

**YEAR I, SEMESTER I**

COURSE CODE	COURSE TITLE	COURSE CATEGORY	HOURS			EVALUATION SCHEME		SUBJECT TOTAL	CREDIT
			L	T	P	CA	EE		
FST101	Introduction to Forensic Science	CORE	3	1	0	30	70	100	4
FST102	Crime and Society	CORE	3	1	0	30	70	100	4
FST103	Chemistry-I	CORE	3	1	0	30	70	100	4
FST104	Environmental Science	AECC	2	0	0	15	35	50	2
FST105	Physics- I	GE	3	1	0	30	70	100	4
FST106	Zoology- I								
FST107	Computer Science- I	GE	3	1	0	30	70	100	4
FST108	Botany- I								
FST153	Chemistry Lab-I	PRACTICAL	0	0	4	15	35	50	2
FST155	Physics Lab- I	PRACTICAL	0	0	4	15	35	50	2
FST156	Zoology Lab- I								
FST157	Computer Lab- I	PRACTICAL	0	0	4	15	35	50	2
FST158	Botany Lab- I								
Total			17	5	12	210	490	700	28

L - Lecture, T - Tutorial, P - Practical, GE- Generic Elective; AECC-Ability Enhancement Compulsory Course; DSE- Discipline Specific Elective; AECC- Ability Enhancement Elective Course (Skill Based Course)

**YEAR I, SEMESTER II**

COURSE CODE	COURSE TITLE	COURSE CATEGORY	HOURS			EVALUATION SCHEME		SUBJECT TOTAL	CREDIT
			L	T	P	CA	EE		
FST201	Law for Forensic Scientists	CORE	3	1	0	30	70	100	4
FST202	Forensic Psychology	CORE	3	1	0	30	70	100	4
FST203	Chemistry-II	CORE	3	1	0	30	70	100	4
FST204	English Communication	AECC	2	0	0	15	35	50	2
FST205	Physics- II	GE							
FST206	Zoology- II		3	1	0	30	70	100	4
FST207	Computer Science- II								
FST208	Botany- II		3	1	0	30	70	100	4
FST253	Chemistry Lab-II		PRACTICAL	0	0	4	15	35	50
FST255	Physics Lab- II	PRACTICAL							
FST256	Zoology Lab- II		0	0	4	15	35	50	2
FST257	Computer Lab- II								
FST258	Botany Lab- II		0	0	4	15	35	50	2
Total			17	5	12	210	490	700	28

L - Lecture, T - Tutorial, P - Practical, GE- Generic Elective; AECC-Ability Enhancement Compulsory Course; DSE- Discipline Specific Elective; AECC- Ability Enhancement Elective Course (Skill Based Course)

<b>B.Sc. Forensic Science: Semester-I</b>	
<b>FST101: Introduction to Forensic Science</b>	
<b>Teaching Scheme</b>	<b>Examination Scheme</b>
Lectures: 3 hrs/Week	Class Test -12 Marks
Tutorials: 1 hr/Week	Teachers Assessment – 6 Marks
Credits: 4	Attendance – 12 Marks
	End Semester Exam – 70 marks

**Course Objective:** *After studying this paper the students will know –*

- a. *The significance of forensic science to human society.*
- b. *The fundamental principles and functions of forensic science.*
- c. *The divisions in a forensic science laboratory.*
- d. *The working of the forensic establishments in India and abroad.*

**Unit 1: History and Development of Forensic Science in India**

Definitions and concepts in forensic science.  
 Historical aspects of forensic science.  
 Basic principles of forensic science.  
 Need and Scope of forensic science. Ethics in Forensic Science

**Unit 2: Role of Forensic Science in Society**

Branches of forensic science.  
 Forensic Science Laboratories, Teaching Institutes and Other Government and Private Bodies related to Forensic Science in India.  
 Forensic science in international perspectives, including set up of INTERPOL and FBI.

**Unit 3: Organizational set up of Different Government Bodies in India**

Hierarchical set up of Central Forensic Science Laboratories, State Forensic Science Laboratories, Regional Forensic Science Laboratories, Mobile Forensic Unit, Government Examiners of Questioned Documents, Fingerprint Bureaus, National Crime Records Bureau, Police & Detective Training Schools, and Directorate of Forensic Science Services.

**Unit 4: Forensic Scientists**

Duties of forensic scientists. Code of conduct for forensic scientists in India. Eligibility and Qualifications of forensic scientist. Data depiction. Report writing.

**Unit 5: Police Organization and Other Armed Forces**

Organizational Setup of POLICE at Central and State Levels. Organizational Setup of CBI, IB, CAPF, BSF, CRPF, ITBP, Assam Rifles, CISF, RAF, BPRnD and MHA. Relationship between POLICE and Forensic Scientist.

### **Suggested Readings**

1. B.B. Nanda and R.K. Tiwari, *Forensic Science in India: A Vision for the Twenty First Century*, Select Publishers, New Delhi (2001).
2. B. S. Nabar, *Forensic Science in Crime Investigation*, 3<sup>rd</sup> Edition, Asia Law House (2019)
3. B. R. Sharma, *Forensic Science in Criminal Investigation and Trials*, 4<sup>th</sup> Edition, Universal Law Publishing - An imprint of LexisNexis (2014)
4. R. Saferstein, *Criminalistics*, 8<sup>th</sup> Edition, Prentice Hall, New Jersey (2004).
5. James E. Girard, *Criminalistics*, 4<sup>th</sup> Edition, Jones and Bartlett Publishers, Inc. (2017)

<b>B.Sc. Forensic Science: Semester-I</b>	
<b>FST102: Crime and Society</b>	
<b>Teaching Scheme</b>	<b>Examination Scheme</b>
Lectures: 3 hrs/Week	Class Test -12 Marks
Tutorials: 1 hr/Week	Teachers Assessment – 6 Marks
Credits: 4	Attendance – 12 Marks
	End Semester Exam – 70 marks

Course Objective: *After studying this paper the students will know –*

- a. *The importance of criminology.*
- b. *The causes of criminal behavior.*
- c. *The significance of criminal profiling to mitigate crime.*
- d. *The consequences of crime in society.*
- e. *The elements of criminal justice system.*

**Unit 1: Basics of Criminology**

Definition, Aim and scope, Theories of Crime-classical, positivist, sociological, Criminal Anthropology, Understanding Modus Operandi, Investigative Strategy, Criminal Profiling, Role of Media

**Unit 2: Crime**

Elements, nature, causes and consequences of crime, Deviant Behavior, Hate Crimes, Organized Crimes, Public Disorder, Domestic Violence and Workplace Violence, White Collar Crimes, Juvenile Delinquency, Victimology, Social Change and Crime, Psychological Disorders and Criminality, Situational Crime Prevention

**Unit 3: Criminal Behavior**

Introduction to Criminal Behavior, Theories of Criminal Behavior: classical and non-classical theories, biological theories, psychological theories, social disorganization theory, labeling theory, conflict theory, anomie theory, routine activity theory, rational choice theory and differential association theory.

**Unit 4: Crime Detection Agency**

Crime Investigation Departments: Central Bureau of investigation, National Investigative Agency, Anti-doping Agency, National Drug Testing Laboratory, Intelligence Bureau, Bureau of Police Research and Development, Fingerprint Bureau of Investigation, Central Police Organizations.

**Unit 5: Criminal Justice System**

Components of Criminal Justice System: Police, Courts and Corrections, Types of Criminal Justice System, Filing of Criminal Charges, Community Policing, Correctional Measures and Rehabilitation of offenders, Human Rights and CJS in India.

**Suggested Readings**

1. Ahuja, R., *Criminology*, Rawat Publications, ND, 2000.
2. Paranjape, NV, *Criminology, Penology and Victimology*, Central Law Publications (CLP), 2017
3. Ellis, L. and Walsh, Anthony, *Criminology – A Global Perspective*, Allyn and Bacon, Boston, 2000.
4. Morris, E. K., and Braukman, C. J. (Eds.), *Behavioral Approaches to Crime and Delinquency- A Hand book of Application, Research and Concepts*, Plenum Press, New York, 1987.
5. Abaadinsky, H., *Organized Crime (2<sup>nd</sup> Edn.)*, Nelson – Hall, Chicago, 1998.
6. Adler, F., Mueller, G. O. W. and Laufer, W. S., *Criminology*, McGraw – Hill, Boston, 1991.
7. Maguire, M.: Morgan, R and Reiner, R., *The Oxford Handbook of Criminology (3<sup>rd</sup> Edn.)*, Oxford University Press, Oxford, 2002.
8. Bajpai, G. S., *Development without Disorders*. Vishwavidyala, Prakashan, Sagar (M. P.), 2002.
9. Ghosh & Rustamji, *Encyclopedia of Police in India 1997 Vol, 3*
10. Vimala Veeraraghavan, *Handbook of Forensic Psychology*

<b>B.Sc. Forensic Science: Semester-I</b>	
<b>FST103: Chemistry-I</b>	
<b>Teaching Scheme</b>	<b>Examination Scheme</b>
Lectures: 3 hrs/Week	Class Test -12 Marks
Tutorials: 1 hr/Week	Teachers Assessment – 6 Marks
Credits: 4	Attendance – 12 Marks
	End Semester Exam – 70 marks

*Course Objective*

- a. On the completion of this course the students will be able to understand the basic concepts of inorganic chemistry
- b. The student will be able to describe and understand the characteristics of the periodic table, concepts of acids and bases, hybridization, and coordination chemistry.

**Unit 1: Periodic trends and properties**

Size, Ionization Energy, Electron Affinity, Electronegativity, Use of redox potential and reaction feasibility

**Chemistry of s and p-block elements:** Alkali and alkaline earth metals: Hydrides and Complexation tendencies. Structural features of hydrides, halides, oxides and oxyacids.

**Chemistry of d-block elements:** Salient features, characteristic properties of 3d-elements with reference to oxidation states, colour, magnetic behavior, and complex formation tendency.

**Unit 2: Acids and bases**

Bronsted-Lowry, Lux-Flood, Solvent System and Lewis concepts of acids and bases. Factors affecting strengths of Lewis acids and bases. HSAB theory and applications

**Unit 3:**

**Hybridization:**  $sp$ ,  $sp^2$ ,  $sp^3$ ,  $sp^3d$ , &  $sp^3d^2$ .

**Coordination compounds:** Nomenclature, Werner's theory. Isomerism. Valence Bond Theory. Stereochemistry of coordination compounds with coordination no. 4 and 6.

**Lanthanides:** Comparative study of lanthanide elements with respect to electronic configuration atomic and ionic radii, oxidation state and complex formation, lanthanide contraction. Separation of lanthanides. Application of lanthanide complexes.

**Suggested Readings**

1. *Chemistry for Degree Students (BSc First Year) by Dr. R L Madan; S Chand And Company Pvt Ltd*
2. *Concise Inorganic Chemistry fifth edition; J D Lee*
3. *Text book of Inorganic chemistry, P. L. Soni, 20th edition, 2001*
4. *F.A. Cotton, G. Wilkinson, C. Murillo and M. Bochman, Advanced Inorganic Chemistry, Wiley India, 6th edition, 2008*



<b>B.Sc. Forensic Science: Semester-I FST104: Environmental Science</b>	
<b>Teaching Scheme</b>	<b>Examination Scheme</b>
Lectures: 2 hr/Week Credits: 2	Internal Assessment – 15 Marks
	External Assessment – 35 Marks
	End Semester Exam – 50 marks

Course Objective: To make the students familiar with-

1. The Environment and its components
2. Population Ecology and Movements related to Environment in India
3. Natural Resources and related Laws

#### **Unit 1: The Environment**

The Atmosphere, Hydrosphere, Lithosphere, Biosphere, Ecology, Ecosystem, Biogeochemical Cycle (Carbon Cycle, Nitrogen Cycle),  
Environment Pollution: Air Pollution, Water Pollution, Soil Pollution, Radiation Pollution.

#### **Unit 2: Population Ecology**

Individuals, Species, Pollution, Community, Control Methods of Population, Urbanization and its effects on Society, Communicable Diseases and its Transmission, Non-Communicable Diseases.

#### **Environmental Movements in India**

Grassroot Environmental movements in India, Role of women, Environmental Movements in Odisha, State Pollution Control Board, Central Pollution Control Board.

