lucknow (2006).

8. A.S. Pillia, Criminal Law, 6th Edition, N.M. Tripathi Pvt Ltd., Mumbai (1983).

9. R.C. Nigam, Law of Crimes in India, Volume I, Asia Publishing House, New Delhi (1965).

10. (Chief Justice) M. Monir, Law of Evidence, 6th Edition, Universal Law Publishing Co. Pvt. Ltd., New Delhi (2002)

SYLLABUS

SEMESTER-IV

COURSE TITLE: ADVANCE PHYSICS II
SUBJECT CODE: BFPH-2401
SEMESTER: IV
CONTACT HOURS/WEEK:

Lecture (L)	Tutorial (T)	Practical (P)	Credit (C)
4	0	0	4

UNIT-I (12 Lectures)
Interference: Concept of coherence, spatial and temporal coherence, coherence time, coherence length, area of coherence, Conditions for observing interference fringes, Interference by wavefrontdivision and amplitude division, Young's double slit experiment, Lloyd's mirror and Fresnel's biprism, phase change on reflection, Michelson interferometer-working, principle and nature of fringes, Interference in thin films, Role of interference in anti-reflection and high reflection dielectric coatings, Multiple beam interference, Fabry-Perot interferometer, nature of fringes

UNIT-II (08 Lectures)
Diffraction: Huygen-Fresnal theory half period zones, zone plates, Distinction between Fresnel and Fraunhofer diffraction,Fraunhofer diffraction at rectangular and circular apertures, Effects of diffraction in optical imaging, resolving power of microscope, telescope, Fabry-Perot interferometer. The diffraction grating, its use as a spectroscopic element, resolving power

UNIT III   (07 Lectures)
Polarization: Concept and analytical treatment of unpolarised, plane polarized and elliptically polarized light. Double refraction, Nicol prism, sheetpolarisers, retardation plates, Production and analysis of polarized light (quarter and half wave plates)

UNIT-IV(15 Lectures)

Interacation of light with matter: Absorption, spontaneous emission, stimulated emission, Charatertistics of stimulated emission, Einstein coefficients and their relations, Light amplification, Population inversion, Lasing action, Components of Laser, Elementary theory of optical cavity, longitudinal and transverse modes, Principal pumping schemes, Three level and four level laser schemes, Types of lasers, Ruby and Nd : YAG lasers. He–Ne, and CO_2 lasers, Semiconductor lasers, Holography. Principle, recording of hologram and reconstruction of image, Theory of holography

Books Recommended:
1. Subramanayam, N.; Lal, B. and Avadhamulu; M. N. Textbook of Optics. New Delhi: S. Chand & Company, 2006.
2. Jenkins, F.A.; White, H.E. Fundamentals of Optics. USA: McGrawHill Publication,
3. Ghatak,A. Optics. New Delhi:Tata McGraw Hill Publication, 2008.

COURSE TITLE: ADVANCE PHYSICS LAB-IV
SUBJECT CODE: BFPH-2402
SEMESTER: IV
CONTACT HOURS/WEEK:

Lecture (L)	Tutorial (T)	Practical (P)	Credit (C)
0	0	4	2

Objective: The objective of this lab is to highlight Properties and Characteristics of light through experiments related to interference and diffraction phenomenon
Note: Students will be required to perform at least 10 experiments from the given list of experiments

List of Experiments
1. To determine the wavelength of laser source using diffraction of single slit.
2. To determine the wavelength of laser source using diffraction of double slits.
3. To determine (1) wavelength and (2) angular spread of He-Ne laser using plane diffraction grating
4. Familiarization with: Schuster`s focusing; determination of angle of prism.
5. To determine refractive index of the Material of a prism using sodium source.
6. To determine the dispersive power and Cauchy constants of the material of a prism using mercury source.
7. To determine the wavelength of sodium source using Michelson's interferometer.
8. To determine wavelength of sodium light using Fresnel Biprism.
9. To determine wavelength of sodium light using Newton's Rings.
10. To determine wavelength of (1) Na source and (2) spectral lines of Hg source using plane diffraction grating.
11. To determine dispersive power and resolving power of a plane diffraction grating.
12. To verify the law of Malus for plane polarized light.
13. To determine the specific rotation of sugar solution using Polarimeter.

14. To study the polarization of light by reflection and determine the polarizing angle for air-glass
interface.

SUBJECT TITLE: Advanced Biology-II
SUBJECT CODE: BFBO-2403
SEMESTER: IV
CONTACT HOURS/WEEK:

Lecture (L)	Tutorial (T)	Practical (P)	Credit (C)
3	0	0	3

Internal Assessment: 40
End Term Exam: 60
Duration of Exam: 3 Hrs

Instruction of Question Paper setter: The question paper consists of three sections A, B and C. Section-A is compulsory consisting of 6 short answer type questions(2 marks) from the whole syllabus. Total marks to this section are 12. There will be no choice in this section. Section-B consists of 8 questions. Each question carries 4 marks. Section-C consists of 4 questions. Students will attempt any three questions. Each carries 8 marks.

Course Objective: To impart knowledge of Forensic Anthropology.

Section-A

Introduction and history,basic information about bones, Significance of Forensic Anthropology Scope of forensic anthropology.Study of human skeleton.Nature, formation, and identification of human bones.   Ethics involved while handling human bones and anthropometry, Determination of age, sex, stature from skeletal material. Personal Identification – Somatoscopy and Somatoscopytechnique to study various parts of human body, and Somatometry technique of measurement– observation of hair on head, forehead, eyes, root of nose, nasal bridge, nasal tip, chin.

Section-B

Darwin's tubercleor auricular tubercle- history and inheritance, ear lobes, supra-orbital ridges, physiognomic ear breadth, circumference of head. Scar marks and occupational marks. Somatometry – measurements of head, face, nose, cheek, ear, hand and foot, body weight, height. Indices - cephalic index, nasal index, cranial index, upper facial index.

Section-C

Facial Reconstruction: Portrait Parle/ Bertillon system. Photofit/identikit.Facial superimposition techniques.Craniofacial superimposition techniques – photographic super imposition, videosuperimposition, Roentgenographic superimposition.Use of somatoscopic and craniometric

methods in reconstruction. Importance of tissue depth in facial reconstruction. Genetic and congenital anomalies – causes, types, identification and their forensic significance.

Books Recommended:

1. Forensic Anthropology: Current Methods and Practice Hardcover – 5 Mar 2014
by Angi M. Christensen (Author), Nicholas V. Passalacqua (Author),Eric J. Bartelink (Author)
2. M.Y. Iscan and S.R. Loth, The scope of forensic anthropology in, Introduction to
Forensic Sciences, 2nd Ed., W.G. Eckert (Ed.), CRC Press, Boca Raton (1997).
3. D. Ubelaker and H. Scammell, Bones, M. Evans & Co., New York (2000).
4. S.Rhine, Bone Voyage: A Journey in Forensic Anthropology, University of Mexico
Press, Mexico (1998).

SUBJECT TITLE: Advanced Biology Laboratory –II
SUBJECT CODE: BFBO-2403
SEMESTER: IV
CONTACT HOURS/WEEK:

Lecture (L)	Tutorial (T)	Practical (P)	Credit (C)
0	0	2	1

Internal Assessment: 40
End Term Exam: 60
Duration of Exam: 3 Hrs

Course Objective: To impart practical knowledge of Forensic Anthropology.

1. To determine of age from skull and teeth.

2. To determine of sex from skull.

3. To determine sex from pelvis.

4. To study identification and description of bones and their measurements.

5. To investigate the differences between animal and human bones.

6. To perform somatometric measurements on living subjects.

7. To carry out craniometric measurements of human skull.

8. To estimate stature from long bone length.

9. To conduct portrait parley using photofit identification kit.

Books Recommended:

1. Forensic Anthropology: Current Methods and Practice Hardcover – 5 Mar 2014

by Angi M. Christensen (Author), Nicholas V. Passalacqua (Author),Eric J. Bartelink (Author)
2. M.Y. Iscan and S.R. Loth, The scope of forensic anthropology in, Introduction to Forensic Sciences, 2nd Ed., W.G. Eckert (Ed.), CRC Press, Boca Raton (1997).
3. D. Ubelaker and H. Scammell, Bones, M. Evans & Co., New York (2000).
4. S.Rhine, Bone Voyage: A Journey in Forensic Anthropology, University of Mexico Press, Mexico (1998).

