



School of Sciences

B.Sc. Forensic Science

Programme Objective:

1. The objective is to impart the students a strong theoretical, practical and experimental foundation and thereby gain specialized skills that would empower them in scientific crime investigation methods.
2. The students would get to know the various branches of Forensic Science, their functioning and their application in legal matters.
3. To provide practical exposure to students by way of conducting Lab-based Experiments, Lab visits, guest lecturers etc.

Programme Outcome:

1. After completion of the Programme, the students would have the choice to further specialize in the chosen area of their study by pursuing higher studies.
2. The degree is so geared that it would help the students to work as independent Questioned Document and Fingerprint Experts and give their valuable opinion to the Court of Law.
3. The Degree would also give the students job opportunities to work with Private detective agencies, Pvt. Forensic Science Laboratories, Security Agencies, Armed Forces etc.

PROGRAMME CORE**FIRST SEMESTER**

Course Code	Course Title	Lecture (L) Hours Per Week	Tutorial (T) Hours Per Week	Practical (P) Hours Per Week	Total Credits (C)	CBL/PBL/RBL
BSC -101	CELL BIOLOGY	3	0	2	4	CBL
BSC-102	BIOCHEMISTRY-I	3	0	2	4	CBL
BSC-103	INTRODUCTORY PARASITOLOGY	3	0	2	4	CBL
ENG-104	COMMUNICATION SKILLS & PERSONALITY DEVELOPMENT-I	3	1	2	5	CBL
BSC-104	BIOMATHEMATICS-I	3	0	0	3	CBL
BFS -101	INTRODUCTION TO CRIMINOLOGY	3	0	0	3	CBL
		18	1	8	23	

SECOND SEMESTER

BSC-201	INTRODUCTION TO C-PGRAMMING & DIGITAL LOGIC	3	0	2	4	CBL
BSC-202	BIOPHYSICS	3	0	0	3	CBL
BSC -203	GENETICS	3	0	2	4	CBL
BSC -204	ENVIRONMENTAL STUDIES	2	0	0	2	CBL
BSC -205	BIOCHEMISTRY-II	3	0	2	4	CBL
*BFS-201	INTRODUCTION TO FORENSIC SCIENCE AND CRIMINAL LAW	3	0	0	3	CBL
		17	0	6	20	

THIRD SEMESTER

BFS-301	Introduction to Forensic Serology	3	-	-	3	CBL
BFS-302	Applied Forensic Biology	3	-	-	3	CBL
BFS-303	Applied Forensic Chemistry	3	-	-	3	CBL
BFS-304	Applied Forensic Physics	3	-	-	3	CBL
BFS-305	Basics of Digital and Cyber Forensics	3	-	-	3	CBL
BFS-306	Practical – III	-	-	6	3	CBL
	TOTAL				18	

FOURTH SEMESTER

BFS-401	Fingerprints	3	-	-	3	CBL
BFS-402	Forensic Anthropology & Odontology	3	-	-	3	CBL
BFS-403	Forensic Toxicology	3	-	-	3	CBL
BFS-404	Basic concepts in Instrumental Methods-Physical	3	-	-	3	CBL
BFS-405	Microscopy	3	-	-	3	CBL
BFS-406	Practical –IV	-	-	6	3	CBL
	TOTAL				18	

FIFTH SEMESTER

BFS-501	Introduction to Questioned Documents	3	-	-	3	CBL
BFS-502	Instrumentation - Biological	3	-	-	3	CBL
BFS-503	Research Methodology and Statistics	3	-	-	3	CBL
BFS-504	Minor Project	-	-	-	6	PBL
BFS-505	Practical –V	-	-	6	3	CBL
	TOTAL				18	

SIXTH SEMESTER

BFS-601	Forensic Ballistics	3	-	-	3	CBL
BFS-602	Forensic Medicine	3	-	-	3	CBL
BFS-603	DNA Fingerprinting	3	-	-	3	CBL
BFS-604	Explosives	3	-	-	3	CBL
BFS-605	Practical – VI	-	-	6	3	CBL
	TOTAL				15	

BSC-101	CELL BIOLOGY	L	T	P	C
Version 1.0	Date of Approval:	3	0	0	3
Pre-requisites					
Co-requisites					

Course Objective:

The given course has been formulated with an objective to make the student aware about the basics of biology. It includes the study of cells, study of the human anatomy and physiology, aspect of Genetics. These modules have been worked out with an aim to introduce the students to the fundamental functioning of the human body and the basic of the chemical changes that are important for Forensic biology. The students will learn about the laws of genetics, organization of chromosomes, cell division, various types of mutations and various genetic disorders.

Course Outcome:

This course would help even the Non-Bio students to understand the basic concepts of Biology. They would be able to identify the various stages of cell division. They would be able to describe the various systems of Human Anatomy. They would be able to describe the structure, properties and functions of the human Biochemistry.

UNIT I Cell: Introduction and classification of organisms by cell structure, cytosol, compartmentalization of eukaryotic cells, cell fractionation. Cell Membrane and Permeability: Chemical components of biological membranes, organization and Fluid Mosaic Model, membrane as a dynamic entity, cell recognition and membrane transport.

UNIT II Membrane Vacuolar system, cytoskeleton and cell motility: Structure and function of microtubules, Microfilaments, Intermediate filaments. Endoplasmic reticulum: Structure, function including role in protein segregation. Golgi complex: Structure, biogenesis and functions including role in protein secretion.

UNIT III

Cell; Tissues; Cell theory, Prokaryotic and eukaryotic cells, Cell components (structure and functions): Plasma membrane, cell wall, endoplasmic reticulum, golgi apparatus, lysosomes, mitochondria, plastids, nucleus, ribosomes, chromosomes, cytoskeleton, centrioles, cilia and flagella.

UNIT IV

Cell cycle, Mitosis: general events of interphase, prophase, metaphase, anaphase, telophase, cytokinesis, significance of mitosis, Meiosis: kinds of meiosis, process of meiosis, Meiosis I, Meiosis II, significance of meiosis; Comparison of mitosis and meiosis, Reproduction: asexual and sexual. Cancer: Carcinogenesis, agents promoting carcinogenesis

Cell biology- PRACTICALS Study of plant cell.