#### **Unit 3: Natural Resources**

Conservation of Natural Resources, Management and Conservation of Wildlife, Soil Erosion and Conservation  
**Environmental Laws:** Water Act, 1974, Air Act, 1981, The Wildlife (Protection) Act, 1972, Environment Protection, 1986, Natural Disasters and their Management.

#### **Suggested Readings**

1. William P. Cunningham, Mary Ann Cunningham, Barbara Woodworth Saigo, Environmental Science: A global concern, McGrawHill 2003
2. William Cunningham, Mary Cunningham, Principles of Environmental Science: Seventh Edition, McGrawHill 2014
3. Roosa SA, Sustainable Development Handbook, CRC Press 2008
4. Atkinson G., Dietz S., Neumayer E., Agarwala M, Handbook of Sustainable Development, Edward Elger, 2014
5. Robbins P., Hintz J., Moore S.A., Environment and Society: A critical introduction, Wiley Blackwel 2014
6. Rogers PP, Jalal, KF, Boyd JA, An introduction to sustainable development, Earthscan

<b>B.Sc. Forensic Science: Semester-I</b>	
<b>FST105: Physics-I</b>	
<b>Teaching Scheme</b>	<b>Examination Scheme</b>
Lectures: 3 hrs/Week	Class Test -12 Marks
Tutorials: 1 hr/Week	Teachers Assessment – 6 Marks
Credits: 4	Attendance – 12 Marks
	End Semester Exam – 70 marks

**Course outcomes:**

1. Recognize the difference between scalars, vectors, pseudo-scalars and pseudo-vectors.
2. Understand the physical interpretation of gradient, divergence and curl.
3. Comprehend the difference and connection between Cartesian, spherical and cylindrical coordinate systems.
4. Know the meaning of 4-vectors, Kronecker delta and Epsilon (Levi Civita) tensors.
5. Study the origin of pseudo forces in rotating frame.
6. Study the response of the classical systems to external forces and their elastic deformation.
7. Understand the dynamics of planetary motion and the working of Global Positioning System (GPS).
8. Comprehend the different features of Simple Harmonic Motion (SHM) and wave propagation.

<b>Unit I – Coordinate Systems</b>
<ul style="list-style-type: none"> <li>• 2D &amp; 3D Cartesian, Spherical and Cylindrical coordinate systems, basis vectors, transformation equations. Expressions for displacement vector, arc length, area element, volume element, gradient, divergence and curl in different coordinate systems. Components of velocity and acceleration in different coordinate systems. Examples of non-inertial coordinate system and pseudo-acceleration.</li> </ul>
<b>Unit II – Introduction to Tensors</b>
<ul style="list-style-type: none"> <li>• Principle of invariance of physical laws w.r.t. different coordinate systems as the basis for defining tensors. Coordinate transformations for general spaces of nD, contravariant, covariant &amp; mixed tensors and their ranks, 4-vectors. Index notation and summation convention. Symmetric and skewsymmetric tensors. Invariant tensors, Kronecker delta and Epsilon (Levi Civita) tensors. Examples of tensors in physics.</li> </ul>
<b>Unit III – Dynamics of a System of Particles</b>
<ul style="list-style-type: none"> <li>• Review of historical development of mechanics up to Newton. Background, statement and critical analysis of Newton's axioms of motion. Dynamics of a system of particles, centre of mass motion, and conservation laws &amp; their deductions. Rotating frames of reference, general derivation of origin of pseudo forces (Euler, Coriolis &amp; centrifugal) in rotating frame, and effects of Coriolis force.</li> </ul>
<b>Unit IV – Dynamics of a Rigid Body</b>
<ul style="list-style-type: none"> <li>• Angular momentum, Torque, Rotational energy and the inertia tensor. Rotational inertia for simple bodies (ring, disk, rod, solid and hollow sphere, solid and hollow cylinder, rectangular lamina). The combined translational and rotational motion of a rigid body on</li> </ul>

horizontal and inclined planes. Elasticity, relations between elastic constants, bending of beam and torsion of cylinder.

**Unit V – Motion of Planets & Satellites**

- Two particle central force problem, reduced mass, relative and centre of mass motion. Newton's law of gravitation, gravitational field and gravitational potential. Kepler's laws of planetary motion and their deductions. Motions of geo-synchronous & geo-stationary satellites and basic idea of Global Positioning System (GPS).

**Suggested Readings:**

1. Murray Spiegel, Seymour Lipschutz, Dennis Spellman, "Schaum's Outline Series: Vector Analysis", McGraw Hill, 2017, 2e
2. A.W. Joshi, "Matrices and Tensors in Physics", New Age International Private Limited, 1995, 3e
3. Charles Kittel, Walter D. Knight, Malvin A. Ruderman, Carl A. Helmholz, Burton J. Moyer, "Mechanics (In SI Units): Berkeley Physics Course Vol 1", McGraw Hill, 2017, 2e
4. Richard P. Feynman, Robert B. Leighton, Matthew Sands, "The Feynman Lectures on Physics - Vol. 1", Pearson Education Limited, 2012
5. Hugh D. Young and Roger A. Freedman, "Sears & Zemansky's University Physics with Modern Physics", Pearson Education Limited, 2017, 14e
6. D.S. Mathur, P.S. Hemne, "Mechanics", S. Chand Publishing, 1981, 3e

<b>B.Sc. Forensic Science: Semester-I</b>	
<b>FST106: Zoology-I</b>	
<b>Teaching Scheme</b>	<b>Examination Scheme</b>
Lectures: 3 hrs/Week	Class Test -12 Marks
Tutorials: 1 hr/Week	Teachers Assessment – 6 Marks
Credits: 4	Attendance – 12 Marks
	End Semester Exam – 70 marks

**Course outcomes:**

The student at the completion of the course will be able to:

- Understand the structure and function of all the cell organelles.
- Know about the chromatin structure and its location.
- To be familiar with the basic principle of life, how a cell divides leading to the growth of an organism and also reproduces to form new organisms.
- How one cell communicates with its neighboring cells?
- Understand the basic principles of genetics and how genes (earlier called factors) are inherited from one generation to another.
- Understand the Mendel's laws and the deviations from conventional patterns of inheritance.
- Comprehend how environment plays an important role by interacting with genetic factors.
- How to detect chromosomal aberrations in humans and study the pattern of inheritance by pedigree analysis in families.

<b>Unit I – Structure and Function of Cell Organelles</b>
<ul style="list-style-type: none"> <li>• Plasma membrane: chemical structure—lipids and proteins</li> <li>• Cell-cell interaction: cell adhesion molecules, cellular junctions</li> <li>• Endomembrane system: protein targeting and sorting, endocytosis, exocytosis</li> <li>• Cytoskeleton: microtubules, microfilaments, intermediate filaments</li> <li>• Mitochondria: Structure, oxidative phosphorylation</li> <li>• Peroxisome and ribosome: structure and function</li> </ul>
<b>Unit II – Nucleus and Chromatin Structure</b>
<ul style="list-style-type: none"> <li>• Structure and function of nucleus in eukaryotes</li> <li>• Chemical structure and base composition of DNA and RNA</li> <li>• DNA supercoiling, chromatin organization, structure of chromosomes</li> <li>• Types of DNA and RNA</li> </ul>
<b>Unit III – Cell cycle, Cell Division and Cell Signaling</b>
<ul style="list-style-type: none"> <li>• Cell division: mitosis and meiosis</li> <li>• Cell cycle and its regulation, apoptosis</li> <li>• Signal transduction: intracellular signaling and cell surface receptors, via G-protein linked receptors, JAK-STAT pathway</li> </ul>

#### **Unit IV – Mendelism and Sex Determination**

- Basic principles of heredity: Mendel's laws, monohybrid and dihybrid crosses
- Complete and Incomplete Dominance
- Penetrance and expressivity
- Sex-linked characteristics and Dosage compensation

#### **Unit V – Infectious Diseases**

- Introduction to pathogenic organisms: viruses, bacteria, fungi, protozoa, and worms.
- Structure, life cycle, pathogenicity, including diseases, causes, symptoms and control of common parasites: *Trypanosoma*, *Giardia* and *Wuchereria*

#### **Suggested Readings:**

1. Lodish et al: Molecular Cell Biology: Freeman & Co, USA (2004).
2. Alberts et al: Molecular Biology of the Cell: Garland (2002).
3. Cooper: Cell: A Molecular Approach: ASM Press (2000).
4. Karp: Cell and Molecular Biology: Wiley (2002). Pierce B. Genetics. Freeman (2004).
5. Lewin B. Genes VIII. Pearson (2004).
6. Watson et al. Molecular Biology of the Gene. Pearson (2004).
7. Thomas J. Kindt, Richard A. Goldsby, Barbara A. Osborne, Janis KubyKuby Immunology. W H Freeman (2007).
8. Delves Peter J., Martin Seamus J., Burton Dennis R., Roitt Ivan M. Roitt's Essential Immunology, 13<sup>th</sup> Edition. Wiley Blackwell (2017).
9. Shetty Nandini Immunology Introductory Textbook. New Age International. (2005)

<b>B.Sc. Forensic Science: Semester-I</b>	
<b>FST107: Computer Science-I</b>	
<b>Teaching Scheme</b>	<b>Examination Scheme</b>
Lectures: 3 hrs/Week	Class Test -12 Marks
Tutorials: 1 hr/Week	Teachers Assessment – 6 Marks
Credits: 4	Attendance – 12 Marks
	End Semester Exam – 70 marks

**Course outcomes:**

- Understand hardware components of computer system such as memory system organization, input/output devices, aware of software components of computer system, and windows operating system concepts.
- Develops basic understanding of computers, the concept of algorithm and algorithmic thinking.
- Develops the ability to analyze a problem, develop an algorithm to solve it.
- Develops the use of the Python programming language to implement various algorithms, and develops the basic concepts and terminology of programming in general.
- Introduces the more advanced features of the Python language

**Unit I – Computer Fundamentals**

- Introduction to Computers: Characteristics of Computers, Uses of computers, Types and generations of Computers.

**Unit II – Basic Computer Organization**

- Units of a computer, CPU,
- ALU, memory hierarchy, registers, I/O devices. Planning the
- Computer Program: Concept of problem solving, Problem definition, Program design, Debugging, Types of errors in programming, Documentation.
- Techniques of Problem Solving: Flowcharting, decision table, algorithms, Structured programming concepts, Programming methodologies viz. top-down and bottom-up programming.

**Unit III – Overview of Programming**

- Structure of a Python Program, Elements of Python, IDEs for python, Python Interpreter, Using Python as calculator, Python shell, Indentation.
- Introduction to Python: Atoms, Identifiers and keywords, Literals, Strings, Operators (Arithmetic operator, Relational operator, Logical or Boolean operator, Assignment, Operator, Ternary operator, Bit wise operator, Increment or Decrement operator).