COURSE TITLE: ORGANIC CHEMISTRY-IV
SUBJECT CODE: BFCH-2405
SEMESTER: IV
CONTACT HOURS/WEEK:

Lecture (L)	Tutorial (T)	Practical (P)	Credit (C)
2	**0**	**0**	**2**

Internal Assessment: 40
End Term Exam: 60
Duration of Exam: 3 Hrs

Course Objective: To impart knowledge of basics of carboxylic acids, ethers, nitrogen containg compounds

Section – A (10 hrs)

Carboxylic Acids

Nomenclature, structure and bonding.physical properties, acidity of carboxylic acids, effects of substituents on acid strength.Preparation of carboxylic acids, Reactions of amides, Reactions of carboxylic acids, Mechanism of decarboxylation.

Methods of formition and chemical reactions of halo acids.Hydroxyacids, maleic and tartaric acid, citric acids. (Structural Formula only),

Methods of formation and chemical reaction of unsaturated nonocarboxylicacids.Dicaboxylic acids, methods of formation and effect of heat and dehydrating agents.

Carboxylic Acid Derivatives

Structure and nomenclature of acid chlorides, esters.amides and cid anhydrides.Relative stability and reactivity of acyl derivatives.

Physical properties, interconversion of acid derivatives by nucleophillic acyl substitution.

Preparation of carboxylic derivatives, chemical reactions, Mechanism of esterfication and hydrolysis (acidic and Basic).

Section-B (10 hrs)

Ethers and Epoxides

Nomenclature of ethers and methods of their formation, physical properties, Chemical reactions-cleavage and autooxidation, Ziesel's Method.

Synthesis of epoxide, add and base catalyzed ring opening of epoxide, orientation of ring opening reactions of Grignard and organolithium reagents with epoxide.

Fats, Oils and Detergents

Natural fats, edible and industrial oils of vegetable origin, common fatty acids, glycerides, hydrogenation of unsaturated oils.Saponification value, iodine value, acid value.Soaps, synthetic detergents, alkyl and aryl sulphonates.

Section-C (10 hrs)

Organic Compunds of Nitrogen

a) Nitro Compounds

Preparation of nitroalkanes and nitroarenes.Chemical reactions of nitroalkanes.Mechanism of nucleophilic substitution in nitroarenes and their reactions in acidic, neutral and alkaline media, Picric acid.

b) Amines

Reactivity, structure and nomenclature of amines, physical properties. Stereochemistry of amines Separation of a mixture secondary and tertiary amines. Structural features effecting the basicity of amines. Amine salts as phase-transfer catalyst and preparation of alkyl and aryl amines (reduction of nitro compounds and nitriles), reductive amination of aldehydic and ketonic compounds

Gabriel-phthalimide reaction, Hoffmann bromamideraction.

Recommended Books:

1. Organic Chemsitry, F.A.Carey, McGraw Hill Inc.
2. Organic Chemsitry, Morrison & Boyd, Prentice Hall.

COURSE TITLE: INORGANIC CHEMISTRY-II
SUBJECT CODE: BFCH-2406
SEMESTER: IV
CONTACT HOURS/WEEK:

Lecture (L)	Tutorial (T)	Practical (P)	Credit (C)
4	0	0	4

Internal Assessment: 40
End Term Exam: 60
Duration of Exam: 3 Hrs

Course Objective: To impart knowledge of transition series, lanthanides and actinides

Section-A (15 hrs)

Chemistry of Elements of First Transition Series

Characteristic properties of d-block elements. Properties of the elements of the first transition series, their simple compounds and complexes illustrating relative stability of their oxidation states, coordination number and geometry.

Chemistry of Lanthanide Elements

Electronic structure, oxidation states and ionic radii and lanthanide contraction, complex formation, occurrence and isolation of lanthanide compounds.

Section-B (15 hrs)

Chemistry of Elements of Second and Third Transition Series

General characteristics, comparative treatment with their 3d-analogues in respect of ionic radii, oxidation states. Magnetic behavior, spectral properties & stereochemistry

Chemistry of Actinides Elements

General features and chemistry of actinides, chemistry of separation of Np, Pu and Am from U, similarities between the later actinides and the later lanthanides.

Coordination Compounds

Werner's coordination theory and its experimental verification, effective atomic number concept, chelates, nomenclature of coordination compounds, isomerism in coordination compounds, valence bond theory of transition metal complexes.

Section – C (15 hrs)

Oxidation and Reduction

Use of redox potential data-analysis of redox cycle, redox stabilityto water-Frost, Latimer and Pourbaix diagrams. Principles involved in the extraction of the elements.

Acids and Bases

Arrhenius, Bronsted-Lowry, the Lux-Flood solvent system and Lewis concepts of acids and bases.

Non-aqueous Solvents

Physical properties of a solvent, types of solvents and their general characteristics, reaction in non-aqueous solvents with reference to liquid NH_3 and liquid SO_2

Recommended Books:

1. J.D. Lee, Concise Inorganic Chemistry, 4th Ed.

2. J.E. Huheey, Inorganic Chemistry, Harper & Row.

3. F.A.Cotton and G. Wilinson, Advanced Inorganic Chemistry, Interscience Publishers.

4. N.N. Greenwood and A. Earnshaw, Chemistry of Elements, Pergamon Press.

COURSE TITLE: CHEMISTRY LABORTARY-IV

SUBJECT CODE: BFCH-2407
SEMESTER: IV
CONTACT HOURS/WEEK:

Lecture (L)	Tutorial (T)	Practical (P)	Credit (C)
0	0	6	3

Internal Assessment: 40
End Term Exam: 60
Duration of Exam: 3 Hrs

Course Objective: To impart knowledge of qualitative analysis

Qualitative Analysis

Detection of elements (N, S and halogens) and functional groups (phenolic, carboxylic, carbonyl, esters, carbohydrates, amines, amides, nitro and anilide) in simple organic compounds.

Physical Chemistry

1. To determine the solubility of benzoic acid at different temperatures and to determine H of the dissolution process.

2. To determine the enthalpy of neutralization of a weak acid/weak base versus strong

base/strong acid and determine the enthalpy of ionization of the weak acid/weak base.

3. To determine the enthalpy of solution of solid calcium chloride.

Recommended Books:

1. Vogel A. I., Tatchell A. R., Furnis B. S., Hannaford A. J., Smith P.W.G.,Vogel's Text

Book of Practical Organic Chemistry,5thEdn.,Pubs: ELBS, 1989.

2. Pavia D.L., Lampanana G.M., Kriz G.S. Jr., Introduction to Organic Laboratory Techniques, 3rd

3. Advanced Practical Physical Chemistry By J. B. Yadav

SUBJECT TITLE: Questioned document examination and Finger Print analysis
SUBJECT CODE: BFFF-2408
SEMESTER: IV
CONTACT HOURS/WEEK:

Lecture (L)	Tutorial (T)	Practical (P)	Credit (C)
3	0	0	3

Internal Assessment: 40
End Term Exam: 60
Duration of Exam: 3 Hrs

Instruction of Question Paper setter: The question paper consists of three sections A, B and C. Section-A is compulsory consisting of 6 short answer type questions (2 marks) from the whole syllabus. Total marks to this section are 12. There will be no choice in this section. Section-B consists of 8 questions. Each question carries 4 marks. Section-C consists of 4 questions. Students will attempt any three questions. Each carries 8 marks.

Course Objective: To impart knowledge of different type of document asked in crime analysis, finger printing and their role in Criminal Investigation.

Section A

Documents in general: Importance, Classification and Preliminary Examination.
Handwriting Characteristics: General Characteristics, Individual Characteristics, Development of Individuality in Handwriting.