1. Study of animal cell.
2. Study of blood cell.
3. Study of mitosis and meiosis with the help of permanent slides.
4. Study of polytene and lampbrush chromosomes with the help of permanent slides.
5. Blood smear preparation
6. Study of structure of any Prokaryotic and Eukaryotic cell.
7. Cell division in onion root tip
8. LS and TS of monocot and dicot root and shoot
9. Study of plasmolysis and de-plasmolysis.
10. Study of prepared slides of histology

Required Books and Materials:

1. *Molecular Biology of the cell*, Albert Etal, Fourth Edition., Garland Science (Iaylor and Francis) New York Group, 2002.
2. *Plant Molecular Biology*2, Herrmann, R.G., Larkins, B.A. Plenum Press, New York, 1991.
3. *Cell and Molecular Biology*, Rastogi, S.C. New Age International (P) Ltd. N. Delhi, 2005.
4. *Molecular Cell Biology*, LodishEtal, Fifth Edition, W H Freeman and company, New York, 2004
5. *Cell Biology*, Rastogi, S.C. New Age International (P) Ltd. N. Delhi, 2008.
6. *Cell Physiology*, Giese Arthur, Fifth Edition, Toppan company Ltd., Tokyo, Japan, 1979

Mode of Evaluation

Quiz, Assignment	20
Minors	20
End term Examination	60

Version: 1.0**Academic Council Approval date:**

BSC-102	BIOCHEMISTRY	L	T	P	C
Version 1.0	Date of Approval:	3	0	2	4
Pre-requisites					
Co-requisites					

Course Objectives: The course has been designed to help student to identify the structural elements of proteins, the basic features of enzyme catalysis and regulation, describe the basic structural features of nucleic acids, the mechanisms by which DNA is transcribed, replicated, and repaired, understanding of the metabolic processes by which energy is produced in cells and amino acids, lipids, purines and pyrimidines, and carbohydrates are synthesized.

Course outcomes:**After completion of course, the Students will be able to:**

- Demonstrate a thorough knowledge of the intersection between the disciplines of Biology and Chemistry.
- Demonstrate a proficiency in developing relevant biochemical questions, carrying out laboratory investigations to answer those questions, and critically analyzing, interpreting, and presenting in oral and written form the results of their experiments.

UNIT I:

- Introduction to Biochemistry: Amino acids & Proteins: Structure & Function. Structure and properties of Amino acids, Types of proteins and their classification, Forces stabilizing protein structure and shape. Different Level of structural organization of proteins, Protein Purification. Denaturation and renaturation of proteins. Fibrous and globular proteins.
- Unit –II Carbohydrates: Structure, Function and properties of Monosaccharides, Disaccharides and Polysaccharides. Homo & Hetero Polysaccharides, Mucopolysaccharides, Bacterial cell wall polysaccharides, Glycoprotein's and their biological functions
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- UNIT III Lipids: Structure and functions –Classification, nomenclature and properties of fatty acids, essential fatty acids. Phospholipids, sphingolipids, glycolipids, cerebrosides, gangliosides, Prostaglandins, Cholesterol.
- UNIT IV Enzymes: Nomenclature and classification of Enzymes, Holoenzyme, apoenzyme, Cofactors, coenzyme, prosthetic groups, metalloenzymes, monomeric & oligomeric enzymes, activation energy and transition state, enzyme activity, specific activity, common features of active sites, enzyme specificity: types & theories
- UNIT V Carbohydrates Metabolism: Glycolysis: Fate of pyruvate under aerobic and anaerobic conditions. Pentose phosphate pathway and its significance, Gluconeogenesis, Glycogenolysis and glycogen synthesis. TCA cycle, Electron Transport Chain, Oxidative phosphorylation. β -oxidation of fatty acids.

PRACTICALS

1. To study activity of any enzyme under optimum conditions.

2. To study the effect of pH, temperature on the activity of salivary amylase enzyme.
3. Determination of - pH optima, temperature optima, Km value, Vmax value, Effect of inhibitor (Inorganic phosphate) on the enzyme activity.
4. Estimation of blood glucose by glucose oxidase method.
5. Principles of Colorimetry: (i) Verification of Beer's law, estimation of protein. (ii) To study relation between absorbance and % transmission.
6. Preparation of buffers.
7. Separation of Amino acids by paper chromatography.
8. Qualitative tests for Carbohydrates, lipids and proteins

Mode of Evaluation

Quiz, Assignment	20
Minors	20
Practical examination	50
End term Examination	60

Version: 1.0

Academic Council Approval date:

BSC-103	INTRODUCTORY PARISITOLOGY	L	T	P	C
Version 1.0	Date of Approval:	2	0	2	3
Pre-requisites					
Co-requisites					

Course objective:

- To provide students with knowledge concerning biological, epidemiological and ecological aspects of parasites causing diseases to humans.
- To enable students to reach diagnosis and know the general outline of treatment, prevention and control of parasitic infections

Course Outcomes:

By the end of the courses, students should be able to:

- Describe the common parasitic diseases and life-threatening conditions caused by some pathogens as regards etiology and life cycle of parasites of medical importance
- Describe the common diseases caused by helminthes and protozoa as regards pathogenesis, clinical features, differential diagnosis

Unit-I Introduction about parasites, types, hosts, types of hosts, schematic steps in parasitological analysis.

Unit-II Habit, habitat, life cycle, pathogenicity, diagnosis, treatment and prophylaxis of *Leishmania donovani* and *Giardia intestinalis* and *Trypanosoma gambiense*.

Unit-III Habit, habitat, life cycle, pathogenicity, diagnosis, treatment and prophylaxis of *Fasciola hepatica*, *Diphyllobothrium latum*, *Paragonimus westermanii* and *Hymenolepis nana* and *Taenia solium*.

Unit-IV Habit, habitat, life cycle, pathogenicity, diagnosis, treatment and prophylaxis of *Ancylostoma dodenale*, *Dracunculus mediansis* and *Wuchereria bancrofti* and *Ascaris lumbricoides*.

Practical:

- Study of museum specimens of Platyhelminthes and Aschelminthes.

- Study of morphology of parasites by means of charts.

Mode of Evaluation

Quiz, Assignment	20
Minors	20
Practical examination	50
End term Examination	60

Version: 1.0

Academic Council Approval date:

BSC-104	COMMUNICATION SKILLS AND PERSONALITY DEVELOPMENT	L	T	P	C
Version 1.0	Date of Approval:	3	0	0	3
Pre-requisites					
Co-requisites					

Objective: The core objective of the course is to improve the language proficiency of the learners. The focus will be on understanding the concept of communication skills while adopting the proper spoken skills with the knowledge of grammar. The motive of the course is to enable students to express themselves fluently and appropriately in social and professional context.

Module I: Introduction to Communication: Definition and Purpose of Communication, Nature of communication, Process of Communication, Types of Communication; verbal and non-verbal communication. Different mediums of Communication, Barriers to Communication – Physical Barriers, Psychological Barriers, Organizational Barriers.

Module II: Basic Grammar: Use of Articles, Prepositions, Syntax, Tenses, Voices (Active & Passive), Narration (Direct & Indirect speech).

Module III: Essentials of Grammar: Sentence Structure, Parts of Speech, Punctuation Marks, Use of Dictionary, Spotting the Sentence Errors.