**Unit IV – Creating Python Programs**

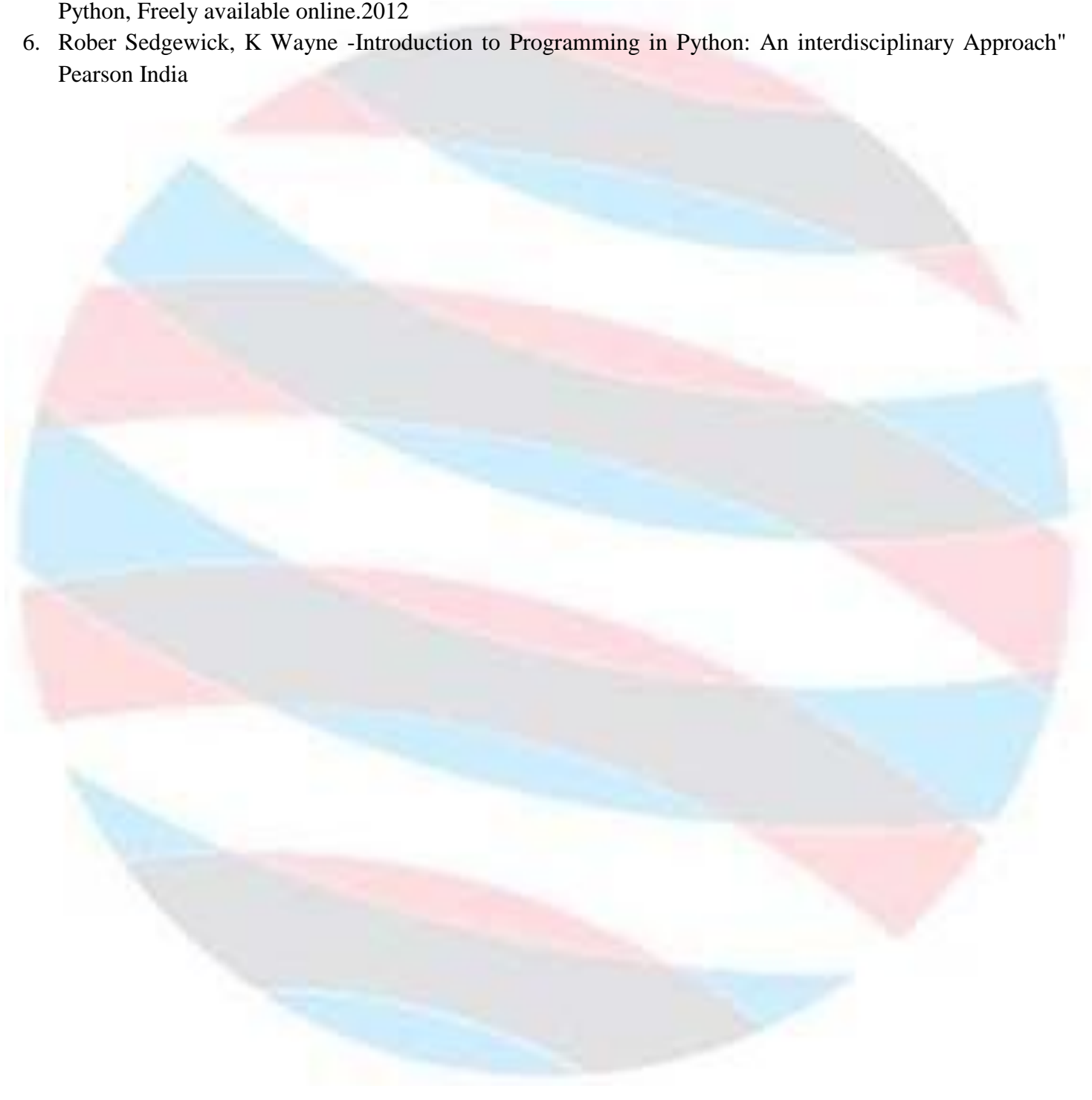
- Input and Output Statements, Control statements (Looping- while Loop, for Loop, Loop Control, Conditional Statement- if...else, Difference between break, continue and pass).

**Unit V – Structures**

- Numbers, Strings, Lists, Tuples, Dictionary, Date & Time, Modules, Defining Functions, Exit function, default arguments. File handling in python.
- Introduction to Advanced Python: Objects and Classes, Inheritance, Regular Expressions, Event Driven Programming, GUI Programming. Basic concepts of concepts of Package and modules

**Suggested Readings:**

1. P. K. Sinha & Priti Sinha , “Computer Fundamentals”, BPB Publications, 2007.
2. Dr. Anita Goel, Computer Fundamentals, Pearson Education, 2010.
3. T. Budd, Exploring Python, TMH, 1st Ed, 2011
4. Python Tutorial/Documentation [www.python.org](http://www.python.org) 2010
5. Allen Downey, Jeffrey Elkner, Chris Meyers , How to think like a computer scientist : learning with Python, Freely available online.2012
6. Rober Sedgewick, K Wayne -Introduction to Programming in Python: An interdisciplinary Approach" Pearson India



<b>B.Sc. Forensic Science: Semester-I</b>	
<b>FST108: Botany-I</b>	
<b>Teaching Scheme</b>	<b>Examination Scheme</b>
Lectures: 3 hrs/Week	Class Test -12 Marks
Tutorials: 1 hr/Week	Teachers Assessment – 6 Marks
Credits: 4	Attendance – 12 Marks
	End Semester Exam – 70 marks

**Course outcomes:**

The student at the completion of the course will be able to:

- Develop understanding about the classification and diversity of different microbes including viruses, Algae, Fungi & Lichens & their economic importance.
- Develop conceptual skill about identifying microbes, pathogens, biofertilizers & lichens.
- Gain knowledge about developing commercial enterprise of microbial products.
- Learn host –pathogen relationship and disease management.
- Learn Presentation skills (oral & writing) in life sciences by usage of computer of computer & multimedia
- Gain Knowledge about uses of microbes in various fields.
- Understand the structure and reproduction of certain selected bacteria algae, fungi and lichens
- Gain Knowledge about the economic values of this lower group of plant community.

**Unit I – Microbial world**

- Cell structure of Eukaryotic and prokaryotic cells, Gram positive and Gram negative bacteria, Structure of a bacteria; Bacterial Chemotaxis and Quorum sensing, Bacterial Growth curve, factors affecting growth of microbes; measurement of growth; Batch culture, fed batch culture and continuous culture; Synchronous growth of microbes; Sporulation and reproduction and recombination in bacteria;
- Viruses, general characteristics, viral culture, Structure of viruses, Bacteriophages, Structure of T4 &  $\lambda$ -phage; Lytic and Lysogenic cycles, viroids, Prions & myco& phytoplasma, Actinomycetes & plasmids and their economic uses.

**Unit II – Phycology**

- Range of thallus organization in Algae, Pigments , Reserve food –Reproduction – Classification and life cycle of – Nostoc; Chlorella, Volvox, Oedogonium , Chara; Sargassum , Ectocarpus, Polysiphonia.
- Economic importance of algae - Role of algae in soil fertility- biofertilizer – Nitrogen fixation- Symbiosis ;Commercial products of algae –biofuel, Agar.

**Unit III – Mycology**

- General characteristics, nutrition, life cycle, Economic importance of Fungi, Classification upto class. Distinguishing characters of Myxomycotina -General characters. Zygomycotina – Rhizopus , Ascomycotina -Saccharomyces, Penicillium, Peziza , Basidiomycotina- Ustilago, Puccinia , Agaricus ; Deuteromycotina – Fusarium, Alternaria , Heterothallism, Physiological specialization, Heterokaryosis & Parasexuality

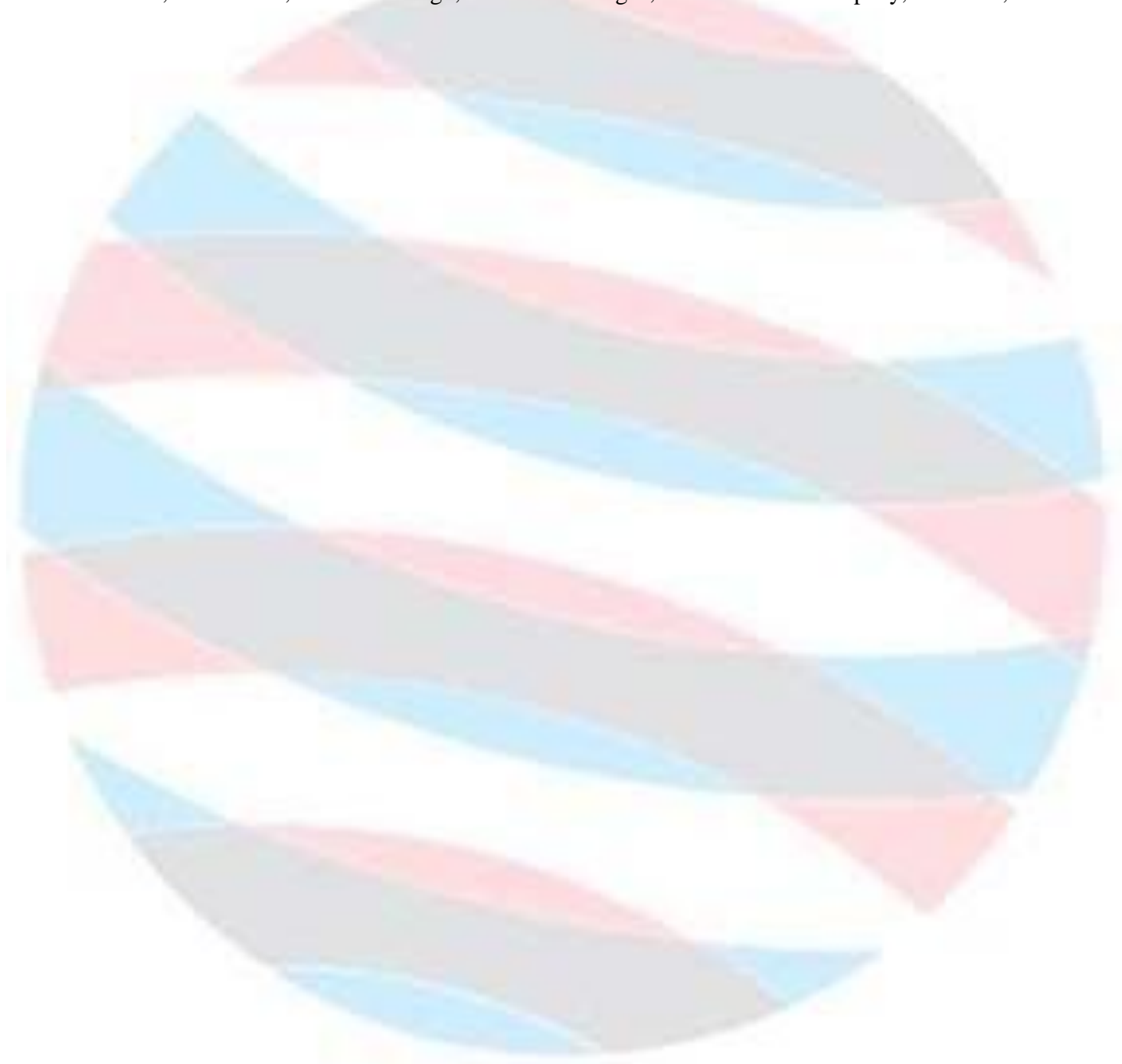


<b>Unit IV – Mushroom Cultivation, Lichenology &amp; Mycorrhiza</b>
<ul style="list-style-type: none"> <li>• Mushroom cultivation.</li> <li>• General account of lichens, reproduction and significance; Mycorrhiza: ectomycorrhiza and endomycorrhiza and their significance.</li> </ul>
<b>Unit V – Plant Pathology</b>
<ul style="list-style-type: none"> <li>• Disease concept, Symptoms, Etiology &amp; causal complex, Primary and secondary inoculum, Infection, Pathogenicity and pathogenesis, Koch's Postulates. Mechanism of infection (Brief idea about Pre-penetration, Penetration and Post-penetration), Disease cycle (monocyclic, polycyclic and polyetic). Defense mechanism with special reference to Phytoalexin, Resistance- Systemic acquired and Induced systemic..fungicides- Bordeaux mixture, Lime sulphur, Tobacco decoction, Neem cake &amp; oil</li> </ul>

### Suggested Readings:

1. Kumar, H.D. (1999). Introductory Phycology. Affiliated East-West. Press Pvt. Ltd. Delhi. 2nd edition.
2. Tortora, G.J., Funke, B.R., Case, C.L. (2010). Microbiology: An Introduction, Pearson Benjamin Cummings, U.S.A. 10<sup>th</sup> edition.
3. Sethi, I.K. and Walia, S.K. (2011). Text book of Fungi & Their Allies, MacMillan Publishers Pvt. Ltd., Delhi.
4. Aggarwal, S. K. 2009. Foundation Course in Biology, A one books Pvt. Ltd., New Delhi.
5. Aneja, K. R. 1993. Experiments in Microbiology, Pathology and Tissue Culture, Vishwa Prakashan, NewDelhi.
6. Annie Ragland, 2012. Algae and Bryophytes, Saras Publication, Kanyakumari, India.
7. Basu, A. N. 1993. Essentials of Plant Viruses, Vectors and Plant diseases, New Age International, New Delhi.
8. Chopra. G. L. 1984. A text book of Algae, Rastogi publications, Meerut,India.
9. Desikachari, T. V. 1959. Cyanophyta, ICAR, New Delhi.
10. Dubey, R. C. and Maheshwari. D.K. 2012. Practical Microbiology, S. Chand & Company, Pvt. Ltd., NewDelhi.
11. Fritsch, R. E. 1977. Structure and Reproduction of Algae, Cambridge University Press, London.
12. Kodo, C.I. and Agarwal, H.O.1972. Principles and techniques in Plant Virology, Van Nostrand, Reinhold Company, New York.
13. Agrios, G.N. (1997). Plant Pathology, 4th edition. Cambridge, U.K.: Academic Press.
14. Alexopoulos, C.J., Mims, C.W., Blackwell, M. (1996). Introductory Mycology, 4th edition. Singapore, Singapore: John Wiley & Sons.
15. Sethi, I.K. and Walia, S.K. (2011). Text book of Fungi and Their Allies. Noida, U.P.: Macmillan Publishers India Ltd.
16. Reven, F.H., Evert, R. F., Eichhorn, S.E. (1992). Biology of Plants. New York, NY: W.H. Freeman and Company.
17. Sharma, P.D. (2011). Plant Pathology. Meerut, U.P.: Rastogi Publication.
18. Webster, J., Weber, R. (2007). Introduction to Fungi, 3rd edition. Cambridge, U.K.: Cambridge University Press..
19. Pandey B.P. 2001. College Botany Volume 1, S Chand & Company Pvt.Ltd, New Delhi.
20. Pandey. B.P. 2014 Modern Practical Botany, (Vol-I) S. Chand and Company Pvt. Ltd., New Delhi.
21. Pelzar, 1963. Microbiology, Tata Mc Graw Hill, New Delhi
22. Rangaswamy, G. 2009, Disease of Crop Plants in India, Prientice Hall of India, New Delhi.
23. Sambamurty. A.V.S.S. 2006, A Text book of Algae, I. K. International Publishing House, Pvt. Ltd., New Delhi.