Comparison of handwriting:
 i) **Natural Variations** in handwriting-Definition and nature, Determination of range of variations (consistency) and its importance for handwriting comparison.
ii) **Fundamental divergences** in handwriting, its interpretation in relation to identification of handwriting, consideration of various writing instruments used in writing.
iii) **Standards for comparison** of handwriting.
iv) **Principles** of handwriting identification.

Section B

Forgery: definitions, types and characteristics

Indented and Invisible Writings: Alterations in the document: erasures, additions, Overwriting and obliterations: their examination. Advanced methods of examination of alterations as Projectina/video- spectral comparator (VSC) and ESDA, their working principles and applications

Built-up Documents: nature and their examination. Determination of sequence of strokes.

Comparison of type written matter: Working of typewriter, Printing and Machine Defects, alterations in typed text, various type of typewriting devices- check writing machines, electronic typewriter and proportional spacing typewriter.

Section C

Fingerprints: History of fingerprints, Definitions of fingerprints given by different authors, Basics of taking inked prints: Plain and rolled prints. Classification of finger Prints, pattern types, pattern area, Henry system of classification, Finger Prints Bureau.

Role of fingerprints in personal identification.

Development of fingerprints by powder, optical and chemical methods, chance prints, latent finger prints, palm prints, shoe impressions: importance and examination.

Application of laser and other radiations to develop latent fingerprints, metal deposition method and development of latent prints on skin.

Comparison of finger prints: basis of comparison, class characteristics, individual characteristics, various types of ridge characteristics.

Books Recommended:
1. Huber A. R. and Headrike A.M. (1999), **Handwriting identification: facts and fundamental,** CRC LLC.
2. Ellen D. (2nd Edition) (1997), **The scientific examination of Documents, Methods and techniques,** Taylor & Francis Ltd.
3. Morris R.N. (2000), **Forensic Handwriting Identification (fundamental concepts and Principals),** Academic press.
4. Harrison W.R. (1966), **Suspect Documents & their Scientific Examination,** Sweet & Maxwell Ltd. London.
5. Hilton O. (1982), **The Scientific Examination of Questioned Document,** Elsaevier North Holland Inc. New York.
6. Conway J.V.P. (1959), **Evidential Documents,** Charles C. Thomas, Illinois.
7. Mehta M. K. (1970), The **identification of Handwriting & Cross Examination of Experts,** N.M. Tripathi, Allahabad.
8. Sulner H.F. (1966), **Disputed Document,** Oceana Publications Inc. New York.
9. Saxena B.L. (1963), **Law & Techniques Relating to Finger Prints, Foot Prints & Detection of Forgery**, Central Law Agency, Allahabad (Ed. A.K. Singla).
10. Osborn A.S. (1929), **Questioned Documents,** Boyd Printing Co. Chicago.
11. Levinson J: (2000), **Questioned Documents,** Academic Press, Tokyo.

12.   Kelly J.S and Lindblom B.S. (2006), **Scientific Examination of Questioned Documents,** Taylor & Francis, New York.

SUBJECT TITLE: Forensic Laboratory -II
SUBJECT CODE: BFFL-3409
SEMESTER: IV
CONTACT HOURS/WEEK:

Lecture (L)	Tutorial (T)	Practical (P)	Credit (C)
0	**0**	**2**	**1**

Internal Assessment: 40
End Term Exam: 60
Duration of Exam: 3 Hrs

Course Objective: To impart knowledge of different type of document asked in crime analysis and Finger Print analysis.

1. How to procure fingerprints & method of taking fingerprints manually (rolled & plain).
2. To carry out ten digit classification of fingerprints.
3. To identify different fingerprint patterns.
4. To identify core and delta.
5. To carry out ridge tracing and ridge counting.
6. To investigate physical methods of fingerprint detection.
7. To investigate chemical methods of fingerprint detection.
8. To study the line quality defects in handwriting samples.
9. To prepare cast of foot prints
10. To identify handwriting characters.
11. To study natural variations in handwriting.
12. To compare handwriting samples.
13. To detect simulated forgery.
14. To detect traced forgery.
15. To differentiate between LTI & RTI.
16. Prepare a case report on "Collecting the samples of handwriting of school & college age groups & making their comparison".

Books Recommended:
1. J.E. Cowger, Friction Ridge Skin, CRC Press, Boca Raton (1983).

2. D.A. Ashbaugh, Quantitative-Qualitative Friction Ridge Analysis, CRC Press, Boca Raton (2000).

3. C. Champod, C. Lennard, P. Margot an M. Stoilovic, Fingerprints and other Ridge Skin Impressions, CRC Press, Boca Raton (2004).

4. Lee and Gaensleen's, Advances in Fingerprint Technology, 3rd Edition, R.S. Ramotowski (Ed.), CRC Press, Boca Raton (2013).

5. O. Hilton, Scientific Examination of Questioned Documents, CRC Press, Boca Raton(1982).

6. 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).

7. R.N. Morris, Forensic Handwriting Identification: Fundamental Concepts and Principles, Academic Press, London (2000).

8. E. David, The Scientific Examination of Documents – Methods and Techniques, 2nd Edition, Taylor & Francis, Hants (1997)

SYLLABUS

SEMESTER-V

COURSE TITLE: Applied Physics-I
SUBJECT CODE: BFPH-3501
SEMESTER: V
CONTACT HOURS/WEEK:

Lecture (L)	Tutorial (T)	Practical (P)	Credit (C)
3	0	0	3

Objective: This course is designed to study the spectrum of atom and molecules. The course also covers the effect of magnetic field on the spectral lines and its applications of spectroscopy in different area.

UNIT-I   (8 Lectures)
One Electron atomic Spectra: Spectrum of Hydrogen atom, Line spectra, Electron Angular Momentum. Space Quantization, Electron Spin and Spin Angular Momentum, Stern Gerlach experiment, Larmor's Theorem, Spin Magnetic Moment, Spin-orbit coupling, Total angular momentum

UNIT-II   (8 Lectures)
Atoms in External Magnetic Field: Zeeman Effect (normal and Anomalous), Experimental set-up for studying Zeeman effect, Explanation of normal Zeeman effect(classical and quantum mechanical), Explanation of anomalous Zeeman effect(Lande g-factor), Zeeman pattern of D1 and D2 lines of Na-atom.

UNIT–III   (12 Lectures)
Many electron atoms: Exchange symmetry of wave function, Symmetric and Antisymmetric Wave Functions, Pauli's Exclusion Principle, and periodic classification of elements, atomic spectra (Helium), Essential features of spectra of Alkaline-earth elements, Spectral Notations for Atomic States, Total angular momentum, Vector Model: Spin-orbit coupling, L-S and J-J coupling schemes, in atoms-L-S and J-J couplings, equivalent and non-equivalent electrons, Two valance electron system-spectral terms of non-equivalent and equivalent electrons, comparison of spectral terms in L-S And J-J coupling, Hyperfine structure of spectral lines and its origin

UNIT-IV   (12 Lectures)
Interaction energy ideas, X-ray spectra, Mosley law, Absorption spectra, Auger effect, General Considerations of Molecular spectra, Electronic States of Diatomic Molecules, Rotational Spectra (Far IR and Microwave Region), Vibrational Spectra (IR Region), Rotator Model of Diatomic Molecule, Raman Effect, Electronic Spectra.

Books Recommended:
1. Introduction to Atomic Spectra: H.E. White-Auckland McGraw Hill,
2. Elements of Spectroscopy, Gupta, Kumar and Sharma, PragatiPrakashan, Meerut, 2016
3. Atomic and MoleculerSpectra:Laser , Raj Kumar, KedarNath Ram Nath Publications.