Module IV: Social Communication Skills: Individualized Pronunciation Practice, Conversational English, Small Talks, Building relationships through Communication.

Module V: Non-verbal Communication & Kinesics: Forms of non-verbal communication, Interpreting body language, Kinesics, Proxemics, Chronemics.

Text Books:

1. Functional Aspects of Communication Skills by P. Prasad, published by S. K. Kataria, 2011.
2. Communication Skills by Leena Sen, published by PHI, 2007.
3. English Grammar & Composition by Wren & Martin published by S. Chand & Company Ltd., New Delhi, 2010.

Reference Books:

1. Business Communication by Virender Kumar, published by Kalyani Publishers.
2. Communication skills for Engineers and Scientists, Sangeeta Sharma and Binod Mishra, PHI Learning private limited, 2010.
3. An Approach to Communication Skills by Bhattacharya Indrajit, published by Dhanpatrai Co., (Pvt.) Ltd., New Delhi, 2010.
4. Handbook of Practical Communication Skills by Wright, Chrissie, published by Jaico Publishing House. Mumbai.

Mode of Evaluation

Quiz, Assignment	20
Minors	20
End term Examination	60

Academic Council Approval date:

BSC-105	BIOMATHEMATICS	L	T	P	C
Version 1.0	Date of Approval:	3	0	0	3
Pre-requisites					
Co-requisites					

Course description:

The primary objective of this course is to provide knowledge of matrices and determinants, differential Calculus, integral calculus and analytical geometry. The emphasis in this course is to understand and evaluate derivatives for complexly constructed elementary functions, evaluate definite and indefinite integrals. This course also emphasis to understand the applications of matrices and determinants & basics of straight line and circle.

Course content:

Upon successful completion of biomathematics, students will be able to:

- Express their interest in mathematics, and
- Write precisely about mathematics.
- Describe several diverse examples of mathematics not in secondary school mathematics,
- Solve problems using mathematics in unfamiliar settings, and
- Explain why mathematical thinking is valuable in daily life.
- Demonstrate algebraic facility with topics like limit and continuity, trigonometric functions, equation of line and distance formula

Unit-A

- Algebra of matrices.
- Minor and Cofactor of Determinant, Determinant of a square matrix, Properties of determinants, singular and non-singular matrices.
- Applications of Determinants in the solution of simultaneous linear algebraic equations by Cramer's rule and area of Triangles.
- Adjoint and inverse of matrices in solving simultaneous equations in two or three variables, Matrix Method.

Unit-B

- Basic concept of limit and continuity.
- Derivative. Rules of differentiation, theorem relating to the derivatives of the sum, difference, product and quotient of functions.
- Derivative of Trigonometric functions, inverse trigonometric functions, logarithmic and exponential functions, Differentiation of Implicit functions, Chain Rule, derivative of functions expressed in parametric form.

Unit-C

- Integration as the inverse of differentiation, indefinite integral or antiderivative.
- Fundamental integrals involving algebraic, trigonometric, exponential and Logarithmic functions, integration by parts (statement only), substitution and partial fractions.

- Important properties of definite integrals.

Unit-D

- Distance Formula.
- Straight Line: General form of the equation to a straight line. Slope of the line, slope-point form, Condition for two lines to be parallel and perpendicular and angle between two lines.
- Circle: General equation of a circle, finding center and radius of the circle, diameter form of a circle.

Text Book:

1. NCERT. Mathematics Text Book for class XI & XII.
2. Mathematics Text Book for class XI & XII, R.D Sharma, DhanpatRai Publications.
3. Mathematics Text Book for class XI, V.K. Bhandari & O. P. Arora, Dinesh Publications.

Reference Book:

1. Differential Calculus by Shantinakaran, S. Chand & Co., Delhi.
Advanced Engineering Mathematics by Grewal, Khanna Publications, Delhi

Mode of Evaluation

Quiz, Assignment	20
Minors	20
End term Examination	60

Academic Council Approval date:

BFS-101	INTRODUCTION TO CRIMINOLOGY	L	T	P	C
Version 1.0	Date of Approval:	3	0	0	3
Pre-requisites					
Co-requisites					

Course Objectives:

The objective of this course is-

1. To introduce to the students the concepts of crime, criminology and the factors or causes of criminal behavior,
2. The different types of crime committed in the society.
3. The students would also acquire good knowledge regarding Police administration and the Indian Laws associated with different types of offences.

Course Outcomes:

On completion of this course, the students will be able to

1. Explain the psychological and social aspects of crime and Criminology.
2. They would be able to identify the different types of crimes committed in the society including the crimes committed by juveniles and the punishments awarded to such offenses.
3. They would be able to understand the functioning of the Police in the Society.

Catalog Description: Criminology is the sociological and psychological aspects of criminal behavior. It is a branch that is closely associated with Forensic Science. The students are required to study this branch as it would help them to understand the basic concepts of criminal behavior, different types of crime prevalent in the society and the punishment meted out for such type of crimes and the role of Police administration in the prevention of crime.

Unit I: Criminology and Criminal Behaviour

Definition, description, and historical perspectives. Crime, Criminal and Criminology; Criminology as Science and Art, The field and scope of Criminology; Methods and Techniques in Criminology; Concept of Criminal Behaviour: Concept of a criminal, classification of criminals.

Unit II: Crime scenario in India

Sociological aspects of crime and criminals in society, criminal inheritance and factors responsible.

Unit III: Crime Types and punishment

Organized crime; White – collar crimes; Sex offences; Murders, Terrorism; Serial Crime; Crime against women and children; Concept of punishment, humanitarian approach to concept of punishment, capital punishment in India

Unit IV: Juvenile Delinquency

Nature and incidence; Characteristics; Types of Juvenile Delinquents; Classification of Juvenile Delinquents; Factors in Juvenile Delinquency, Custody of juvenile delinquents; Juvenile Court procedure; Residential treatment, Counseling of Juvenile Delinquents, behaviour modification techniques; Preventive Programmes.

Unit V: Police Administration Indian Police System – State & Central level, The Police Act of 1861, Role of police in regard to criminals; Police role in the society as protectors of citizens and their property; Custodial crimes.