24. Sharma, P. D. 2012, Microbiology and Plant Pathology, Rastogi Publication Pvt Ltd., Meerut, India.
25. Singh, R. P. 2007. Microbial Taxonomy and Culture Techniques, Kalyani Publication, New Delhi.
26. Smith. G. M. 1996. Cryptogamic Botany Volume I, Tata Mc Graw Hill, New Delhi.
27. Sundar Rajan. S. 2010.College Botany Volume I, Himalaya Publications, Mumbai.
28. Vashishta, B.R. Sinha, A.K. and Singh, V. P. 1991. Algae, S. Chand and Company, Pvt. Ltd., New Delhi



<b>B.Sc. Forensic Science: Semester-I</b>	
<b>FST153: Chemistry Lab-I</b>	
<b>Teaching Scheme</b>	<b>Examination Scheme</b>
Practicals: 4 hr/Week Credits: 2	Internal Assessment – 15 Marks
	External Assessment – 35 Marks
	End Semester Exam – 50 marks

**Course Objective:** To make the students trained in different techniques of Chemistry and Biochemistry for future applications in Forensic Science Laboratories

#### **Experiment Details**

1. Determination of acetic acid in commercial vinegar using NaOH.
2. Determination of alkali content – antacid tablet using HCl.
3. Estimation of oxalic acid by titrating it with  $\text{KMnO}_4$
4. Qualitative Inorganic Mixture Analysis: Not containing more than 4 ions and one interfering anion
5. Chromatographic separation of metal ions.
6. Gravimetric estimation of Cations/Anions.
7. Estimation of hardness of water by EDTA

#### **Suggested Readings**

1. Concise Inorganic Chemistry, J. D. Lee, 5th Edition (1996), Chapman & Hall, London.
2. Inorganic Chemistry, J.E. Huheey, E.A. Keiter and R.L. Keiter.
3. Modern Inorganic Chemistry, R. C. Aggarwal, 1st Edition (1987), Kitab Mahal, Allahabad.
4. Basic Inorganic Chemistry, F. A Cotton, G. Wilkinson, and Paul L. Gaus, 3rd Edition (1995), John Wiley & Sons, New York.
5. Inorganic Chemistry, A. G. Sharpe, 3rd International Student Edition (1999), ELBS / Longman, U.K.
6. Inorganic Chemistry, D. F. Shriver and P. W. Atkins, 3rd Edition (1999), ELBS, London

<b>B.Sc. Forensic Science: Semester-I</b>	
<b>FST155: Physics Lab-I</b>	
<b>Teaching Scheme</b>	<b>Examination Scheme</b>
Practicals: 4 hr/Week Credits: 2	Internal Assessment – 15 Marks
	External Assessment – 35 Marks
	End Semester Exam – 50 marks

**Course outcomes:**

- Experimental physics has the most striking impact on the industry wherever the instruments are used to study and determine the mechanical properties. Measurement precision and perfection is achieved through Lab Experiments. Online Virtual Lab Experiments give an insight in simulation techniques and provide a basis for modeling.

**Lab Experiment List**

- Moment of inertia of a flywheel
- Moment of inertia of an irregular body by inertia table
- Modulus of rigidity by statistical method (Barton’s apparatus)
- Modulus of rigidity by dynamical method (sphere / disc / Maxwell’s needle)
- Young’s modulus by bending of beam
- Young’s modulus and Poisson’s ratio by Searle’s method
- Poisson’s ratio of rubber by rubber tubing
- Surface tension of water by capillary rise method
- Surface tension of water by Jaeger’s method
- Coefficient of viscosity of water by Poiseuille’s method
- Acceleration due to gravity by bar pendulum
- Frequency of AC mains by Sonometer
- Height of a building by Sextant
- Study the wave form of an electrically maintained tuning fork / alternating current source with the help of cathode ray oscilloscope.

**Suggested Readings:**

1. B.L. Worsnop, H.T. Flint, “Advanced Practical Physics for Students”, Methuen & Co., Ltd., London, 1962, 9e
2. S. Panigrahi, B. Mallick, “Engineering Practical Physics”, Cengage Learning India Pvt. Ltd., 2015, 1e
3. R.K. Agrawal, G. Jain, R. Sharma, “Practical Physics”, Krishna Prakashan Media (Pvt.) Ltd., Meerut, 2019
4. S.L. Gupta, V. Kumar, “Practical Physics”, Pragati Prakashan, Meerut, 2014

<b>B.Sc. Forensic Science: Semester-I</b> <b>FST156: Zoology Lab-I</b>	
<b>Teaching Scheme</b>	<b>Examination Scheme</b>
Practicals: 4 hr/Week Credits: 2	Internal Assessment – 15 Marks
	External Assessment – 35 Marks
	End Semester Exam – 50 marks

**Course outcomes:**

**At the completion of the course students will learn Hands-on:**

- To use simple and compound microscopes.
- To prepare slides and stain them to see the cell organelles.
- To be familiar with the basic principle of life, how a cell divides leading to the growth of an organism and also reproduces to form new organisms.
- The chromosomal aberrations by preparing karyotypes.
- How chromosomal aberrations are inherited in humans by pedigree analysis in families.
- The antigen-antibody reaction.

<b>Unit I</b>
<ul style="list-style-type: none"> <li>• To study different cell types such as buccal epithelial cells, neurons, striated muscle cells using Methylene blue.</li> <li>• To study the different stages of Mitosis in root tip of onion.</li> <li>• To study the different stages of Meiosis in grasshopper testis.</li> <li>• To prepare molecular models of nucleotides, amino acids, dipeptides using bead and stick method.</li> <li>• To check the permeability of cells using salt solution of different concentrations.</li> </ul>
<b>Unit II</b>
<ul style="list-style-type: none"> <li>• Study of parasites (ex. Protozoans, helminthes etc.) from permanent slides.</li> <li>• To learn the procedures for preparation of temporary and permanent stained/unstained slides.</li> </ul>
<b>Unit III</b>
<ul style="list-style-type: none"> <li>• Study of mutant phenotypes of Drosophila.</li> <li>• Preparation of polytene chromosomes.</li> <li>• Study of sex chromatin (Barr bodies) in buccal smear and hair bud cells (Human).</li> <li>• Preparation of human karyotype and study the chromosomal aberrations with respect to number, translocation, deletion etc. from the pictures provided.</li> </ul>

**Suggested Readings:**

1. Lodish et al: Molecular Cell Biology: Freeman & Co, USA (2004).
2. Alberts et al: Molecular Biology of the Cell: Garland (2002).
3. Cooper: Cell: A Molecular Approach: ASM Press (2000).
4. Karp: Cell and Molecular Biology: Wiley (2002). Pierce B. Genetics. Freeman (2004).
5. Thomas J. Kindt, Richard A. Goldsby, Barbara A. Osborne, Janis KubyKuby Immunology. W H Freeman (2007).
6. Kesar, Saroj and Vashishta N. (2007). Experimental Physiology: Comprehensive Manual. Heritage Publishers, New Delhi

<b>B.Sc. Forensic Science: Semester-I</b> <b>FST157: Computer Lab-I</b>	
<b>Teaching Scheme</b>	<b>Examination Scheme</b>
Practicals: 4 hr/Week Credits: 2	Internal Assessment – 15 Marks
	External Assessment – 35 Marks
	End Semester Exam – 50 marks

**Course outcomes:**

- To learn and understand Python programming basics.
- To learn and understand python looping, control statements and string manipulations.
- Students should be made familiar with the concepts of GUI controls and designing GUI applications.
- To learn and know the concepts of file handling, exception handling and database connectivity.

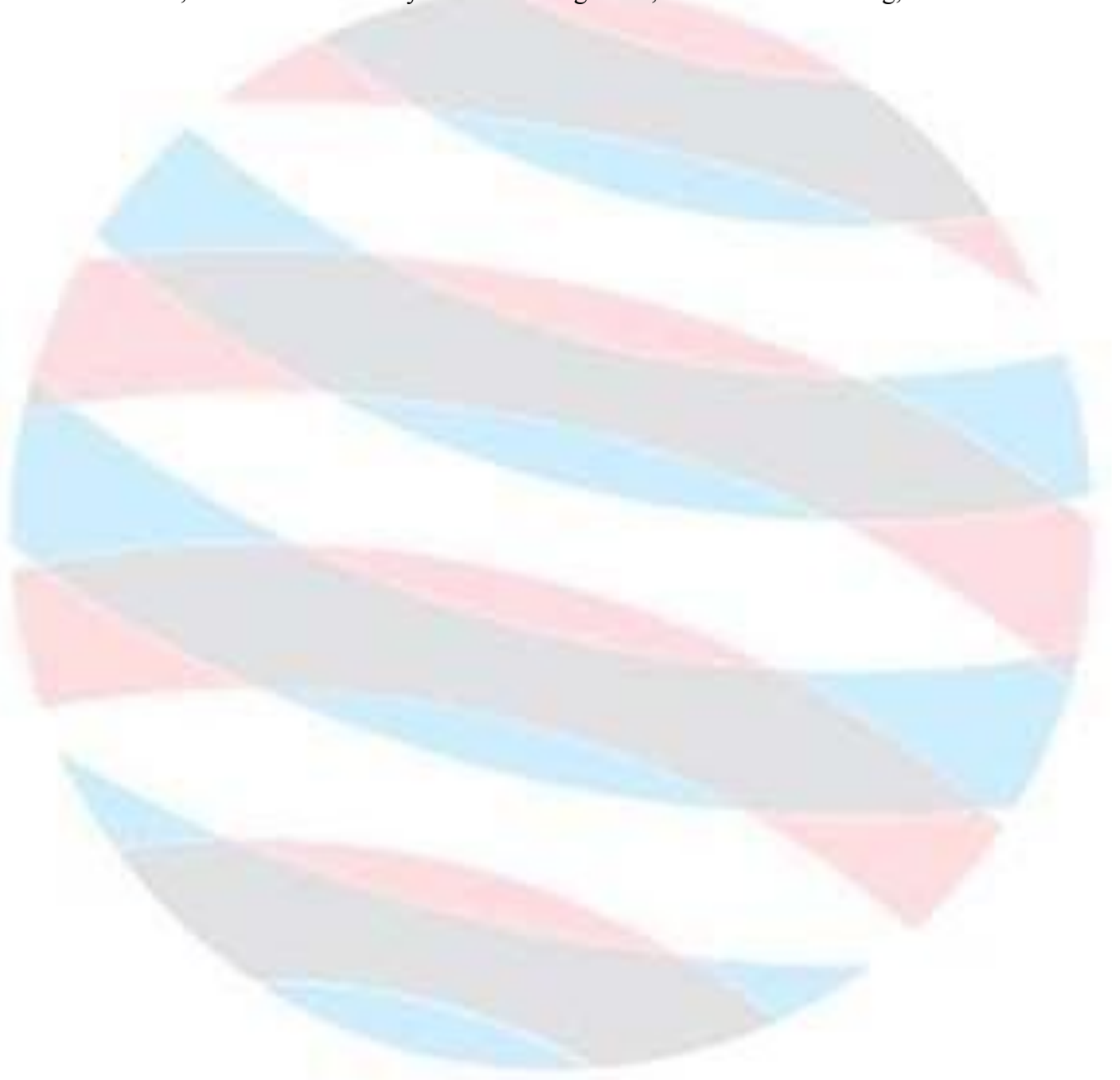
**Lab Activity List**

- Write a menu driven program to convert the given temperature from Fahrenheit to Celsius and vice versa depending upon user’s choice.
- WAP to calculate total marks, percentage and grade of a student. Marks obtained in each of the three subjects are to be input by the user. Assign grades according to the following criteria :  
Grade A: Percentage  $\geq 80$   
Grade B: Percentage  $\geq 70$  and  $< 80$   
Grade C: Percentage  $\geq 60$  and  $< 70$   
Grade D: Percentage  $\geq 40$  and  $< 60$   
Grade E: Percentage  $< 40$
- Write a menu-driven program, using user-defined functions to find the area of rectangle, square, circle and triangle by accepting suitable input parameters from user.
- WAP to display the first n terms of Fibonacci series.
- WAP to find factorial of the given number.
- WAP to find sum of the following series for n terms:  $1 - 2/2! + 3/3! - \dots - n/n!$
- WAP to calculate the sum and product of two compatible matrices.
- WAP to read n integers and display them as a histogram.
- WAP to display sine, cosine, polynomial and exponential curves.
- WAP to plot a graph of people with pulse rate p vs. height h. The values of p and h are to be entered by the user.