COURSE TITLE: Applied Physics Laboratory-I
SUBJECT CODE: BFPH-3502
SEMESTER: V
CONTACT HOURS/WEEK:

Lecture (L)	Tutorial (T)	Practical (P)	Credit (C)
0	0	4	2

Objective: The course covers experiments related to atomic spectra & Solid state physics
Note: Students will be required to perform at least 12 experiments from the given list of experiments

List of Experiments
1. Photo-electric effect: photo current versus intensity and wavelength of light; maximum energy of photo-electrons versus frequency of light
2. To determine the Planck's constant using LEDs of at least 4 different colours.
3. To determine the wavelength of H-alpha emission line of Hydrogen atom.
4. To determine the ionization potential of mercury.
5. To determine the absorption lines in the rotational spectrum of Iodine vapour.
6. To determine the value of e/m by (a) Magnetic focusing or (b) Bar magnet.
7. To setup the Millikan oil drop apparatus and determine the charge of an electron.
8. Study of Zeeman Effect: with external magnetic field; Hyperfine splitting
9. Measurement of Planck's constant using black body radiation and photo-detector
10. Measurement of susceptibility of $Fecl_3$ (Quinck`s Tube Method)
11. To measure the Magnetic susceptibility of Solids.
12. To measure the Dielectric Constant of a dielectric Materials
13. To draw the BH curve of Fe using Solenoid & determine energy loss from Hysteresis.
14. To measure the resistivity of a semiconductor (Ge) with temperature by four-probe method (room temperature to 150ºC) and to determine its band gap.
15. To determine the Hall coefficient of a semiconductor sample.

Books Recommended:
1. Advanced Practical Physics for students, B.L. Flint and H.T. Worsnop, Asia Publishing House, 1971
2. A Text Book of Practical Physics, I.Prakash& Ramakrishna, KitabMahal, 2011
3. Elements of Solid State Physics, J.P. Srivastava, Prentice-Hall of India, 2006
4. B.Sc Practical Physics, C L Arora, S. Chand & Company, 2010

SUBJECT TITLE:Applied Biology-I
SUBJECT CODE: BFBO-3503
SEMESTER: V
CONTACT HOURS/WEEK:

Lecture (L)	Tutorial (T)	Practical (P)	Credit (C)
3	0	0	3

Internal Assessment: 40
End Term Exam: 60

Duration of Exam: 3 Hrs

Instruction of Question Paper setter: The question paper consists of three sections A,B and C. Section-A is compulsory consisting of 6 short answer type questions(2 marks) from the whole syllabus. Total marks to this section are 12. There will be no choice in this section. Section-B consists of 8 questions. Each question carries 4 marks. Section-C consists of 4 questions. Students will attempt any three questions. Each carries 8 marks.

Course Objective: To impart knowledge of genetics and evolution.

Section-A

1. Genetic material: DNA structure; types of DNA; DNA replication in Prokaryotes and Eukaryotes (in brief); DNA – protein interaction; the nucleosome model. Satellite and repetitive DNA; Cell division: Mitosis; meiosis. 2. Transcription (Prokaryotes and Eukaryotes); Types of structures of RNA (mRNA, rRNA, tRNA), RNA polymerase- various types; Translation (Prokaryotes and Eukaryotes; Genetic code. Regulation of gene expression: Structure of gene; Prokaryotes: Lac operon, Tryptophan operon and in Eukaryotes (in brief).Protein structure.

Section-B

3. Genetic inheritance: Mendelism; laws of segregation and independent assortment; linkage and crossing over; Polygenes- Quantitative inheritance; allelic (Incomplete dominance, Codominance, Multiple alleles, Lethal genes and Pleiotropic genes) and non-allelic interactions (Duplicate genes, Polymeric or Additive genes, Complementary genes, Supplementary genes, Epistasis and Inhibitor genes). 4. Genetic Variations: Mutations – Mechanism of spontaneous and induced; transposable genetic elements. Evolution: Brief account of Origin of life, evolutionary theories of Lamarck, Darwin, De Vries and Modern Theory, evidences for organic evolution.

Section-C

Basic Principles DNA as biological blueprint of life. Extraction of DNA for analysis.Quantization of DNA – yield gel quantization and slot blot quantization. Mitochondrial DNA – sequence analysis. Forensic DNA Typing Collection of specimens. Polymerase chain reaction – historical perspective, sequence polymorphisms, individualization of evidence. Short tandem repeats (STR) – role of fluorescent dyes, nature of STR loci. Tools and techniques of recombinant DNA technology with special reference to restriction enzymes, gel electrophoresis, Southern blotting, cloning vectors and PCR. Genomic and cDNA library.

Books Recommended:

1. Bajaj, Y.P.S. 2000. Biotechnology in Agriculture and Forestry-44-Transgenic Trees, spinger Pub., New York, USA

2. Bajaj, Y.P.S. 2000. Biotechnology in Agriculture and Forestry-46-Transgenic Trees, spinger Pub., New York, USA

3. Brown, T.A. 1999. Genomes. John Wiley & Sons (Asia) Pvt. Ltd., Singapore.

4. Dawson, M.T., Powell, R. and LGannon, F. 1996. Gene Technology, BIOS Sci. Pub. Ltd., Oxford, UK.

5. Erlich, H.A. (Ed.) 1989, PCR Technology – Principles and applications for DNA Amplification. Stockton Press, New York, USA

6. Glazer, A.N. and Nikaido, H. 1995. Microbial Biotechnology, W.H. Freeman & Company, New York, USA

7. Glover, D.M. and Hames, B.D. (Eds.) 1995. DNA Clonning I – A Practical Approach, OIRL Press, Oxford, UK.

8. Gupta, P.K. 1996. Elements of Biotechnology, Rastogi& Co., Pub., Meerut, India.

SUBJECT TITLE: Applied Biology Laboratory-I
SUBJECT CODE: BFBO-3504
SEMESTER: V
CONTACT HOURS/WEEK:

Lecture (L)	Tutorial (T)	Practical (P)	Credit (C)
0	**0**	**2**	**1**

Internal Assessment: 40
End Term Exam: 60
Duration of Exam: 3 Hrs

Course Objective: To impart knowledge of different instrumental techniques.

1. Sterilization: principles & operations – Autoclave,Hot Air Oven, Filtration, Laminar Air Flow
2. Principles & operations of Incubators & Shakers
3. Principle & operation of Centrifuge
4. Principle & operation of pH meter
5. Principle & operation of Colorimeter
6. Principle & operation of Spectrophotometer
7. Electrophoresis techniques

COURSE TITLE: ORGANIC CHEMISTRY-V
SUBJECT CODE: BFCH-3505
SEMESTER: V
CONTACT HOURS/WEEK:

Lecture (L)	Tutorial (T)	Practical (P)	Credit (C)
2	0	0	2

Internal Assessment: 40
End Term Exam: 60
Duration of Exam: 3 Hrs

Course Objective: To impart knowledge of basics of spectroscopy & organometallics.

SECTION-A (15hrs)

I. Spectroscopy
Nuclear magnetic resonance (NMR) spectroscopy.
Proton magnetic resonance (^{1}H NMR) spectroscopy, nuclear shielding and deshielding, chemical shift and molecular structure, spin-spin splitting and coupling constants, areas of signals interpretation of PMR spectra of simple organic molecules such as ethyl bromide, ethanol, acetaldehyde, 1,1,2 tribromoethane, ethyl acetate, toluene and acetophenone.

II. Electromagnetic spectrum: Absorption Spectra
Ultraviolet (UV) absorption spectroscopy-absorption laws (Beer-Lambert's law, Molar absorptivity, presentation and analysis ofUV Spectra, types of electronic transitions, effect of conjugation. Concept of chromophore and auxochrome. Bathochromic, hypsochromic, hyperchromic and hypochromic shifts. UV spectra of conjugated enes and enones.

SECTION – B (5hrs)

III Infrared (IR)
Infrared (IR) absorption spectroscopy-molecular vibrations, Hooke's law, Selection rules, intensity and position of IR bands, measurement of lR spectrum, fingerprint region, characteristic absorption of various functional groups and Interpretation of IR spectra of simple organic compounds.
Problems pertaining to the structure elucidation of simple organic compounds using UV, IR, and PMR spectroscopic techniques.