Text & References:

- ❖ Ellis, L. and Walsh, Anthony, Criminology – A Global Perspective, Allyn and Bacon, Boston, 2000.
- ❖ Morris, E. K., and Braukman., C. J.(Eds.), Behavioural Approaches to Crime and Delinquency- A Hand book of Application, Research and Concepts, Plenum Press, New York, 1987.
- ❖ Abaadinsky, H., Organised Crime (2ndEdn.), Nelson – Hall, Chicago, 1998.
- ❖ Adler, F., Mueller, G. O. W. and Laufer, W. S., Criminology, McGraw – Hill, Boston, 1991.
- ❖ Maguire, M.: Morgan, R and Reiner, R., TheOxford Handbook of Criminology (3rdEdn.), OxfordUniversity Press, Oxford, 2002.
- ❖ Ahuja, R., Criminology, Rawat Publications, ND, 2000.
- ❖ Bajpai, G. S., Development without Disorders. Vishwavidyala, Prakashan, Sagar (M. P.), 2002.
- ❖ Ghosh&Rustamji, Encyclopedia of Police in India 1997 Vol, 3
- ❖ VimalaVeeraraghavan, Handbook of Forensic Science
- ❖ B S Nabar, Forensic Science in Crime Investigation
- ❖ VimalaVeeraraghavan, Handbook of Forensic Psychology

Mode of Evaluation

Quiz, Assignment	20
Minors	20
End term Examination	60

Academic Council Approval date:

BBT-101	INTRODUCTORY MICROBIOLOGY	L	T	P	C
Version 1.0	Date of Approval:	3	0	2	4
Pre-requisites					
Co-requisites					

Course Description:

This course will educate the students in a variety of important microbiological disciplines, as well as to promote and develop skills and competencies that have enduring value beyond the classroom, familiarize growth, evolution and classification, description of metabolic processes and diversity of microorganisms in order to understand how microorganisms live. The students will be trained in such a way that they develop critical thinking and problem solving as related to the microbiology.

Course Outcomes:

The students will be able to:

- ❖ Acquire knowledge and understanding of the microbiology concepts as applicable to diverse areas such as medical, industrial, environment, genetics, agriculture, food and others
- ❖ Competent enough to use microbiology knowledge and skills to analyze problems involving microbes, articulate these with peers/ team members/ other stake holders, and undertake remedial measures/ studies etc

Course Content:

Unit-A: Introduction

History of Microbiology, Germ theory, Disciplines of Microbiology, Structure of Microbes (bacteria, archaea, algae, fungi and viruses), Microbial taxonomy including modern approaches of taxonomy such as DNA taxonomy and Numerical taxonomy, different groups of bacteria

Unit-B: Methods in Microbiology

Principles of microbial nutrition, culture media, theory and practice of sterilization, pure culture techniques, methods of isolation, Purification and preservation.

Unit-C: Metabolic diversity among Microorganisms

Microbial growth: Growth curve, Generation time, synchronous batch and continuous culture, measurement of growth and factors affecting growth of bacteria. Microbial Metabolism Bacterial Reproduction: Transformation, Transduction and Conjugation. Endospores and sporulation in bacteria.

Unit-D:

Basic concepts of Virology - General characteristics of viruses, differences between bacteria and viruses. Classification of viruses Physical and chemical Structures of different Viruses on the basis of capsid symmetry - enveloped (Herpes virus), helical (TMV) and icosahedral (Polyoma viruses), Capsids, complex (Bacteriophage, and Virion size, enveloped (Herpes), helical (TMV) and icosahedral (Polyoma), Capsids.

List of Practical:

- To study different parts of compound microscope.
- Cleaning of glass wares, Preparation of media, Cotton plugging and sterilization.
- Isolation of microorganisms from air, water and soil samples.
- Dilution and pour plating techniques.
- Enumeration of microorganisms total vs viable counts.
- Identification of isolated bacteria.
- Gram staining, other staining methods, metabolic characterisation (IMVIC) Tests.
- Growth curve of microorganisms.
- Testing of water quality.
- Use of haemocytometer
- Observation of morphology - shape and arrangement of cells.
- Microscopic measurements, micrometer (ocular and stage)
- Methods of inoculation of different microbes in selective media.

Required Books and Materials:

1. Alexopoulos CJ, Mims CW, and Blackwell M. (1996). Introductory Mycology. 4 th edition. John and Sons, Inc.
2. Madigan MT, Martinko JM and Parker J. (2009). Brock Biology of Microorganisms. 12th edition. Pearson/Benjamin Cummings.
3. Pelczar MJ, Chan ECS and Krieg NR. (1993). Microbiology. 5th edition. McGraw Hill Book Company.
4. Stanier RY, Ingraham JL, Wheelis ML, and Painter PR. (2005). General Microbiology. 5th edition. McMillan.
5. Tortora GJ, Funke BR, and Case CL. (2008). Microbiology: An Introduction. 9 th edition. Pearson Education.
6. Willey JM, Sherwood LM, and Woolverton CJ. (2008). Prescott, Harley and Klein's Microbiology. 7th edition. McGraw Hill Higher Education.

Required Books and Materials:

Text Book: Microbiology by Pelzer

Mode of Evaluation

Quiz, Assignment	20
Minors	20
End term Examination	60

Academic Council Approval date:

SEMESTER-2

AGU ECS 101	Introduction to Computers and C Programming	L	T	P	C
Version 1.0	Date of Approval:	3	0	2	5
Pre-requisites					
Co-requisites					

Course Objectives:

The **course** is designed to provide complete knowledge of **C language**. Students will be able to develop logics which will help them to create programs, applications in **C**. Also by **learning** the basic **programming** constructs they can easily switch over to any other **language** in future.

Course Outcomes:

- Demonstrate a basic understanding of computer hardware and software
- Develop proficiency in writing small to medium sized programs in a procedural programming language.
- Apply problem-solving skills and knowledge of computing fundamentals to a wide variety of engineering, science and technology problems
- Expose, diagnose, and fix errors in a program, using systematic testing and debugging techniques
- Have developed interest in the field of computers to be able to adjust to the demands of current trends and technology

Course Description:

The **course** fully covers the basics of **programming** in the “**C**” **programming language** and demonstrates fundamental **programming** techniques, customs and vocabulary including the most common library functions and the usage of the preprocessor.

Course contents:

Unit 1:

Introduction to Computers –Computer Languages, Creating and running programs, Role of Compiler and Interpreter, algorithms and flowcharts. Introduction to C Language – Background, Header Files, Compiling and Execution of C programs, Tokens in C.

Operators and Functions:-Arithmetic, relational, logical and bitwise Operators in C, Expressions, Precedence and Associativity. Designing Structured Programs, Functions, user defined functions, inter function communication, Standard functions, Scope of Variables, recursion- recursive functions, Limitations of recursion.

Unit 2:

Statements- If and ElseIf statements in C, Nested if and switch-case statements, Repetition statements -while, for, do-while statements, other statements– break, continue, goto.

Arrays – Concepts, declaration, definition, accessing elements, storing elements, one and two – dimensional arrays, multidimensional arrays, Working with 2-D arrays.