**Suggested Readings:**

1. Allen B. Downey, “Think Python: How to Think Like a Computer Scientist”, 2nd edition, Updated for Python 3, Shroff/O’Reilly Publishers, 2016
2. Guido van Rossum and Fred L. Drake Jr, “An Introduction to Python – Revised and updated for Python 3.2, Network Theory Ltd., 2011.

3. Charles Dierbach, "Introduction to Computer Science using Python: A Computational Problem-Solving Focus, Wiley India Edition, 2013.
4. John V Guttag, "Introduction to Computation and Programming Using Python", Revised and expanded Edition, MIT Press , 2013
5. Kenneth A. Lambert, "Fundamentals of Python: First Programs", CENGAGE Learning, 2012.



<b>B.Sc. Forensic Science: Semester-I</b>	
<b>FST158: Botany Lab-I</b>	
<b>Teaching Scheme</b>	<b>Examination Scheme</b>
Practicals: 4 hr/Week Credits: 2	Internal Assessment – 15 Marks
	External Assessment – 35 Marks
	End Semester Exam – 50 marks

**Course outcomes:**

**At the completion of the course students will be able to:**

- Understand the instruments, techniques, lab etiquettes and good lab practices for working in a microbiology laboratory.
- Develop skills for identifying microbes and using them for Industrial, Agriculture and Environment purposes.
- Practical skills in the field and laboratory experiments in Microbiology & Pathology. learn to identify Algae, Lichens and plant pathogens along with their Symbiotic and Parasitic associations.

<b>Unit I</b>
<ul style="list-style-type: none"> <li>• Laboratory safety and good laboratory practices</li> <li>• Principles and application of Laboratory instruments-microscope, incubator, autoclave, centrifuge, LAF, filtration unit, shaker, pH meter.</li> <li>• Buffer preparation &amp; titration</li> <li>• Cleaning and Sterilization of glasswares</li> <li>• Preparation of media- Nutrient Agar and Broth</li> </ul>
<b>Unit II</b>
<ul style="list-style-type: none"> <li>• Identification of bacteria.</li> <li>• Staining techniques: Gram's, Negative, Endospore, Capsule and Cell Wall.</li> </ul>
<b>Unit III</b>
<ul style="list-style-type: none"> <li>• Type study of algae and Cyanobacteria –Spirulina, Nostoc. Chlorophyceae - Chlorella, Volvox, Oedogonium, Cladophora, and Chara; Xanthophyceae – Vaucheria ;Bacillariophyceae – Pinnularia Phaeophyceae – Sargassum Rhodophyceae - Polysiphonia</li> </ul>

**Suggested Readings:**

1. Aneja, K. R. 1993. Experiments in Microbiology, Pathology and Tissue Culture, Vishwa Prakashan, New Delhi.
2. Dubey, R. C. and Maheshwari. D.K. 2012. Practical Microbiology, S. Chand & Company, Pvt. Ltd., New Delhi.
3. Kodo, C.I. and Agarwal, H.O.1972. Principles and techniques in Plant Virology, Van Nostrand, Reinhold Company, New York.
4. Madhavee Latha, P. 2012, A Textbook of Immunology, S. Chand & Company Pvt. Ltd., New Delhi.
5. Pandey. B.P. 2014 Modern Practical Botany, (Vol-I) S. Chand and Company Pvt. Ltd., New Delhi.
6. Sambamurty. A.V.S.S. 2006, A Text book of Algae, I. K. International Publishing House, Pvt. Ltd.,
7. Singh, R. P. 2007. Microbial Taxonomy and Culture Techniques, Kalyani Publication, New Delhi.



<b>B.Sc. Forensic Science: Semester-II</b>	
<b>FST 201: Law for Forensic Scientists</b>	
<b>Teaching Scheme</b>	<b>Examination Scheme</b>
Lectures: 3 hrs/Week	Class Test -12 Marks
Tutorials: 1 hr/Week	Teachers Assessment – 6 Marks
Credits: 4	Attendance – 12 Marks
	End Semester Exam – 70 marks

Course Objectives: After studying this paper the students will know –

1. Elements of Criminal Procedure Code related to forensic science.
2. Acts and provisions of the Constitution of India related to forensic science.
3. Acts governing socio-economic crimes.
4. Acts governing environmental crimes.

### **Unit 1: Introduction to criminal law**

Offence – Definition and its types. Classification – civil, criminal cases.

Essential elements of criminal laws. Constitution and hierarchy of criminal courts.

Criminal Procedure Code – Cognizable and non-cognizable offences. Bailable and non-bailable offences and other relevant sections. Section 291, 292 and 293.

### **Unit 2: Indian Penal Code**

Offences against persons – Sections 121A, 299, 300, 302, 304, 304A, 304B, 306, 307, 309, 319, 320, 324, 326, 351, 354, 359, 362.

Sections 375 & 377 and their amendments.

Offences against property – Sections 378, 383, 390, 391, 405, 415, 420, 441, 463, 489A, 497, 499, 503, 511.

POCSO

**Unit 3: Indian Evidence Act**

Evidence and rules of relevancy in brief. Expert witness. Cross examination and re-examination of witnesses. Examination in Chief.

Sections 32, 45, 46, 47, 57, 58, 60, 73, 135, 136, 137, 138, 141.

**Unit 4: Constitution Of India**

Preamble, Fundamental Rights, Directive Principles of State Policy. – Articles 14, 15, 20, 21, 22, 51A.

**Unit 5: Acts Pertaining to Socio-economic and Environmental Crimes**

Narcotic Drugs and Psychotropic Substances Act. Essential Commodity Act. Drugs and Cosmetics Act. Explosive Substances Act. Arms Act. Dowry Prohibition Act. Prevention of Food Adulteration Act. Prevention of Corruption Act. Wildlife Protection Act. I.T. Act. Environment Protection Act.

**Suggested Readings**

1. D.A. Bronstein, *Law for the Expert Witness*, CRC Press, Boca Raton (1999).
2. Vipa P. Sarthi, *Law of Evidence*, 6<sup>th</sup> Edition, Eastern Book Co., Lucknow (2006).
3. A.S. Pillia, *Criminal Law*, 6<sup>th</sup> Edition, N.M. Tripathi Pvt Ltd., Mumbai (1983).
4. R.C. Nigam, *Law of Crimes in India*, Volume I, Asia Publishing House, New Delhi (1965).
5. (Chief Justice) M. Monir, *Law of Evidence*, 6<sup>th</sup> Edition, Universal Law Publishing Co. Pvt. Ltd., New Delhi (2002).
6. Constitution of India, Bare Act

<b>B.Sc. Forensic Science: Semester-II</b> <b>FST 202: Forensic Psychology</b>	
<b>Teaching Scheme</b>	<b>Examination Scheme</b>
Lectures: 3 hrs/Week	Class Test -12 Marks
Tutorials: 1 hr/Week	Teachers Assessment – 6 Marks
Credits: 4	Attendance – 12 Marks
	End Semester Exam – 70 marks

Course Objectives: After studying this paper the students will know –

1. The overview of forensic psychology and its applications.
2. The legal aspects of forensic psychology.
3. The significance of criminal profiling.
4. The importance of psychological assessment in gauging criminal behavior.
5. The tools and techniques required for detection of deception.
6. The critical assessment of advanced forensic techniques like polygraphy, narco analysis, etc.

**Unit 1: Introduction**

Introduction to forensic Psychology, Nature, History and its Scope. Fundamental distinctions between Psychology and Law, Police Psychology, Forensic Psychology in India and its sub-fields. Ethical and Legal issues in Forensic Practice, Psychologist as Expert Witnesses.

**Unit 2: Crime and the Victim**

Crime: Causes, impact of crime on victim, Victimization, Factors affecting victimization: Bystander Effect, Forensic Mental Health. Psychological explanations of specific crime types: Arson, terrorism, homicides, sexual offences, burglary, robbery, theft, white collar crimes.

**Unit 3: Psychology in Investigation, Court-Room & Corrections**

Criminal Profiling, Eyewitness Testimony, Competence to stand trial, Roles of correctional psychologist, Treatment and Rehabilitation in Correctional facilities, Risk Assessment, Treatment of Special population: Violent Offenders, Women Prisoners, Juvenile Justice.

**Unit 4: Assessment and Evaluation in Forensic Psychology**

Psychological Tests used in forensic psychology, Forensic methods in detection of crime: Brain Electrical Oscillation Signature Profiling (BEOS). Lie Detections: Polygraph, Brain Mapping, Narco-analysis.

**Unit 5: Professional Practice**

Forensic consultancy and supervision, core competences, Cognitive interviewing techniques, psychologist as a consultant, Family law issues, custody and adoptions, Psychology and the legal process interaction, Presentation of evidences and providing feedback, Psychotherapy with Criminal Offenders.

**Suggested Readings**

1. A.A. Moenssens, J. Starrs, C.E. Henderson and F.E. Inbau, *Scientific Evidence in Civil and Criminal Cases*, 4<sup>th</sup> Edition, The Foundation Press, Inc., New York (1995).
2. R. Saferstein, *Criminalistics*, 8<sup>th</sup> 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).

<b>B.Sc. Forensic Science: Semester-II</b>	
<b>FST 203: Chemistry-II</b>	
<b>Teaching Scheme</b>	<b>Examination Scheme</b>
Lectures: 3 hrs/Week	Class Test -12 Marks
Tutorials: 1 hr/Week	Teachers Assessment – 6 Marks
Credits: 4	Attendance – 12 Marks
	End Semester Exam – 70 marks