SECTION – C (10hrs)

IV. Organometallic Compounds
Organomagnesium Compounds The Grignard reagents formation, structure and chemical reactions.
Organozinc compounds: formation and chemical reactions.
Organolithium compounds: formation and chemical reactions.

V. Organosulphur Compounds
Nomenclature, structural features, methods of formation and chemical reactions of thiols, thioethers, sulphonic acids, and sulphonamides.

Recommended Books:

1.Organic Chemistry, F.A Carey, McGraw-Hill, Inc.
2.Introduction to Organic Chemistry, Streitwieser, Healthcock and Kosover and Kosover, Macmillan.
3.Organic Chemistry, Vol. I, II & III, S.M. Mukherji, S.P. Singh and R.P. Kapoor, Wiley Eastern Ltd. (New Age International).

COURSE TITLE: PHYSICAL CHEMISTRY-III
SUBJECT CODE: BFCH-3506
SEMESTER: V
CONTACT HOURS/WEEK:

Lecture (L)	Tutorial (T)	Practical (P)	Credit (C)
4	0	0	4

Internal Assessment: 40
End Term Exam: 60
Duration of Exam: 3 Hrs

SECTION-A (20hrs)
I. Elementary Quantum Mechanics
Black-body radiations, Planck's radiation law, photoelectric effect, heat capacity of solids.
Sinusoidal wave equation Hamiltonian operator, Schrodingcr wave equation and its importance, physical interpretation of the wave function, postulates of quantum mechanics, particle in a one dimensional box.
Schrodinger wave equation for H-atom, separation into three equations (without derivation), quantum numbers and their importance, hydrogen like wave functions, radial wave functions, angular wave functions.

II. Spectroscopy
Introduction :
        Electromagnetic radiation, regions of spectrum, basic features of different spectrometers, statement of Born-Oppenheimer approximation, degrees of freedom.

SECTION-B (20hrs)

III. Rotational Spectrum :
Diatomic molecules. Energy levels of a rigid rotor (semi-classical principles), selection rules, spectral intensity, determination of bond length, qualitative description of non-rigid rotor, isotope effect.
IV. Vibrational Spectrum:
Infrared spectrum: Energy levels of simple harmonic oscillator, selection rules, pure vibrational spectrum, intensity, determination of force constant and qualitative relation of force constant and bond energies, effect of anharmonic motion and isotope on the spectrum, idea of vibrational frequencies of different functional groups.

V. Raman Spectrum :

Concept of polarizability, pure rotational and pure vibrational Raman spectra of diatomic molecules, selection rules.

VI. Electronic Spectrum :

Concept of potential energy curves for bonding and antibonding molecular orbitals, qualitative description of selection rules and Franck-Condon principle. Qualitative description of σ, π and n M.O.their energy levels and their respective transitions.

SECTION-C (20hrs)

VII. Solid State

Definition of space lattice and unit cell.

Laws of crystallography-(i) Law of constancy of interfacial angles. (ii) Law of rationality of indices (iii) Law of symmetry elements in crystals.

X-ray diffraction by crystals.Derivation of Bragg's equation.Determination of crystal structure ofNaCI, KCI and CsCI (Laue's method and powder method).

VIII.   Photochemistry

Interaction of radiation with matter, difference between thermal and photochemical process. Laws of photochemistry: Grothus-Drapperlaw, Stark-Einstein law, Jablonski diagram depicting various processes occurring in the excited state, qualitative description of fluorescence, non-radiative processes (internal conversion, intersystem crossing), quantumyield, photosensitized reactions- energy transfer processes (simple examples). Basic concepts of Laser and Maser.Photochemistry of vision and colour.

Recommended Books:

1. Physical Chemistry, R.A Alberty, Wiley Eastern Ltd.
2. The Elements of Physical Chemistry, P. W. Atkins, Oxford.
3. Physical Chemistry Through Problems, S.K. Dogra and S. Dogra, Willey Eastern Ltd.
4. Fundamentals of Photochemistry, Rohtga and Mukherji.

COURSE TITLE: CHEMISTRY LABORTARY-IV
SUBJECT CODE: BFCH-3507
SEMESTER: V
CONTACT HOURS/WEEK:

Lecture (L)	Tutorial (T)	Practical (P)	Credit (C)
0	**0**	**6**	**3**

Internal Assessment: 40
End Term Exam: 60
Duration of Exam: 3 Hrs

Course Objective: To impart knowledge of synthesis of inorganic & organic compounds.

Synthesis and Analysis

(a) Preparation of sodium trioxalatoferrate(III), $Na_3[Fe(C_2O_4)_3]$ and determination of its composition by permagnometry.
(b) Preparation of Ni-DMG complex, $[Ni (DMG)_2]^{2+}$
(c) Preparation of copper tetra-ammine complex. $[Cu (NH_3)_4] SO_4$.
(d) Preparation of cis-and trans-bis(oxalato)diaquachromate(III) ion.

Synthesis of Organic Compounds
 (a) Iodoform from ethanol and acetone
 (b) Aromatic electrophlic substitution of benzene
   1. p-nitroacetanilide
   2. 2,4,6-tribromophenol
      Diazotization/Coupling
   3. Preparation of methyl orange and methyl red
   4. Preparation of benzoic acid from toluene
   5. Reduction
    Preparation of m-nitroaniline from m-dinitrobenzene

Recommended Books:

1. Vogel's book on Inorganic Qualitative Analysis

2. Vogel's book on Organic Qualitative Analysis

SUBJECT TITLE: Fundamentals of computer forensic and biometrics
SUBJECT CODE: BFFF-3508
SEMESTER: V
CONTACT HOURS/WEEK:

Lecture (L)	Tutorial (T)	Practical (P)	Credit (C)
3	0	0	3

Internal Assessment: 40
End Term Exam: 60
Duration of Exam: 3 Hrs

Instruction of Question Paper setter: The question paper consists of three sections A, B and C. Section-A is compulsory consisting of 6 short answer type questions (2 marks) from the whole syllabus. Total marks to this section are 12. There will be no choice in this section. Section-B consists of 8 questions. Each question carries 4 marks. Section-C consists of 4 questions. Students will attempt any three questions. Each carries 8 marks.
Course Objective: To impart knowledge of the cases which fall under the purview of digital crimes. The types of digital crimes and the elements involved in investigation of digital crimes**.**

Section A

Computer Crimes
Definition and types of computer crimes. Distinction between computer crimes and conventional crimes. Reasons for commission of computer crimes. Breaching security and operation of digital systems.

Computer virus, and computer worm – Trojan horse, trap door, super zapping, logic bombs, computer stalking, pornography, hacking, computer terrorism, hate speech, private and national security in cyber space.

An overview of hacking, spamming, phishing and stalking.

Software Piracy: Introduction, types and investigation of pirated discs.

Section B

Computer Forensics Investigations

Protocol to be taken at the scene. Preparation required prior to seizure.

Seizure and collection of suspected computer and its peripheral devices. Treatment of exhibits. Extraction of information from the from various storage devices.

Creating bitstream of the original media. Legal and privacy issues. Examination and Restoration of deleted files.

Section C

Mobile phone forensics: Crime and mobile phones, forensic procedures for seizing Mobile Phones, Role of IMEI, IMSI, CCICD, CDRs & TDRs in Crime Investigation, Recovery of data available in SIM Card, internal & external memory Phones, Mobile operators systems Logical and Physical dump / imaging.

Biometrics

Definition, Types of Biometrics tools, Fingerprints, Face, Iris and retina scan, Voice, DNA and Handwriting, Relevance in Forensic Science.

Books Recommended:

1. R.K. Tiwari, P.K. Sastry and K.V. Ravikumar, Computer Crimes and Computer
Forensics, Select Publishers, New Delhi (2003).
2. C.B. Leshin, Internet Investigations in Criminal Justice, Prentice Hall, New Jersey (1997).
3. R. Saferstein, Criminalistics, 8th Edition, Prentice Hall, New Jersey (2004).
4. E. Casey, Digital Evidence and Computer Crime, Academic Press, London (2000).