Unit 3:

String Handling and Structures – Concepts, C Strings, String Library functions, String Input / Output functions, arrays of strings, string manipulation functions, working with structures. Structures- declaration, definition and initialization of structures, accessing structures, nested structures, arrays of structures, structures and functions, pointers to structures, self referential structures, unions, typedef, bitfields

Unit 4:

Pointers – concepts, initialization of pointer variables, pointers and function arguments, address arithmetic, Character

pointers and functions, pointers to pointers, pointers and multidimensional arrays.

File Handling in C– Function Calls, Call by Value and Call by Reference, Concept of a file, streams, text files and binary files, Differences between text and binary files, State of a file, Opening and Closing files, file input / output functions (standard library input / output functions for files), file status functions (error handling), Positioning functions (fseek ,rewind and ftell).

TEXT BOOKS

- 1: Fundamentals of Computer Programming in C, S.K.Jha, Katson Books.
- 2: Introduction to C Programming, Reema Thareja, Oxford University Press.
- 3: [Computer Fundamentals and Programming in C, Pradip Dey](#) & Manas Ghosh, Oxford University Press.
- 4: Computer science, A structured programming approach using C, B.A. Forouzan and R.F. Gilberg, Third edition, Thomson.

REFERENCES

1. Spoken Tutorials for C and CPP from IIT Bombay at <https://spoken-tutorial.org>.
2. The C Programming Language, B.W. Kernighan, Dennis M.Ritchie, PHI/Pearson Education
3. C Programming with problem solving, J.A. Jones & K. Harrow, Dreamtech Press
4. Programming in C - Stephen G. Kochan, III Edition, Pearson Eductaion.
5. Data Structures and Program Design in C, R.Kruse, C.L. Tondo, BP Leung, Shashi M, Second Edition, Pearson Education.

List Of Practicals:

- Program 1.** Write a program to print your name.
- Program 2.** Write a program to print "Welcome to the World of C". See what happens if \n is not included in the printf statement.
- Program 3.** Write a program that identifies several tokens and datatypes used C.
- Program 4.** Write a program in C for getting the sum of predefined two variables, using function.
- Program 5.** Write a program in C which identifies the global and local scope of variables.
- Program 6.** Write a program in C using if else statements to display the range of sum of two user defined integers.
- Program 7.** Write a program in C which describes the difference of post and pre increment/decrement operators.
- Program 8.** Write a program in C which demonstrates the operations of Arithmetic Operators.
- Program 9.** WAP in C to demonstrate the use of several Relational Operators.
- Program 10.** WAP in C using logical AND and OR operators which displays the functioning of Logical Operators.
- Program 11.** WAP in C using do-while loop to display the sum of positive integers.
- Program 12.** WAP in C using single dimensional array to calculate the sum of its elements.
- Program 13.** WAP in C using arrays to get the sum of two multidimensional arrays.
- Program 14.** WAP in C using String libraries to illustrate the usage of strings.
- Program 15.** WAP in C which compares two entered strings.
- Program 16.** WAP in C which copies the content of a string.
- Program 17.** WAP in C which determines the length of the content of a string.
- Program 18.** WAP in C using a structure to obtain the total marks of a student.
- Program 19.** WAP in C which identifies the different set of pointers used in C.
- Program 20.** WAP in C which swaps the values using CALL By Reference function.
- Program 21.** WAP in C which evaluates the cube of a number by using the CALL by Value property of a function.
- Program 22.** WAP in C which writes the output into a different program illustrating the concept of FILE HANDLING in C.

Mode of Evaluation

Quiz, Assignment, Seminar and Attendance etc.:
Minors:
Major:

20 Marks
20 Marks
60 Marks

Total:

100 Marks

Version: 1.0

Academic Council Approval date:

BSC-202	BIOPHYSICS	L	T	P	C
Version 1.0	Date of Approval:	3	0	0	3
Pre-requisites					
Co-requisites					

Course Objective:

The students will learn about the fundamentals of Physics including Newton's Law of Motion, elasticity, and fluid dynamics. They will also study about Kinetic Energy, work and Rotation, waves and sound characteristics of laser and fiber Optics.

Course Outcome:

The students will be able to gain knowledge about the fundamentals of Physics including Newton's Law of Motion, elasticity, and fluid dynamics. They would be able to describe the characteristics of Laser and fiber Optics. The knowledge about Radio Activity, Kinetic Energy, Work and Rotation will help the student in understanding the various aspects of Forensic Physics and Ballistics.

Unit I: Newton's Law Of Motion, Elasticity & Fluid Dynamics

Definition of motion, position and displacement, average velocity, average speed, acceleration, acceleration of freely falling body, projectile motion, uniform circular motion, relative motion in one dimension and two dimension;

Interpretation and applications of Newton's laws of motion, Pseudo forces, elastic properties of matter, elastic constants and their interrelations

Fluid dynamics, equation of continuity, Bernoulli's equation, stream line and turbulent flow, lines of flow in air foil, Poiseuille's equation

Unit II: Kinetic Energy and Work, and Rotation

Energy, kinetic energy, work, work done by gravitational force, work done by spring force, power, work and potential energy, work done on system by external force, conservation of energy.

Rotation: The rotational variable, rotation with constant angular acceleration, relating linear and angular variables, kinetic energy of rotation

Unit III: Study of Waves and Sound

Types of waves, transverse and longitudinal waves, wavelength and frequency, speed of travelling wave, the wave equation, sound waves, speed of sound, intensity and sound level, the Doppler effect, shock waves.

Velocity of sound, noise and sound intensity measurement, echo, reverberation, Sabine's Formula, absorption coefficient, acoustics of buildings and factors affecting acoustics of buildings.

Sound distribution in an auditorium, introduction to ultrasonic, production of ultrasonic waves, applications of ultrasonics.

Unit IV: Laser and Fiber Optics

Laser Characteristics, Einstein's co-efficient, Population Inversion and Pumping; types of Laser (Ruby laser, He-Ne, dye laser, semi-conductor lasers), Application of lasers: Industrial & Medical, Holography: construction and reconstruction of images.

Optical fibers, Propagation of light through optical fiber, Angle of acceptance and numerical aperture, losses, Solar cells.

Unit V: Radio Activity

Review of nuclear composition, nuclear properties and half life, Radioactive decay Schemes, Applications of Radio Isotopes, Radiometric dating.

Text & References books:

1. Halliday, Resnick and Walker, **Fundamentals of Physics**, John Wiley & Sons Publication, sixth edition, 2004.
2. R. K. Gaur and S. L. Gupta, **Engineering Physics**, DhanpatRai Publication, 8th Edition, 2010.
3. Feynman, Leighton and Sands, **The Feynman Lectures on Physics -Volume 1**, Narosa Publishing house, 13th edition, 2008.
4. A.P. French, **Vibrations and waves**, CBS Publishers and Distributors, Inc., first Indian edition 1987.