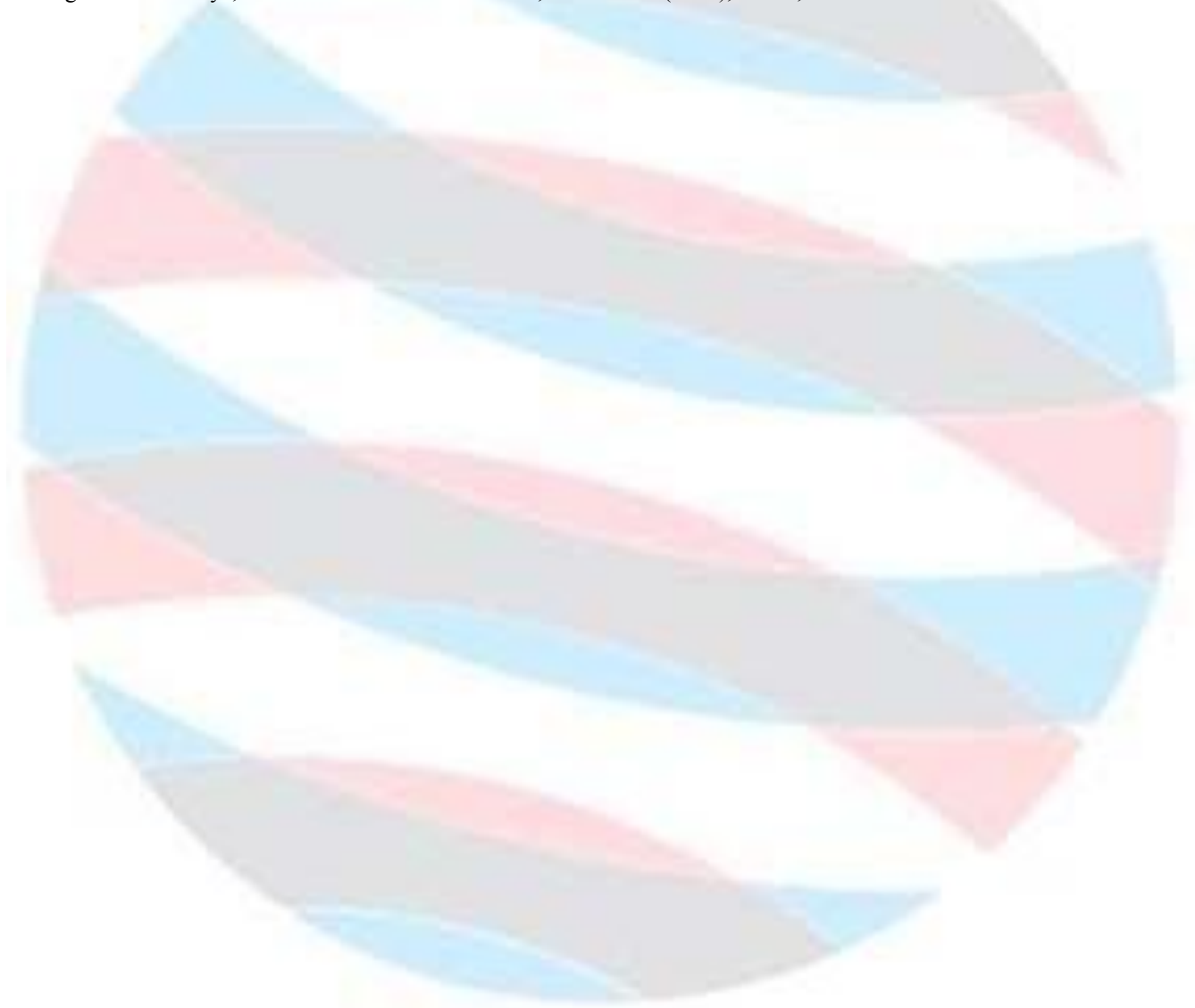
**Course Objective:**

- a. *On the completion of this course the students will be able to understand the properties of transition elements.*
- b. *The student will be able to describe and understand the characteristics of the periodic table, metal complexes, bioinorganic chemistry, and organometallic chemistry.*

<b>Unit 1: Magnetic Properties of Transition Metal Complexes</b>
Types of magnetic behavior, methods of determining magnetic susceptibility, L-S and J-J coupling, orbital contribution to magnetic moments. Correlation of magnetic moment data and stereochemistry of Co(II) and Ni(II) complexes; anomalous magnetic moments.
<b>Unit 2: Electronic Spectra of Transition Metal Complexes</b>
Types of electronic transitions, selection rule for dd transitions, spectroscopic ground states. Explanation of electronic spectra on the basis of Orgel energy level diagrams for d1, d4, d6 and d9 states.
<b>Unit 3: Chemistry of f-block Elements</b>
Comparative study of actinide elements with respect to electronic configuration, atomic and ionic radii, oxidation states and complex formation; occurrence and principles of separation. General features and chemistry of actinides, principles of separation of Np, Pu and Am from U. Trans-Uranium elements.
<b>Unit 4: Bioinorganic Chemistry</b>
Essential and trace element in biological process, oxygen transport with reference to hemoglobin; synthetic models of O <sub>2</sub> carriers., Biological role of alkali metals ions. Vitamin B-12
<b>Unit 5: Organometallic Chemistry</b>
Definition, nomenclature and classification of organometallic compounds. Preparation, properties, bonding and applications of alkyl and aryls of Li, Al, Hg, Sn, Ti. A brief account of metal-ethylene complexes and homogeneous hydrogenation

**Suggested Readings:**

1. "Concise Inorganic Chemistry", J. D. Lee, 5th Edition (1996), Chapman & Hall, London.
2. "Inorganic Chemistry", J.E. Huheey, E.A. Keiter and R.L. Keiter.
3. "Modern Inorganic Chemistry", R. C. Aggarwal, 1st Edition (1987), Kitab Mahal, Allahabad.
4. "Basic Inorganic Chemistry", F. A Cotton, G. Wilkinson, and Paul L. Gaus, 3rd Edition (1995), John Wiley & Sons, New York.
5. "Inorganic Chemistry", A. G. Sharpe, 3rd International Student Edition (1999), ELBS / Longman, U.K.
6. "Inorganic Chemistry", D. F. Shriver and P. W. Atkins, 3rd Edition (1999), ELBS, London.



<b>B.Sc.: Semester-II</b>	
<b>FST 204: English Communication</b>	
<b>Teaching Scheme</b>	<b>Examination Scheme</b>
Lectures: 2 hr/Week Credits: 2	Internal Assessment – 15 Marks
	External Assessment – 35 Marks
	End Semester Exam – 50 marks

**Course objectives:**

1. To provide an overview of Prerequisites to Business Communication.
2. To put in use the basic mechanics of Grammar.
3. To impart the correct practices of the strategies of Effective Business writing.

<b>Unit 1: Basics of Communication</b>
Fundamentals of Communication: Introduction, Definition, Process, Importance, Different Forms and Purpose of Communication, Barriers to Communication, Organization and Interpersonal Communication.
<b>Unit 2: English Grammar</b>
Grammar and Vocabulary: Tenses, Verb Types, Active and Passive Voice, Narration, Prepositions, Conditionals, Conjunctions, One word substitutions, Synonyms and Antonyms
<b>Unit 3: Speaking Skills</b>
Speaking Skills: Introduction, Purpose, Features, Delivering Speeches – Welcome and Introductory, Vote of Thanks. Farewell Speech.
<b>Unit 4: Writing Skills</b>
Professional Writing: Official Communication: Drafting Emails, Letter drafting, Notices, Minutes of Meeting, Circulars Technical Writing: Summer reports, Live Project reports, Field Visit Reports, Resume writing.
<b>Unit 5: Presentation Skills</b>
Presentation: Fundamentals of Presentation, Audience Analysis, Question–Answer Session. Report Writing: General and Technical, Definition, Types, structure, Technical proposals-Definitions, Types and Format. Group Discussion: Introduction to Group Discussion, Difference between GD and Debate, Preparation Strategy.

**Suggested Readings:**

1. Communication Skills, PushpLata, Sanjay Kumar, Oxford Higher Education/Oxford University Press , 2011.
2. Technical Communication, Principles and Practice, Meenakshi Raman & Sangita Sharma, Oxford University Press.
3. Effective Technical Communication, M Ashraf Rizvi, Tata McGraw –Hill Education.
4. Basic Communication Skills for Technology, Andre J Rutherford , Pearson Education Asia.

<b>B.Sc. Forensic Science: Semester-II</b>	
<b>FST 205: Physics-II</b>	
<b>Teaching Scheme</b>	<b>Examination Scheme</b>
Lectures: 3 hrs/Week	Class Test -12 Marks
Tutorials: 1 hr/Week	Teachers Assessment – 6 Marks
Credits: 4	Attendance – 12 Marks
	End Semester Exam – 70 marks

**Course outcomes:**

- Recognize the difference between reversible and irreversible processes.
- Understand the physical significance of thermodynamical potentials.
- Comprehend the kinetic model of gases w.r.t. various gas laws.
- Study the implementations and limitations of fundamental radiation laws.
- Utility of AC bridges.
- Recognize the basic components of electronic devices.
- Design simple electronic circuits.
- Understand the applications of various electronic instruments.

**Unit I – Laws of Thermodynamics**

- **0th & 1st Law**  
State functions and terminology of thermodynamics. Zeroth law and temperature. First law, internal energy, heat and work done. Work done in various thermodynamical processes. Enthalpy, relation between CP and CV. Carnot's engine, efficiency and Carnot's theorem. Efficiency of internal combustion engines (Otto and diesel).
- **2nd & 3rd Law**  
Different statements of second law, Clausius inequality, entropy and its physical significance. Entropy changes in various thermodynamical processes. Third law of thermodynamics and unattainability of absolute zero. Thermodynamical potentials, Maxwell's relations, conditions for feasibility of a process and equilibrium of a system. Clausius- Clapeyron equation, Joule-Thompson effect.

**Unit II – Kinetic Theory of Gases**

- Kinetic model and deduction of gas laws. Derivation of Maxwell's law of distribution of velocities and its experimental verification. Degrees of freedom, law of equipartition of energy (no derivation) and its application to specific heat of gases (mono, di and poly atomic).

**Unit III – Theory of Radiation**

- Blackbody radiation, spectral distribution, concept of energy density and pressure of radiation. Derivation of Planck's law, deduction of Wien's distribution law, Rayleigh-Jeans law, Stefan-Boltzmann law and Wien's displacement law from Planck's law.

**Unit IV – DC & AC Circuits**

- Growth and decay of currents in RL circuit. Charging and discharging of capacitor in RC, LC and RCL circuits. Network Analysis - Superposition, Reciprocity, Thevenin's and Norton's theorems. AC Bridges - measurement of inductance (Maxwell's, Owen's and Anderson's bridges) and measurement of capacitance (Schering's, Wein's and de Sauty's bridges).



## Unit V – Semiconductors & Diodes

- P and N type semiconductors, qualitative idea of Fermi level. Formation of depletion layer in PN junction diode, field & potential at the depletion layer. Qualitative idea of current flow mechanism in forward & reverse biased diode. Diode fabrication. PN junction diode and its characteristics, static and dynamic resistance. Principle, structure, characteristics and applications of Zener, Tunnel, Light Emitting, Point Contact and Photo diodes. Half and Full wave rectifiers, calculation of ripple factor, rectification efficiency and voltage regulation. Basic idea about filter circuits and voltage regulated power supply.

### Suggested Readings:

1. M.W. Zemansky, R. Dittman, "Heat and Thermodynamics", McGraw Hill, 1997, 7e
2. F.W. Sears, G.L. Salinger, "Thermodynamics, Kinetic theory & Statistical thermodynamics", Narosa Publishing House, 1998
3. Enrico Fermi, "Thermodynamics", Dover Publications, 1956
4. S. Garg, R. Bansal, C. Ghosh, "Thermal Physics", McGraw Hill, 2012, 2e
5. Meghnad Saha, B.N. Srivastava, "A Treatise on Heat", Indian Press, 1973, 5e
6. R.L. Boylestad, L. Nashelsky, "Electronic Devices and Circuit Theory", Prentice-Hall of India Pvt. Ltd., 2015, 11e
7. J. Millman, C.C. Halkias, Satyabrata Jit, "Electronic Devices and Circuits", McGraw Hill, 2015, 4e
8. B.G. Streetman, S.K. Banerjee, "Solid State Electronic Devices", Pearson Education India, 2015, 7e
9. J.D. Ryder, "Electronic Fundamentals and Applications", Prentice-Hall of India Private Limited, 1975, 5e
10. A. Sudhakar, S.S. Palli, "Circuits and Networks: Analysis and Synthesis", McGraw Hill, 2015, 5e
11. S.L. Gupta, V. Kumar, "Hand Book of Electronics", Pragati Prakashan, Meerut, 2016, 43e

<b>B.Sc. Forensic Science: Semester-II</b>	
<b>FST 206: Zoology-II</b>	
<b>Teaching Scheme</b>	<b>Examination Scheme</b>
Lectures: 3 hrs/Week	Class Test -12 Marks
Tutorials: 1 hr/Week	Teachers Assessment – 6 Marks
Credits: 4	Attendance – 12 Marks
	End Semester Exam – 70 marks

**Course outcomes:**

**The student at the completion of the course will learn:**

- To develop a deep understanding of structure of biomolecules like proteins, lipids and carbohydrates
- How simple molecules together form complex macromolecules.
- To understand the thermodynamics of enzyme catalyzed reactions.
- Mechanisms of energy production at cellular and molecular levels.
- To understand systems biology and various functional components of an organism.
- To explore the complex network of these functional components.
- To comprehend the regulatory mechanisms for maintenance of function in the body.