SUBJECT TITLE: Forensic Laboratory -III
SUBJECT CODE: BFFF-3509
SEMESTER: V
CONTACT HOURS/WEEK:

Lecture (L)	Tutorial (T)	Practical (P)	Credit (C)
0	0	2	1

Internal Assessment: 40
End Term Exam: 60
Duration of Exam: 3 Hrs

Course Objective: To impart knowledge of cybercrime & biometrics.

1. To identify, seize and preserve digital evidence from crime scenes.
2. To detect deletions, obliterations and modifications of files using encase software.
3. To trace routes followed by e-mails and chats.
4. To identify the IP address of the sender of e-mails.
5. To demonstrate concealment techniques using cryptographic PGP.
6. To identify encrypted files.
7. To identify hidden files.
8. To use digital signatures for securing e-mail and online transactions.
9. To acquire data from PCs/laptops/HDDs/USBs, pen drives, memory cards and SIM cards.
10. To use symmetric and asymmetric keys for protection of digital record.
11. To carry out imaging of hard disks.

Books Recommended:
1. R.K. Tiwari, P.K. Sastry and K.V. Ravikumar, Computer Crimes and Computer Forensics, Select Publishers, New Delhi (2003).
2. C.B. Leshin, Internet Investigations in Criminal Justice, Prentice Hall, New Jersey (1997).
3. R. Saferstein, Criminalistics, 8th Edition, Prentice Hall, New Jersey (2004).
4. E. Casey, Digital Evidence and Computer Crime, Academic Press, London (2000).

SYLLABUS

SEMESTER-VI

COURSE TITLE: Applied Physics-II
SUBJECT CODE: BFPH-3601
SEMESTER: VI
CONTACT HOURS/WEEK:

Lecture (L)	Tutorial (T)	Practical (P)	Credit (C)
4	0	0	3

Objective: The course aims to provide knowledge of fundamental aspects of the structure of the nucleus, radioactive decay, nuclear reactions, the interaction of radiation and matter and basic fundamental particles of the universe.

UNIT-I   (14 Lecture)
Nuclear Properties: Constituents of nucleus, non-existence of electrons in nucleus, Nuclear mass and binding energy, features of binding energy versus mass number curve, nucleus radius, angular momentum and parity, nuclear moments: magnetic dipole moment and electric quadruple moment, properties of nuclear forces, Yukawa theory, Nuclear Models: Liquid drop model, semi-empirical mass formula, condition of stability, evidence for nuclear magic numbers, Shell Model, energy level scheme, angular momenta of nuclear ground states, parity and magnetic moment of nuclear ground states

UNIT–II   (14 Lectures)
Radioactive Decays: Modes of decay of radioactive nuclides and decay Laws, radioactive series and displacement law, radioactive dating, constituents of Cosmic rays, Alpha decay: Gamow's theory of alpha decay, barrier penetration as applied to alpha decay, Geiger Nuttal law, Beta decays: β-, β+ and electron capture decays, Neutrino hypothesis and its detection, parity violation in β decay, Gamma transitions: Excited levels, isomeric levels, Gamma transitions, internal conversion.

UNIT–III   (15 Lecture)
Nuclear Reactions: Types of nuclear reactions, reactions cross section, conservation laws, Kinematics of nuclear reaction, Q-value and its physical significance, compound nucleus, level width.
Interaction of Nuclear Radiation with matter: Energy loss due to ionization (BetheBlock formula), energy loss of electrons, Cerenkov radiation, Gamma ray interaction through matter, photoelectric effect, Compton scattering, pair production, neutron interaction with matter
Basis of detection of nuclear radiations, Gas-filled detectors, proportional and Geiger-Muller counters, Scintillation detectors.

UNIT-IV   (14 Lectures)
Particle physics: Particle interactions; basic features, types of particles and its families. Symmetries and Conservation Laws: energy and momentum, angular momentum, parity, baryon number, Lepton number, Isospin, Strangeness and charm, concept of quark model, color quantum number and gluons

Books Recommended:
1. Introduction to Nuclear and Particle Physics by V. K. Mittal, R. C. Verma, and S.C. Gupta Prentice Hall of India, 2011
2. Introductory nuclear Physics by Kenneth S. Krane, Wiley India Pvt. Ltd., 2008
3. Nuclear Physics by I. Kaplan, Narosa Publication, 2002
4. Nuclear Physics D. C Tayalby Himalaya Publication Home, 2007

COURSE TITLE: Applied Physics Laboratory-II
SUBJECT CODE: BFPH-3602
SEMESTER: VI
CONTACT HOURS/WEEK:

Lecture (L)	Tutorial (T)	Practical (P)	Credit (C)
0	**0**	**4**	2

Objective: The course covers experiments related to analogue electronics, characteristics of solis state electronics devices and nuclear physics.
Note: Students will be required to perform at least 12 experiments from the given list of experiments

List of Experiments
1. To study V-I characteristics of PN junction diode, and Light emitting diode.
2. To study the V-I characteristics of a Zener diode and its use as voltage regulator.
3. Study of V-I & power curves of solar cells, and find maximum power point & efficiency.
4. To study the characteristics of a Bipolar Junction Transistor in CE configuration.
5. To study the various biasing configurations of BJT for normal class A operation.
6. To design a CE transistor amplifier of a given gain (mid-gain) using voltage divider bias.
7. To study the frequency response of voltage gain of a RC-coupled transistor amplifier.
8. To design a Wien bridge oscillator for given frequency using an op-amp.
9. To design a phase shift oscillator of given specifications using BJT.
10. To draw output and mutual characteristics of an FET and determine its parameters.
11. To set up an oscillator and to study its output on CRO for different C-values.
12. To draw the plateau of a GM counter and find its dead time.
13. To study the statistical fluctuations and end point energy of beta particles using GM counter.
14.To study the absorption of beta particles in aluminium using GM counter and determine the absorption coefficient of beta particles from it.
15. To study the response of RC circuit to various input voltage (square, sine and triangular).

Books Recommended:
1. Basic Electronics: A text lab manual, P.B. Zbar, A.P. Malvino, M.A. Miller, Mc-Graw Hill, 2001
2. OP-Amps and Linear Integrated Circuit, R. A. Gayakwad, 2000, Prentice Hall.
3. A Text Book of Practical Physics, I.Prakash& Ramakrishna, 2011, KitabMahal
4. B.Sc Practical Physics, C L Arora, S. Chand & Company, 2010

SUBJECT TITLE:Applied Biology-II
SUBJECT CODE: BFBO-3603
SEMESTER: VI
CONTACT HOURS/WEEK:

Lecture (L)	Tutorial (T)	Practical (P)	Credit (C)
3	0	0	3

Internal Assessment: 40
End Term Exam: 60
Duration of Exam: 3 Hrs

Instruction of Question Paper setter: The question paper consists of three sections A,B and C. Section-A is compulsory consisting of 6 short answer type questions(2 marks) from the whole syllabus. Total marks to this section are 12. There will be no choice in this section. Section-B consists of 8 questions. Each question carries 4 marks. Section-C consists of 4 questions. Students will attempt any three questions. Each carries 8 marks.

Course Objectives: After studying this paper the students will know –
a. The significance of biological and serological evidence.
b. The forensic importance of hair evidence.
c. The importance of biological fluids – blood, urine, semen, saliva, sweat and milk – in crime investigations.
d. How wildlife forensics aid in conserving natural resources.
e. How forensic entomology assists in death investigations.

Section A
Biological Evidence:
Nature and importance of biological evidence.
Significance of hair evidence.Transfer, persistence and recovery of hair evidence.Structureof human hair.Comparison of hair samples.Morphology and biochemistry of human hair.Comparison of human and animal hair.
Types and identification of microbial organisms of forensic significance.Identification of wood, leaves, pollens and juices as botanical evidence. Diatoms and theirforensic significance.

Section B
Wildlife Forensics:
Fundamentals of wildlife forensic.Significance of wildlife forensic.Protected andendangered species of animals and plants.Illegal trading in wildlife items, such as skin, fur,bone, horn, teeth, flowers and plants.Identification of physical evidence pertaining to wildlifeforensics. Identification of pug marks of various animals.