Mode of Evaluation

Quiz, Assignment, Seminar and Attendance etc.:	20 Marks
Minors:	20 Marks
Practical	50 Marks
Major:	60 Marks
Total:	150 Marks

Version: 1.0

Academic Council Approval date:

BSC-203	GENETICS	L	T	P	C
Version 1.0	Date of Approval:	3	0	2	4
Pre-requisites					
Co-requisites					

Course Description: It embodies our belief that a good course in genetics should maintain the right balance between two important aspects of the science. The first aspect is that genetics is a body of knowledge pertaining to genetic transmission, function, and mutation. This constitutes the **Principles**. The second aspect is that genetics is an experimental approach, or a kit of "tools," for the study of biological processes such as development or behavior. This is **Analysis**. The overall aim of Course: Principles and Analysis, is to provide a clear, comprehensive, rigorous, and balanced introduction to genetics at the college level.

Course outcome:

- (a) To Utilize the knowledge in understanding how particular genetic disease transfer from parents to offspring
- (b) After learning this course one will understand how closely genes resides on chromosomes
- (c) Learning of basic understanding of concept of gene.

UNIT I- Introduction to model organisms and Mendelism: Model organisms: *Escherichia coli*, *Saccharomyces cerevisiae*, *Drosophila melanogaster*, *Caenorhabditis elegans* and *Arabidopsis thaliana*, Basic principles of heredity. Laws of probability & binomial expansion, formulating and testing genetic hypothesis, chromosomal basis of Mendelism -Sutton and Boveri hypothesis with experimental evidences.

UNIT II -Extensions of Mendelism: Allelic variation and gene function - dominance relationships, multiple alleles, lethal alleles and null alleles. Pleiotropy gene interaction - epistatic and non-epistatic interaction between gene(s) and environment. Penetrance and expressivity.

UNIT III -Genetic definition of a gene: Complementation test, limitations of *cis-trans* test, intragenic complementation, rII locus of phage T4 and concept of cistron.

Mechanism of genetic exchange - conjugation, transformation and transduction.

UNIT IV - Linkage, crossing over and mapping techniques: Linkage and crossing over, genetic mapping in eukaryotes, centromere mapping with ordered tetrads, detection of linked loci by pedigree analysis in humans and somatic cell hybridization Pedigree conventions, characteristics of dominant and recessive inheritance. Applications of pedigree analysis.

PRACTICALS-Genetics

1. Squash preparation of salivary glands of Dipteran larva to observe polytene chromosomes.
2. Induction of polyploidy in onion roots by colchicine treatment
3. Smear technique to demonstrate sex chromatin in buccal epithelial cells.
4. Monohybrid crosses in *Drosophila* for studying autosomal and sex linked inheritance.
5. PTC testing in a population and calculation of allele and genotype frequencies.
7. Conjugation in bacteria
8. Pedigree charts of some common characters like blood group, color blindness and PTC tasting.
9. Permanent and temporary mount of mitosis.
10. Permanent and temporary mount of meiosis.
11. Demonstration of Law of segregation and Independent assortment
12. Detection of Blood groups (A B O & Rh factors)

SUGGESTED READING

1. Gardner, E.J., Simmons, M.J., Snustad, D.P. (2006). Principles of Genetics. VIII Edition John Wiley & Sons.
2. Snustad, D.P., Simmons, M.J. (2009). Principles of Genetics. V Edition. John Wiley and Sons Inc.
3. Klug, W.S., Cummings, M.R., Spencer, C.A. (2009). Concepts of Genetics. IX Edition. Benjamin Cummings.
4. Russell, P. J. (2009). Genetics- A Molecular Approach. III Edition. Benjamin Cummings.
5. Griffiths, A.J.F., Wessler, S.R., Lewontin, R.C. and Carroll, S.B. IX Edition. Introduction to Genetic Analysis, W. H. Freeman & Co.

Mode of Evaluation

Quiz, Assignment, Seminar and Attendance etc.:

Minors:

Practical

Major:

Total:

20 Marks

20 Marks

50 Marks

60 Marks

150 Marks

Version: 1.0

Academic Council Approval date:

BSC-204	ENVIRONMENTAL STUDIES	L	T	P	C
Version 1.0	Date of Approval:	2	0	0	2
Pre-requisites					
Co-requisites					

Objective:

To study and understand the impact of development on the environment as well as look at remedies to reduce such adverse impact, so as to make the world a sustainable place to live in.

Course outcomes:

The students will be able to:

- Understand various aspects of ecosystem and resources
- Have knowledge about creation of environmental pollution and its effect
- Knowledge about the role of various organizations in minimization of pollution

Course Contents**Unit I**

Environment - Definition, Eco system -- Balanced ecosystem, Human activities - Food, Shelter, Economic and Social Security; Effects of human activities on environment - Agriculture, Housing, Industry, Mining, and Transportation activities, Environmental Impact Assessment. Sustainable Development.

Unit II

Natural Resources - Water resources - Availability and Quality aspects. Water borne diseases, Water induced diseases, Fluoride problem in drinking water. Mineral Resources, Forest Wealth, Material Cycles - Carbon, Nitrogen and Sulphur Cycles; Energy - Different types of energy, Electro-magnetic radiation. Conventional and Non - Conventional sources - Hydro Electric, Fossil fuel based, Nuclear, Solar, Biomass and Bio-gas. Hydrogen as an alternative future source of Energy.

Unit III

Environmental pollution-such as air water, social & noise pollution. Their global, regional & local aspects. Air pollution, Water pollution, Noise pollution, Soil pollution –Their sources, effects on humans, plants & animals and their control., Climate change and Global warming - Effects, Urbanization, Automobile pollution

Unit IV

Acid Rain, Ozone layer depletion, Animal Husbandry; Environmental Protection - Role of Government, Legal aspects, Initiatives by Non - Governmental Organizations (NGO), Environmental Education, Women Education.

Text Books:

1. Environmental Studies - Benny Joseph - Tata McGrawHill-2005.
2. Environmental Studies - Dr. D.L Manjunath, Pearson Education – 2006
3. Environmental Studies – 2005 by R. Rajagopalan, Oxford Publishers.

Reference Books:

1. Principles of Environmental Science and Engineering - P. Venugopala Rao, Prentice Hall of India.
2. Environmental Science and Engineering - Meenakshi, Prentice Hall India.
3. Gilbert M. Masters, (2004), *Introduction to Environmental Engineering and Science*, 2nd Ed., Pearson
4. Hans-Joachim Joerdening and Josef Winter., (20 05), *Environmental Biotechnology*; Concepts and Applications, Willy-VCH Verlag

Mode of Evaluation

Quiz, Assignment, Seminar and Attendance etc.:

Minors:

Major:

Total:

20 Marks

20 Marks

60 Marks

100 Marks

Version: 1.0

Academic Council Approval date:

BSC-205	BIOCHEMISTRY-II	L	T	P	C
Version 1.0	Date of Approval:	3	0	2	4
Pre-requisites					

Co-requisites	
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Course Objective:

On completion of this course, the students would be able to learn about the basic concepts of organic, inorganic, physical and nuclear chemistry.