<b>Unit I – Structure and Function of Biomolecules</b>
<ul style="list-style-type: none"> <li>• Classification, Structure and function of Carbohydrates, Lipids, Protein, Enzyme, Nucleic Acid.</li> </ul>
<b>Unit II – Digestion and Respiration</b>
<ul style="list-style-type: none"> <li>• Structural organization and functions of gastrointestinal tract and associated glands</li> <li>• Mechanical and chemical digestion of food; Absorptions of carbohydrates, lipids, proteins, water, minerals and vitamins; Histology of trachea and lung</li> <li>• Mechanism of respiration, Pulmonary ventilation; Respiratory volumes and capacities; Transport of oxygen and carbon dioxide in blood Respiratory pigments, Dissociation curves and the factors influencing it; Control of respiration</li> </ul>
<b>Unit III – Circulation and Excretion</b>
<ul style="list-style-type: none"> <li>• Components of blood and their functions</li> <li>• Haemostasis: Blood clotting system, Blood groups: Rh factor, and ABO.</li> <li>• Structure of mammalian heart, Double circulation.</li> <li>• Cardiac cycle; Cardiac output and its regulation, Electrocardiogram, Blood pressure and its regulation</li> <li>• Structure of kidney and its functional unit; Mechanism of urine formation</li> </ul>
<b>Unit IV – Muscular System</b>
<ul style="list-style-type: none"> <li>• Histology of different types of muscle; Ultra structure of skeletal muscle;</li> <li>• Molecular and chemical basis of muscle contraction.</li> </ul>
<b>Unit V – Nervous System</b>
<ul style="list-style-type: none"> <li>• Structure of neuron, and its types</li> <li>• Structure and Types of synapse.</li> <li>• Nerve impulse in myelinated and Non-myelinated neuron</li> </ul>

## **Suggested Readings:**

- Nelson & Cox: Lehninger's Principles of Biochemistry: McMillan (2000)
- Zubay et al: Principles of Biochemistry: WCB (1995)
- Voet&Voet: Biochemistry Vols 1 & 2: Wiley (2004)
- Murray et al: Harper's Illustrated Biochemistry: McGraw Hill (2003) Elliott and Elliott: Biochemistry and Molecular Biology: Oxford University Press
- Guyton, A.C. & Hall, J.E. Textbook of Medical Physiology. XI Edition. Hercourt Asia PTE Ltd. /W.B. Saunders Company. (2006).
- Tortora, G.J. & Grabowski, S. Principles of Anatomy & Physiology. XI Edition John Wiley & sons (2006).
- Christopher D. Moyes, Patricia M. Schulte. Principles of Animal Physiology. 3rd Edition, Pearson Education (2016).
- Hill, Richard W., et al. Animal physiology. Vol. 2. Sunderland, MA: Sinauer Associates, (2004).
- Chatterjee C C Human Physiology Volume 1 & 2. 11th edition. CBS Publishers(2016).

<b>B.Sc. Forensic Science: Semester-II</b>	
<b>FST 207: Computer Science-II</b>	
<b>Teaching Scheme</b>	<b>Examination Scheme</b>
Lectures: 3 hrs/Week	Class Test -12 Marks
Tutorials: 1 hr/Week	Teachers Assessment – 6 Marks
Credits: 4	Attendance – 12 Marks
	End Semester Exam – 70 marks

**Course outcomes:**

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

- Understands the basic concepts of data base management systems.
- Design E-R diagrams for real world applications.
- Formulate relational algebraic expressions using relational data models and languages.
- Apply normalization transaction properties and concurrency control to design database.
- Analyze the security algorithms for database protection.

<b>Unit I – Database Management System</b>
<ul style="list-style-type: none"> <li>• Introduction: Database System Concepts, File system vs. database system, Database system architecture, Data models and their types, Data base scheme and instances, Data independence, Database Languages and Interfaces.</li> </ul>
<b>Unit II – Data Modeling Concepts</b>
<ul style="list-style-type: none"> <li>• ER model concepts: Notations for ER diagram, Extended E-R diagram, Extended E-R model, E-R model design issues, constraints, and keys: Weak entity set strong entity set, Relationships of higher degree.</li> <li>• Relational model concepts: code rules, constraints, Relational Algebra operations, Extended relational algebra operations, Relational Calculus, Tuple and Domain relational calculus.</li> </ul>
<b>Unit III – Database Design</b>
<ul style="list-style-type: none"> <li>• Functional dependencies, Normal forms, First, second, and third normal forms, BCNF, Multi-valued dependencies and Fourth Normal form, Join Dependencies and Fifth Normal form.</li> <li>• Transaction, Query Processing: Transaction and system concepts: transaction states, ACID properties of transactions, concurrent execution schedules and Recoverability, Serializability of schedules. Query Processing and Optimization: Measures of Query cost, Cost, Evaluation of expression. Optimization: Transformation of relational expression, Choice of evaluation plan.</li> </ul>
<b>Unit IV – Concurrency Control</b>
<ul style="list-style-type: none"> <li>• Concurrency Control Techniques: Two phase Locking Techniques for Concurrency Control; Time stamping in Concurrency control.</li> <li>• Introduction to SQL: Basic Structure of SQL Query, Set operators, SELECT, UNION, INTERSECT, and EXCEPT, Nested queries, Aggregate function, Null values, Derived Relations, Modification of the Database, Joined relations and up-dates in SQL.</li> </ul>
<b>Unit V – Database Security</b>
<ul style="list-style-type: none"> <li>• Importance of data, Threats and risks, Users and database privileges, Access Control, Security for Internet Applications, Role of Database Administrator.</li> </ul>

### **Suggested Readings:**

1. Henry F. Korth and Abraham Silberschatz, "Database System Concepts," Second Edition, McGraw Hill, 1991.
2. AtulKahate, "Introduction to Database Management Systems," Pearson India, 2004.
3. Raghu Ramakrishnan and Johannes Gehrike, "Database Management Systems," Third McGraw Hill, Edition, 2003.
4. R. Elmasri, S.B. Navathe Database Systems Models, Languages, Design and application Programming, 6 Edition, Pearson Education,2013.
5. A. Silberschatz, H.F. Korth, S. Sudarshan, Database System Concepts 6<sup>th</sup> Edition, McGraw Hill, 2010.
6. C.J Date " An Introduction to Database Systems", Addison Wesley

<b>B.Sc. Forensic Science: Semester-II</b>	
<b>FST 208: Botany-II</b>	
<b>Teaching Scheme</b>	<b>Examination Scheme</b>
Lectures: 3 hrs/Week	Class Test -12 Marks
Tutorials: 1 hr/Week	Teachers Assessment – 6 Marks
Credits: 4	Attendance – 12 Marks
	End Semester Exam – 70 marks

**Course outcomes:**

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

- Develop critical understanding on morphology, anatomy and reproduction of Bryophytes, Pteridophytes and Gymnosperms
- Understanding of plant evolution and their transition to land habitat.
- Understand morphology, anatomy, reproduction and developmental changes therein through typological study and create a knowledge base in understanding the basis of plant diversity, economic values & taxonomy of plants
- Understand the details of external and internal structures of flowering plants

<p><b>Unit I – Introduction to Archegoniates, Bryophytes &amp; Pteridophytes</b></p> <ul style="list-style-type: none"> <li>• Unique features of archegoniates, Bryophytes: General characteristics, adaptations to land habit, Range of thallus organization. Classification (up to family), morphology, anatomy and reproduction of Riccia, Marchantia , Anthoceros and Sphagnum. (Developmental details not to be included). economic importance of bryophytes.</li> <li>• Pteridophytes General characteristics, Early land plants (Rhynia). Classification (up to family)with examples, Heterospory and seed habit, stelar evolution, economic importance of Pteridophytes.</li> </ul>
<p><b>Unit II – Gymnosperms &amp; Palaeobotany</b></p> <ul style="list-style-type: none"> <li>• Classification and distribution of gymnosperms; Salient features of Cycadales, Ginkgoales, Coniferales and Gnetales, their examples, structure and reproduction; economic importance</li> <li>• General account of Cycadofilicales, Bennettitales and Cordaitales; Geological time scale; Brief account of process of fossilization &amp;types of fossils and study techniques ; Contribution of Birbal Sahni</li> </ul>
<p><b>Unit III – Angiosperm Morphology (Stem, Roots, Leaves &amp; Flowers, Inflorescence)</b></p> <ul style="list-style-type: none"> <li>• Morphology and modifications of roots; Stem, leaf and bud. Types of inflorescences; flowers, flower parts, fruits and types of placentation; Definition and types of seeds.</li> </ul>
<p><b>Unit IV – Plant Anatomy</b></p> <ul style="list-style-type: none"> <li>• Meristematic and permanent tissues, Organs (root, stem and leaf). Apical meristems &amp; theories on apical organization - Apical cell theory, Histogen theory, Tunica - Corpus theory. Secondary growth - Root and stem- cambium (structure and function) annular rings, Anomalous secondary growth - Bignonia, Boerhaavia, Dracaena, Nyctanthus</li> </ul>
<p><b>Unit V – Reproductive Botany</b></p> <ul style="list-style-type: none"> <li>• Plant Embryology, Structure of microsporangium, microsporogenesis, , Structure of megasporangium and its types, megasporogenesis, Structure and types of female gametophyte, types of pollination, Methods of pollination, Germination of pollen grain, structure of male gametophyte, Fertilization, structure of dicot and monocot embryo, Endosperm, Double fertilization, Apomixis and polyembryony.</li> </ul>

### **Suggested Readings:**

1. Gangulee H. S. and K. Kar 1992. College Botany Vol. I and II. (New Central Book Agency)
2. Bhatnagar, S.P. and Moitra, A. (1996). Gymnosperms. New Age International (P) Ltd Publishers, New Delhi, India.
3. Parihar, N.S. (1991). An introduction to Embryophyta. Vol. I. Bryophyta. Central Book Depot, Allahabad.
4. Rashid A (1999) An Introduction to Pteridophyta, Vikas Publishing House Pvt. Ltd. New Delhi.
5. Sharma OP (1990) Textbook of Pteridophyta. MacMillan India Ltd. Delhi.
6. Vashishtha BR, Sinha AK and Kumar A (2010) Botany for Degree Students – Pteridophyta, S. Chand and Company,
7. Vashishtha BR, Sinha AK and Kumar A (2010) Botany for Degree Students – Gymnosperms, S. Chand and
8. Parihar NS (1976) Biology and Morphology of Pteridophytes. Central Book Depot.
9. Bhatnagar SP (1996) Gymnosperms, New Age International Publisher.
10. Pandey BP (2010) College Botany Vol II S. Chand and Company, New Delhi

<b>B.Sc. Forensic Science: Semester-II</b> <b>FST253: Chemistry Lab- II</b>	
<b>Teaching Scheme</b>	<b>Examination Scheme</b>
Practical: 4 hrs/Week Credits: 2	Internal Assessment – 15 Marks
	External Assessment – 35 Marks
	End Semester Exam – 50 marks

**Course Objectives:** To make the students trained in different techniques of Inorganic Chemistry for future applications in Forensic Science Laboratories

1. Detection of elements (X, N, S)
2. Preparation of Inorganic Compounds:
  - (i) Potassium trioxalato chromate (III);
  - (ii) Double salts (Chrome alum/ Mohr's salt)
3. Preparation of coordination compounds.
4. Spectral and magnetic characterization of compounds

**Suggested Reading**

1. Concise Inorganic Chemistry, J. D. Lee, 5th Edition (1996), Chapman & Hall, London.
2. Inorganic Chemistry, J.E. Huheey, E.A. Keiter and R.L. Keiter.
3. Modern Inorganic Chemistry, R. C. Aggarwal, 1st Edition (1987), Kitab Mahal, Allahabad.
4. Basic Inorganic Chemistry, F. A Cotton, G. Wilkinson, and Paul L. Gaus, 3rd Edition (1995), John Wiley & Sons, New York.
5. Inorganic Chemistry, A. G. Sharpe, 3rd International Student Edition (1999), ELBS / Longman, U.K.
6. Inorganic Chemistry, D. F. Shriver and P. W. Atkins, 3rd Edition (1999), ELBS, London



<b>B.Sc. Forensic Science: Semester-II</b>	
<b>FST255: Physics Lab- II</b>	
<b>Teaching Scheme</b>	<b>Examination Scheme</b>
Practical: 4 hrs/Week Credits: 2	Internal Assessment – 15 Marks
	External Assessment – 35 Marks
	End Semester Exam – 50 marks

**Course outcomes:**

- Experimental physics has the most striking impact on the industry wherever the instruments are used to study and determine the thermal and electronic properties. Measurement precision and perfection is achieved through Lab Experiments. Online Virtual Lab Experiments give an insight in simulation techniques and provide a basis for modeling.