Section C
Forensic Entomology:

Basics of forensic entomology.Insects of forensic importance. Collection of entomological evidence during death investigations.Review of the several schemes for classifying stages of decomposition in human and animalremains and how this may vary geographically and seasonally. Simulation and study of humandecomposition processes using various dead animal models, particularly pigs, including previousstudies worldwide.

Entomology in human death

Uses of entomology in investigation of the causes of human death, the duration of the postmorteminterval (PMI), what has occurred in the PMI, some specific case studies illustrating each ofthese.

Books Recommended:

1. L. Stryer, Biochemistry, 3rd Edition, W.H. Freeman and Company, New York (1988).
2. R.K. Murray, D.K. Granner, P.A. Mayes and V.W. Rodwell, Harper's Biochemistry, APPLETON & Lange, Norwalk (1993).
3. S. Chowdhuri, Forensic Biology, BPRD, New Delhi (1971).
4. R. Saferstein, Forensic Science Handbook, Vol. III, Prentice Hall, New Jersey (1993).
5. G.T. Duncan and M.I. Tracey, Serology and DNA typing in, Introduction to Forensic Sciences, 2nd Edition, W.G. Eckert (Ed.), CRC Press, Boca Raton (1997).

SUBJECT TITLE: Applied Biology Laboratory -II
SUBJECT CODE: BFBO-3604
SEMESTER: VI
CONTACT HOURS/WEEK:

Lecture (L)	Tutorial (T)	Practical (P)	Credit (C)
0	0	2	1

Internal Assessment: 40
End Term Exam: 60

Duration of Exam: 3 Hrs

Course Objective: To impart knowledge of forensic entomology and the forensic importance of hair evidence.

1. To examine hair morphology and determine the species to which the hair belongs.
2. To prepare slides of scale pattern of human hair.
3. To examine human hair for cortex and medulla.
4. To carry out microscopic examination of pollen grains.
5. To carry out microscopic examination of diatoms.
6. To cite a crime case in which diatoms have served as forensic evidence.
7. To prepare a case report on forensic entomology.
8. To prepare a case report on problems of wildlife forensics.

Books Recommended:

1. L. Stryer, Biochemistry, 3rd Edition, W.H. Freeman and Company, New York (1988).
2. R.K. Murray, D.K. Granner, P.A. Mayes and V.W. Rodwell, Harper's Biochemistry, APPLETON & Lange, Norwalk (1993).
3. S. Chowdhuri, Forensic Biology, BPRD, New Delhi (1971).
4. R. Saferstein, Forensic Science Handbook, Vol. III, Prentice Hall, New Jersey (1993).
5. G.T. Duncan and M.I. Tracey, Serology and DNA typing in, Introduction to Forensic Sciences, 2nd Edition, W.G. Eckert (Ed.), CRC Press, Boca Raton (1997).

COURSE TITLE: ORGANIC CHEMISTRY-VI
SUBJECT CODE: BFCH-3605
SEMESTER: VI
CONTACT HOURS/WEEK:

Lecture (L)	Tutorial (T)	Practical (P)	Credit (C)
2	0	0	2

Internal Assessment: 40
End Term Exam: 60
Duration of Exam: 3 Hrs

Course Objective: To impart knowledge of heterocyclic compounds, polymers, carbohydrates & amino acids.

SECTION-A (7hrs)

I. Heterocyclic Compounds

Introduction: Molecular orbital picture and aromatic characteristics of pyrrole, furan, thiophene and pyridine. Methods of synthesis and chemical reactions with particular emphasis on mechanism of electrophlic substitution.Mechanism of nucleophlic substitution reaction in pyridine derivatives.Comparison of basicity of pyridine, piperidine and pyrrole.

Introduction to condensed five and six membered heterocycles.Preparation and reactions of indole, quinoline and isoquinolinewith special reference to Fischer indole synthesis, Skraup synthesis and Bischler- Napieralski synthesis. Mechanism of electrophlic substitution reactions of indole, quinoline and isoquinoline.

SECTION – B (8hrs)

II. Synthesis of Polymers

Ziegler-Natta polymerziation and vinyl polymers. Condensation or step growth polymerziation. Urea formaldhehyde resins, epoxy resins and polyurethanes. Natural and synthetic rubbers.

III. Organic Synthesis ViaEnolatcs

Acidity of α-hydrogens, alkylation of diethyl malonate and ethyl acetoacetate. Synthesis of ethyl acetoacetate: the Claisen condensation. Keto-enoltautomerism of ethyl acetoacetate.Alkylation and acylation of enamines.

SECTION – C (15hrs)

IV. Carbohydrates

Classification and nomenclature, Monosaccharides, mechanism of osazone formation, interconversion of glucose and fructose, chain lengthening and chain shortening of aldoses.

Configuration of monosaccharides.Erythro and threodiastereomers.Conversion of glucose into mannose.Formation of glycosides, ethers, and esters.Determination of ring size of monosaccharides. Cyclic structure of D (+)-glucose. Mechanism of mutarotation.

Structures of ribose and deoxyribose.

An introduction to disaccharides (maltose, sucrose and lactose) and polysaccharide starch and cellulose without involving structure determination.

V. Amino Acids, Pcptides, Proteins and Nucleic Acids

Classification, structure and stereochemistry of amino acids.Acid base behaviour, isoelectric point and electrophoresis.Preparation and reactions of α-amino acids.

Structure and nomenclature of peptides and proteins.Classification of proteins. Peptide structure determination, end group analysis, selective hydrolysis of peptides. Classical levels of protein structure. Protein denaturation/renaturation.

Nucleic acids: Introduction, Constituents of nucleic acids Ribonucleosides and ribonucleotides. The double helical structure of DNA.

Recommended Books:

1.Organic Chemistry, F.A Carey, McGraw-Hill, Inc.
2.Introduction to Organic Chemistry, Streitwieser, Healthcock and Kosover and Kosover, Macmillan.
3.Organic Chemistry, Vol. I, II & III, S.M. Mukherji, S.P. Singh and R.P. Kapoor, Wiley Eastern Ltd. (New Age International).

COURSE TITLE: INORGANIC CHEMISTRY-III

SUBJECT CODE: BFCH-3606
SEMESTER: VI
CONTACT HOURS/WEEK:

Lecture (L)	Tutorial (T)	Practical (P)	Credit (C)
4	0	0	4

Internal Assessment: 40
End Term Exam: 60
Duration of Exam: 3 Hrs

Course Objective: To impart knowledge of Transition metal complexes, Bioinorganic chemistry & organometallics.

SECTION-A (15hrs)

I. Metal-ligand Bonding in Transition Metal Complexes.

Limitations of valence bond theory, an elementary idea of crystal- field theory, crystal field splitting in octahedral, tetrahedral and square planar complexes, factors affecting the crystal-field parameters.

II. Thermodynamic and Kinetic Aspects of Metal Complexes

A brief outline of thermodynamic stability of metal complexes and factors affecting the stability, substitution reactions of square planar complexes.

SECTION –B (20hrs)

III. Magnetic Properties of Transition Metal Complexes

Types of magnetic behaviour, methods of determining magnetic susceptibility, spin-only formula, L-S coupling, Correlation of μ_s and μ_{eff} values, orbital contribution to magnetic moment, application of magnetic moment data for 3d-metal complexes.

IV. Electronic Spectra of Transition Metal Complexes.

Types of electronic transitions, selection rules for d-d transitions, spectroscopic ground states, spectrochemical series. Orgel-energy level diagram for d^1 and d^9 states, discussion of electronic spectrum of $[Ti (H_2 O)_6]^{3+}$ complexion.

V. Hard and Soft acids and Bases (HSAB)

Classification of acids and bases as a hard and soft, Pearson's HSAB concept, acid-base strength and hardness and softness.Symbiosis, theoretical basis of hardness and softness, electronegativity and hardness and softness.