Course Outcome:

The students would be able to describe and understand the basic structure of atom, describe the characteristics of the periodic Table. They also understand the basic concepts in inorganic and organic Chemistry and also the properties of liquid state substances.

Unit I: Some Basic Concepts of Chemistry

Dalton's atomic theory: concept of elements, atoms and molecules, Atomic and Molecular masses, Isotopes and isobars, Mole concept and molar mass, Percentage composition and empirical and molecular formula, Chemical reactions, stoichiometry and calculations based.

Unit II: Atomic Structure

Discovery of Electrons, protons and neutrons, Thomson's model and its limitations, Rutherford's model and its limitations and Bohr's model and limitations. Concept of shells and sub-shell, dual nature of matter and light, de Broglie relationship, Heisenberg uncertainty principle, concept of orbitals, quantum numbers, shapes of s, p and d orbitals, rules for filling electrons in orbitals -Aufbau principle, Pauli exclusion principle and Hund's rule, electronic configuration of atoms, stability of Hund's rule.

Unit: III - Atomic Structure

Radioactivity, Types of Radiations, Properties of radiations, Detection and measurement of radioactivity, Types of radioactive decay, The Group Displacement Law, Radioactive disintegration series, Rate of radioactive decay, half-life, Nuclear Reactions (Fission and fusion reactions), Mass defect, Carbon dating.

Unit IV- Introduction of inorganic chemistry

Types of bonds, Hybridisation and shape of simple molecules and ions, Valence Bond Theory and its limitations, Molecular Orbital theory, Coordination complexes and their nomenclature.

Unit V - Introduction of Organic Chemistry

Electronic displacements in a covalent bond: inductive effect, electromeric effect, resonance and hyper-conjugation, Homolytic and heterolytic fission of a covalent bond: free radicals, carbocations, carbanions, electrophiles and nucleophiles, types of organic reactions (substitution and addition reactions), Markonikov's rule, anti-Markonikov's rule.

Text & References:

1. Darrell D. Ebbing, Steven D. Gammon, (2009) General Chemistry, 9th edition, Cengage Learning,
2. W.R. Robinson, J.D. Odom, and H.F. Holtzclaw, Jr., (1997) General Chemistry, Houghton Mifflin Co., 10th Ed, Boston.
3. J. R. Partington 1969 A History of Chemistry, Volume 2, , Macmillan
4. Eding Darrel D, 1970 Introductory Chemistry
5. Odian George, 1990 General, Organic And Biological Chemistry

LIST OF PRACTICALS:

1. Determine volumetrically the amount of hydroxyl ions in the given tablet of Gelusil, provided with N/10 HCL solution.
2. Determination of the total acid value of given oil.
3. Preparation of Phenol-formaldehyde resin.
4. To determine the amount of free chlorine in a given water sample.
5. Determine volumetrically the normality and strength per liter of given solution of NaOH provided N/10 Oxalic acid solution.
6. Preparation of Urea Formaldehyde resin.
7. Determination of dissolved oxygen present in given water sample.

8. To determine the total, permanent and temporary hardness in the given water sample by EDTA method.
9. To determine the surface tension of the given liquid by drop number method.
10. To determine the viscosity of a given sample of a lubricating oil using Redwood viscometer method.

Text Books:

1. Laboratory manual for Engineering Chemistry by B.B.Batra.
2. A Text Book on Experimental and Calculation – Engineering Chemistry, S.S. Dara, S. Chand & Company (Ltd.).
3. Theory & Practice Applied Chemistry – O.P. Virmani, A.K. Narula (New Age).

Mode of Evaluation

Quiz, Assignment, Seminar and Attendance etc.:	20 Marks
Minors:	20 Marks
Major:	60 Marks
Total:	100 Marks

Version: 1.0

Academic Council Approval date:

BFS-201	INTRODUCTION TO FORENSIC SCIENCE AND CRIMINAL LAW	L	T	P	C
Version 1.0	Date of Approval:	3	0	0	3
Pre-requisites					
Co-requisites					

Course Objective:

This course would introduce the students to Forensic Science and its role in the investigative system. The students would be appraised about the functions and principles of Forensic Science, its historical development and the different types of evidences encountered in the field of Forensic Science. They would also acquire knowledge regarding functions and services provided by the Forensic Laboratories.

Course Outcome:

The students would understand the growth and development of Forensic Science in India, the setup of the Forensic Science Laboratory and the functions of the various divisions of the Laboratory. The students would understand the Law of evidence and some important sections of IPC, CrPC and IEA.

Course Contents:

Unit I: Development and growth of forensic science

Introduction to Forensic science – Definition, nature, need and function; Laws and Principles, basics of Forensic Science; Historical development and scope of Forensic Science in India.

Unit II: Forensic Science

Branches of Forensic Science, its utilization at the scene of crime and in the courts, Different agencies involved in crime detection: Police, Medico-legal expert, Judicial officers.

Unit III: Forensic Science Laboratory

Forensic Science Laboratory – Growth of Forensic Science Laboratories in India – Central and State level laboratories, Services and functionalities provided by various FSLs, Various divisions in the FSL – Ballistics, Biology, Chemistry Documents, Physics, Psychology, Serology, Toxicology; Mobile forensic science laboratory: its functions and utility.

Unit IV: Law of Evidence

The law of evidence, testimonial and real evidence and admissibility of scientific evidence in the court of Law;

Law related to interrogation and interviewing of the criminals; First Information Report, types of cognizable and non-cognizable offences ; mental disorder and acceptance of evidence in court; child witness and acceptance of evidence in the court.

Unit V: Criminal Justice System:

Introduction to IPC (Indian Penal Code) and Cr.P.C – sections 291, 292 and 293. Indian Evidence Act – Introduction and Sections 32, 45, 46, 47, 57, 58, 60, 73, 135, 136, 137, 159. Court Testimony- admissibility of expert testimony, Court Procedure: Examination in chief, Cross Examination and Re-examination; Ethics in Forensic Science. International Justice System – an overview.