**Lab Experiment List**

- Mechanical Equivalent of Heat by Callender and Barne’s method
- Coefficient of thermal conductivity of copper by Searle’s apparatus
- Coefficient of thermal conductivity of rubber
- Coefficient of thermal conductivity of a bad conductor by Lee and Charlton’s disc method
- Value of Stefan’s constant
- Verification of Stefan’s law
- Variation of thermo-emf across two junctions of a thermocouple with temperature
- Temperature coefficient of resistance by Platinum resistance thermometer
- Charging and discharging in RC and RCL circuits
- A.C. Bridges: Various experiments based on measurement of L and C
- Resonance in series and parallel RCL circuit
- Characteristics of PN Junction, Zener, Tunnel, Light Emitting and Photo diode
- Characteristics of a transistor (PNP and NPN) in CE, CB and CC configurations
- Half wave & full wave rectifiers and Filter circuits
- Unregulated and Regulated power supply
- Various measurements with Cathode Ray Oscilloscope (CRO)

**Suggested Readings:**

1. B.L. Worsnop, H.T. Flint, “Advanced Practical Physics for Students”, Methuen & Co., Ltd., London, 1962, 9e
2. S. Panigrahi, B. Mallick, “Engineering Practical Physics”, Cengage Learning India Pvt. Ltd., 2015, 1e
3. R.L. Boylestad, L. Nashelsky, “Electronic Devices and Circuit Theory”, Prentice-Hall of India Pvt. Ltd., 2015, 11e
4. A. Sudhakar, S.S. Palli, “Circuits and Networks: Analysis and Synthesis”, McGraw Hill, 2015, 5e

<b>B.Sc. Forensic Science: Semester-II</b> <b>FST256: Zoology Lab- II</b>	
<b>Teaching Scheme</b>	<b>Examination Scheme</b>
Practical: 4 hrs/Week Credits: 2	Internal Assessment – 15 Marks
	External Assessment – 35 Marks
	End Semester Exam – 50 marks

**Course outcomes:**

**The student at the completion of the course will be able to:**

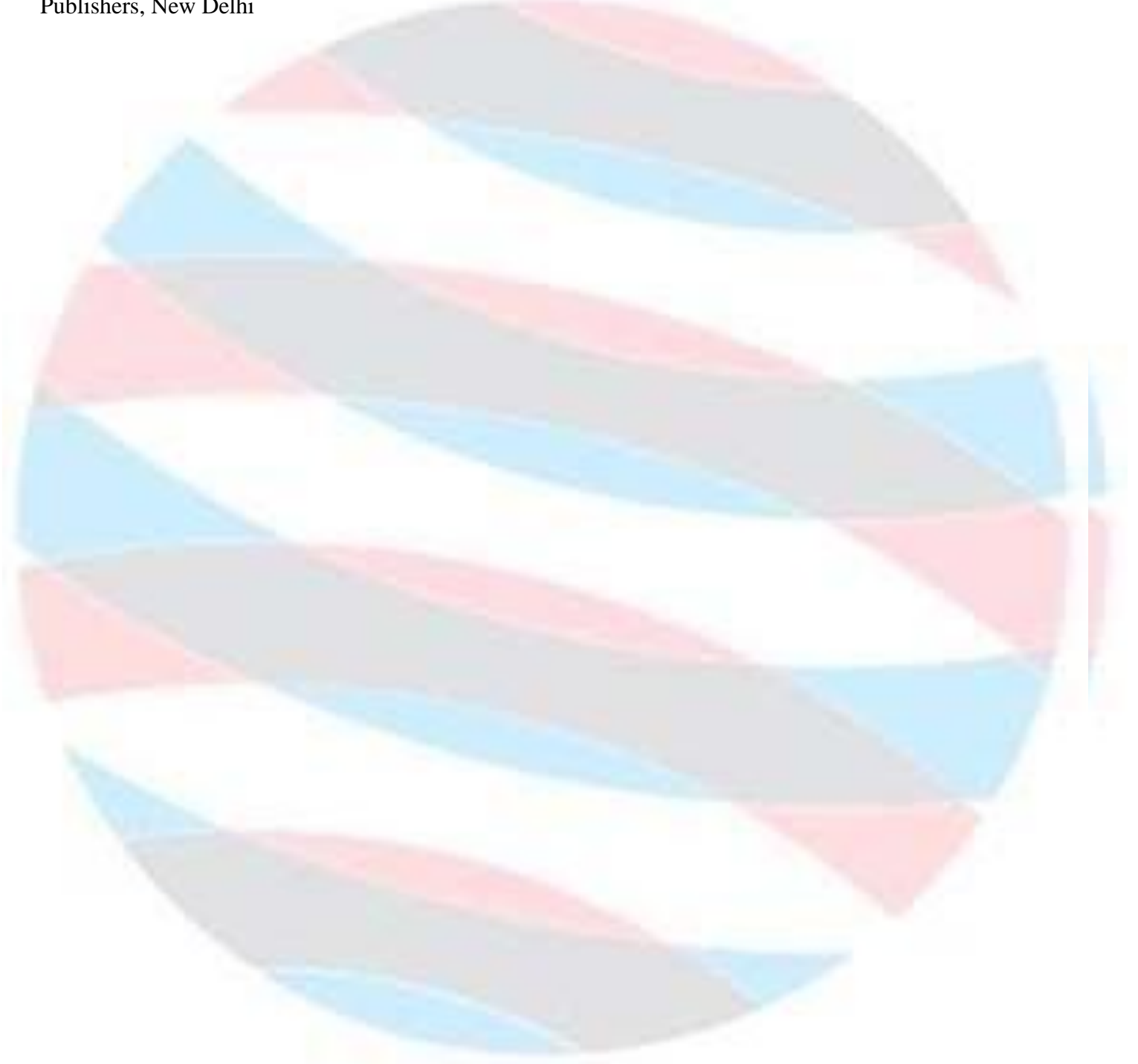
- Understand the structure of biomolecules like proteins, lipids and carbohydrates
- Perform basic hematological laboratory testing,
- Distinguish normal and abnormal hematological laboratory findings to predict the diagnosis of hematological disorders and diseases.

<b>Unit I</b>
<ul style="list-style-type: none"> <li>• Preparation of haemin and haemochromogen crystals</li> <li>• To study different mammalian blood cell types.</li> </ul>
<b>Unit II</b>
Study of permanent slides of <ul style="list-style-type: none"> <li>• Mammalian skin,</li> <li>• Cartilage,</li> <li>• Bone,</li> <li>• Spinal cord,</li> <li>• Nerve cell,</li> <li>• Pituitary,</li> <li>• Pancreas,</li> <li>• Testis,</li> <li>• Ovary,</li> <li>• Adrenal,</li> <li>• Thyroid</li> <li>• Parathyroid</li> </ul>
<b>Unit III</b>
<ul style="list-style-type: none"> <li>• Ninhydrin test for <math>\alpha</math>-amino acids.</li> <li>• Benedict's test for reducing sugar and iodine test for starch.</li> <li>• Test for sugar in urine.</li> <li>• Action of salivary amylase under optimum conditions.</li> </ul>

**Suggested Readings:**

1. Cox, M.M and Nelson, D.L. (2008). Lehninger's Principles of Biochemistry, V Edition, W.H. Freeman and Co., New York.
2. Berg, J.M., Tymoczko, J.L. and Stryer, L. (2007). Biochemistry, VI Edition, W.H. Freeman and Co., New York.

3. Guyton, A.C. & Hall, J.E. (2006). Textbook of Medical Physiology. XI Edition. Herculourt Asia PTE Ltd. /W.B. Saunders Company.
4. Tortora, G.J. & Grabowski, S. (2006). Principles of Anatomy & Physiology. XI Edition John Wiley & sons
5. Victor P. Eroschenko. (2008). diFiore's Atlas of Histology with Functional correlations. XII Edition. Lippincott W. & Wilkins.
6. Arey, L.B. (1974). Human Histology. IV Edition. W.B. Saunders.
7. Kesar, Saroj and Vashishta N. (2007). Experimental Physiology: Comprehensive Manual. Heritage Publishers, New Delhi



<b>B.Sc. Forensic Science: Semester-II</b>	
<b>FST257: Computer Lab- II</b>	
<b>Teaching Scheme</b>	<b>Examination Scheme</b>
Practical: 4 hrs/Week Credits: 2	Internal Assessment – 15 Marks
	External Assessment – 35 Marks
	End Semester Exam – 50 marks

### Course outcomes:

Ability to:

- Understand, analyze and apply common SQL statements including DDL, DML and DCL statements to perform different operations.
- Design and implement a database schema for a given problem.
- Do connectivity of PHP and MySQL to develop applications.

### Lab Experiment List

- Creation of databases and execution of SQL queries.
- Creation of Tables using MySQL: Data types, Creating Tables (along with Primary and Foreign keys), Altering Tables and Dropping Tables.
- Practicing DML commands- Insert, Select, Update, Delete.
- Practicing Queries using ANY, ALL, IN, EXISTS, NOT, EXISTS, UNION, INTERSECT, and CONSTRAINTS, etc.
- Practice Queries using COUNT, SUM, AVG, MAX, MIN, GROUP BY, HAVING, VIEWS Creation and Dropping.
- Use of COMMIT, ROLLBACK and SAVEPOINT.
- Practicing on Triggers - creation of trigger, Insertion using trigger, Deletion using trigger, Updating using trigger.
- To remove the redundancies and anomalies in the above relational tables, Normalize up to Third Normal Form.

### Suggested Readings:

1. Paul DuBois, “MySQL Cookbook: Solutions for Database Developers and Administrators,” Third Edition, O’Reilly Media, 2014.
2. Frank M. Kromann, “Beginning PHP and MySQL: From Novice to Professional,” Fifth Edition, Apress, 2018.
3. Joel Murach and Ray Harris, “Murach’s PHP and MySQL,” First Edition, Mike Murach & Associates, 2010.
4. Luke Welling, Laura Thomson, “PHP and MySQL Web Development,” Fourth Edition, Addison-Wesley, 2008.

<b>B.Sc. Forensic Science: Semester-II</b> <b>FST258: Botany Lab- II</b>	
<b>Teaching Scheme</b>	<b>Examination Scheme</b>
Practical: 4 hrs/Week Credits: 2	Internal Assessment – 15 Marks
	External Assessment – 35 Marks
	End Semester Exam – 50 marks

**Course outcomes:**

- The students will be made aware of the group of plants that have given rise to land habit and the flowering plants. Through field study they will be able to see these plants grow in nature and become familiar with the biodiversity.
- Understand morphology, anatomy, reproduction and developmental changes therein through typological study and create a knowledge base in understanding plant diversity, economic values & taxonomy of lower group of plants
- Understand the composition, modifications, internal structure & architecture of flowering plants for becoming a Botanist.

**Unit I**

- Structure of anther, microsporogenesis and pollen grains
- Structure of ovule and embryo sac development (through slides).
- Study of embryo development in monocots and dicots.
- Vegetative propagation by means of cutting, budding and grafting exercises.
- Study of seed germination.
- Study of pollen morphology of the following plants –Hibiscus, Vinca, Balsam, Ixora,
- Crotalaria, Bougainvillea by microscopic observation.
- Calculation of pollen viability percentage using in vitro pollen germination techniques

**Unit II**

- Study of primary and secondary growth in root and stem of monocots and dicots by section cutting and permanent slides.
- Study of internal structure of dicot and monocot leaves.
- Study of structure of stomata.

**Suggested Readings:**

1. Pandey, BP and Trivedi, P.S. 1997. Botany Vol. I(10th edition). Vikas Publishing House.
2. Pandey, BP; Misra; Trivedi, P.S. 1997. Botany Vol. II. Vikas Publishing House.
3. Pandey, BP and Chadha. 1997. Botany Vol. III. Vikas Publishing House.
4. Santra, SC and Chatterjee. 2005. College Botany Practical Vol. I. New Central Book Agency (P) Ltd.
5. Kumar, S and Kashyap. 2003. Manual of Practical Algae. Campus Books International, New Delhi
6. Bendre and Kumar A text book of Practical Botany. Vol I,II., Rastogi Pub. Meerut.