SECTION –C (25hrs)

VI. Bioinorganic Chemistry

Essential and trace elements in biological processes, metalloporphyrins with special reference to

haemoglobin and myoglobin.Biological role of alkali and alkaline earth metal ions with special reference to Ca^{+2}, Nitrogen fixation.

VII. Silicones and Phosphazenes

Silicones and Phosphazenes as examples of inorganic polymers,nature of bonding in triphosphazenes.

VIII. Organometallic Chemistry

Definition, Nomenclature and classification of organometallic compounds. Preparation, properties, bonding and applications of alkyls,of' Li, Al, Hg, Sn and Ti, a brief account of metal-ethylene complexes and homogeneous hydrogenation, mononuclear carbonyls and the nature of bonding in metal carbonyls.

Recommended Books

1. D.F.C. Shriver, P.W. Atkins and C.H. Langford, Inorganic Chemistry, ELBS

Oxford,1991.

2. J.E. Huheey, E.A. Keiter, R.L. Keiter, Inorganic Chemistry, 4th Ed, Pearson

Education,Singapore, 1999

3. J.D.Lee, Concise Inorganic Chemistry, ELBS, Oxford 1994.

4. Puri Sharma Kalia Principles of Inorganic Chemistry

COURSE TITLE: CHEMISTRY LABORTARY-IV
SUBJECT CODE: BFCH-3607
SEMESTER: VI
CONTACT HOURS/WEEK:

Lecture (L)	Tutorial (T)	Practical (P)	Credit (C)
0	0	6	3

Internal Assessment: 40
End Term Exam: 60
Duration of Exam: 3 Hrs

Course Objective: To impart knowledge of synthesis.

Laboratory Techniques

Column Chromatography

1. Separation of fluorescein and methylene blue.
2. 2. Separation of leaf pigments from spinach leaves.

Physical Experiments

(a) To determine the strength of the given acid conductometrically using standard alkali solution.

(b) To determine the solubility and solubility product of a given sparingly soluble electrolyte conductometrically.

(c) To study the saponification of ethyl acetate conductometrically.

(d) To determine the ionisation constant of a weak acid conductometrically.

(e) To determine the strength of the given acid solution pH- metrically by using standard alkali solution.

(f) To determine the molar refraction of methanol, ethanol and propanol.

(g) To study the distribution of benzoic acid between benzene and water, and ether and water.

(h) Knowledge of Stereochemical Study of Organic Compounds.

      Rand S configuration of optical isomers.

      E, Z configuration of geometrical isomers.

      Conformational analysis of cyclohexanes and substituted cyclohexanes.

Recommended Books:

1. Experiments in Physical Chemistry, R.C. Das, and B. Behra, Tata Mc-graw Hill.
2. Advanced Practical Physical Chemistry, J.B. Yadav, Goel Publishing House.
3. Advanced Exp. Chemistry, Vol. I-Physical, J.N. Gurutu and R. Kapoor, S. Chand & Co.
4. Selected Exp. in Physical Chemistry, N.G. Mukherjee, J.N. Ghose& Sons.
5. Exp. in Physical Chemistry, J.C. Ghosh, BhartiBhavan.

SUBJECT TITLE: Forensic Psychology
SUBJECT CODE: BFFF-3608
SEMESTER: VI
CONTACT HOURS/WEEK:

Lecture (L)	Tutorial (T)	Practical (P)	Credit (C)
3	0	0	3

Internal Assessment: 40
End Term Exam: 60
Duration of Exam: 3 Hrs

Instruction of Question Paper setter: The question paper consists of three sections A, B and C. Section-A is compulsory consisting of 6 short answer type questions (2 marks) from the whole syllabus. Total marks to this section are 12. There will be no choice in this section. Section-B consists of 8 questions. Each question carries 4 marks. Section-C consists of 4 questions. Students will attempt any three questions. Each carries 8 marks.

Course Objective: To impart knowledge of the overview of forensic psychology and its applications, the legal aspects of forensic psychology, the significance of criminal profiling and the importance of psychological assessment in gauging criminal behavior.

Section A

Basics of Forensic Psychology
Definition and fundamental concepts of forensic psychology and forensic psychiatry.
Psychology and law. Ethical issues in forensic psychology.
Assessment of mental competency. Mental disorders and forensic psychology.
Psychology of evidence – eyewitness testimony, confession evidence. Criminal profiling.
Psychology in the courtroom, with special reference to Section 84 IPC. Differentiate between Forensic Handwriting & Handwriting Psychology.

Section B

Psychology and Criminal Behavior
Psychopathology and personality disorder. Psychological assessment and its importance.
Serial murderers. Psychology of terrorism.

Biological factors and crime – social learning theories, psycho-social factors, abuse.
Juvenile delinquency – theories of offending (social cognition, moral reasoning),
Child abuse (physical, sexual, emotional), juvenile sex offenders, legal controversies.

Section C

Detection of Deception
Tools for detection of deception – interviews, non-verbal detection, statement analysis, voice stress analyzer, hypnosis.
Polygraphy – operational and question formulation techniques, ethical and legal aspects, the guilty knowledge test.

Narco analysis and brain electrical oscillation signatures – principle and theory, ethical and legal issues.

Books Recommended:

1. A.A. Moenssens, J. Starrs, C.E. Henderson and F.E. Inbau, Scientific Evidence in Civil and Criminal Cases, 4th Edition, The Foundation Press, Inc., New York (1995).
2. R. Saferstein, Criminalistics, 8th Edition, Prentice Hall, New Jersey (2004).
3. J.C. DeLadurantey and D.R. Sullivan, Criminal Investigation Standards, Harper & Row, New York (1980).
4. J. Niehaus, Investigative Forensic Hypnosis, CRC Press, Boca Raton (1999).
5. E. Elaad in Encyclopedia of Forensic Science, Volume 2, J.A. Siegel, P.J. Saukko and G.C. Knupfer (Eds.), Academic Press, London (2000).

SUBJECT TITLE: Forensic Laboratory-IV
SUBJECT CODE: BFFF-3609
SEMESTER: VI
CONTACT HOURS/WEEK:

Lecture (L)	Tutorial (T)	Practical (P)	Credit (C)
0	0	2	1

Internal Assessment: 40
End Term Exam: 60
Duration of Exam: 3 Hrs

Course Objective: To impart knowledge of psychic behavior and relationship between mental disorders and forensic psychology.

1. To visit a crime scene.
2. To cite a crime case where legal procedures pertaining to psychic behavior had to be invoked.
3. To prepare a report on relationship between mental disorders and forensic psychology.
4. To review a crime case involving serial murders. Comment on the psychological traits of the accused.
5. To cite a crime case involving a juvenile and argue for and against lowering the age for categorizing an individual as juvenile.
6. To study a criminal case in which hypnosis was used as a means to detect deception.
7. To prepare a case report on thematic appreciation test.
8. To prepare a case report on Minnesota multiphasic personality inventory test.
9. To prepare a case report on thematic appreciation test.
10. To prepare a case report on word association test.
11. To prepare a case report on Bhatia's battery of performance test of intelligence.
12. To cite a criminal case in which narco analysis was used as a means to detect deception.

Books Recommended:

1. A.A. Moenssens, J. Starrs, C.E. Henderson and F.E. Inbau, Scientific Evidence in Civil and Criminal Cases, 4th Edition, The Foundation Press, Inc., New York (1995).
2. R. Saferstein, Criminalistics, 8th Edition, Prentice Hall, New Jersey (2004).
3. J.C. DeLadurantey and D.R. Sullivan, Criminal Investigation Standards, Harper & Row, New York (1980).
4. J. Niehaus, Investigative Forensic Hypnosis, CRC Press, Boca Raton (1999).
5. E. Elaad in Encyclopedia of Forensic Science, Volume 2, J.A. Siegel, P.J. Saukko and G.C. Knupfer (Eds.), Academic Press, London (2000).

S. No.	Semester	Credit
1	I	25
2	II	25
3	III	23
4	IV	23
5	V	23
6	VI	23

Total=145