Text & References:

- Bodziak, W., Footwear Impression Evidence (2ndEdn.) CRC Press, Boca Raton, Florida, 2000.
- DeForest, P., Gaensslen, R., and Lee, H., Forensic Science; an Introduction to Criminalistics, McGraw Hill, New York, 1983.
- Fisher, B., Techniques of Crime Scene Investigation (6thEdn.) CRC Press, Boca Raton, Florida, 2000.
- James, S. H. And Nordby, J. J. (Eds), Forensic Science - An Introduction to Scientific and Investigative Techniques, CRC Press, London, 2003.
- James, S., and Eskerc, W., Interpretation of Blood Stain Evidence at Crime Scenes, (2ndEdn) CRC Press, Boca Raton, Florida, 1999.
- Saferstein, Richard, Criminalistics, An Introduction to Forensic Science, 6th Ed. Prentice-Hall, New Jersey, 1998.
- Sharma, B. R., Forensic Science in Criminal Investigation and Trials (3rdEdn) Universal Law Publishing Co. Ltd. New Delhi, 2001.

Mode of Evaluation

Quiz, Assignment, Seminar and Attendance etc.:

20 Marks

Minors:

20 Marks

Major:

60 Marks

Total:

100 Marks

Version: 1.0

Academic Council Approval date:

BBT-201	PRINCIPLES OF IMMUNOLOGY	L	T	P	C
Version 1.0	Date of Approval:	3	0	2	4
Pre-requisites					
Co-requisites					

Course description:

This course is a foundation course designed to introduce to and to extends basic and fundamental knowledge of Immunology to understand how the immune system functions in health and disease and how immunological therapies can be devised. The evolution of the immune system has been shaped by its need to protect the host from infection and the majority of multicellular organisms have some form of organized immune system that increases in complexity in line with the organism. The course considers the cells and organs of the immune system, their differentiation and how they function to provide innate and adaptive immunity. Antibody structure and function, Antigen-antibody interactions, Immunoassays, hybridoma technology, B and T cell, immunoassay, mono and polyclonal sera are covered in detail.

Course outcomes:

On the completion of course, the students will:

- Communicate effectively in oral and written formats using appropriate vocabulary regarding the immunological response, mechanisms of this response, its regulation and the genetic basis.
- Apply scientific principles in the interpretation of immunological responses and data.
- Apply an understanding of the roles of immunology in protection against disease and autoimmune disorders to choices in their daily lives.

Course Content:

Unit-A: Introduction

Types of immunity-innate and adaptive; features of immune response-memory, Specificity and recognition of self and non-self; terminology and approaches to the study of immune system; immunity to viruses, bacteria, fungi and tumors; Vaccines

Unit-B: Cells and organs of the Immune System

Lymphoid cells, heterogeneity of lymphoid cells, T-cells, B-cells, Null cells; Monocytes, Polymorphs, Primary and Secondary lymphoid organs-thymus, Bursa of fabricius, spleen, lymph nodes, lymphatic system, Mucosa Associated Lymphoid Tissue (MALT), Lymphatic traffic

Unit-C: Humoral Immunity and Cell mediated Immunity

Antigen-antibody interactions; affinity and avidity; high and low affinity antibodies, immunoglobulins, classes and structure, molecular mechanism of generation of antibody diversity, complement fixing antibodies and complement cascade Polyclonal sera Monoclonal antibodies, Hybridoma technology

T-cell subsets and surface markers, T-dependent and T-independent antigens, recognition of antigens by T-cells and role of MHC, structure of T-cell antigen receptors

Unit-D: Immunodiagnostic Procedures

Various types of immuno-diffusion and immuno-electrophoretic procedures, Immunoblot, ELISA, RIA, Agglutination of pathogenic bacteria, Haemagglutination and Haemagglutination inhibition

Course outcome:

Required Books and Materials:

TEXT BOOKS:

- Kuby Immunology, Godsby, R.A. et al. 2000. W.H. Freeman and Company.
- Fundamental Immunology, Robert M. coleman, Mary F. Lanbard and Raymond E.S. Card. 1992. Wm. C. Brown Publishers.
- Immunology, Roitt, I.M., Brostoff. J. and Male, D.K. 1985. Churchil Livingstone.

REFERENCE BOOKS:

- Immune Regulation, Ruben, L.N. and Gershwin, M.E. 1982.
- Comparative Immunology, Cooper, E.L. 1976. Prentice Hall.
- Immunology, Burnet, F.M. W.H. Freeman and Company.
- Hayward, A.R. Immunodeficiency.

- Abbas AK, Lichtman AH, Pillai S. (2007). Cellular and Molecular Immunology. 6 th edition Saunders Publication, Philadelphia.
- Murphy K, Travers P, Walport M. (2008). Janeway's Immunobiology. 7th edition Garland Science Publishers, New York.

List of Practicals:

- Differential Leucocytes Count
- Total Leucocytes Count
- Total RBC count
- Haemagglutination Assay
- Haemagglutination inhibition Assay
- Double immuno-diffusion test using specific antibody and antigen
- Latex agglutination test
- Isolation of mononuclear cells from peripheral blood and viability test by dye exclusion methods
- Direct and Indirect ELISA
- Antigen-Antibody reactions – Immuno-electrophoresis, Rocket immuno-electrophoresis.

Mode of Evaluation

Quiz, Assignment, Seminar and Attendance etc.:

20 Marks

Minors:

20 Marks

Practical

50 Marks

Major:

60 Marks

Total:

150 Marks

Version: 1.0

SEMESTER-3

BFS-301	INTRODUCTION TO FORENSIC SEROLOGY	L	T	P	C
Version 1.0	Date of Approval:	3	0	0	3
Pre-requisites					
Co-requisites					

Course Objective:

The objective of this course is to impart complete and thorough knowledge to the students regarding the various aspects of forensic biology, especially blood, its properties, its various methods of analysis and laboratory examination

Course Outcome:

After the completion of this course the students will be able to describe the properties and composition of blood, They would be able to identify blood using the different techniques that they have studied; and they would be able to use it in their laboratory assignments and crime scene investigative techniques..

Course Contents:

Unit I: Blood and its Properties

The nature of blood, Composition of blood, study of blood components and its functions, identification of blood by microscopic methods.

Unit II: Tests used in Blood Analysis and Grouping of blood stains

Catalytic test (Phenolphthalein, Benzidine tests), crystal tests (Teichmann test, Takayama test and Wagenaar test). ABO system, Rh system and MN system; Techniques for the determination of blood groups from bloodstains: Absorption –inhibition, mixed-agglutination, Absorption-elution method.

Unit III: Instrumental Techniques and Methods used in Blood Analysis

Spectrophotometric method, chromatographic and immunological methods. Electrophoresis methods: Cellulose Acetate Electrophoresis, Immunoelectrophoresis, Determination of species of origin: Ring test, single diffusion, double diffusion, Crossed-Over electrophoresis

Unit IV: Analysis of Biological Fluids

Composition and examination of Biological Fluids such as Saliva, semen, Vaginal Fluid, Urine and sweat, Protection of Biological Evidences, Packaging & transportation of Biological Evidences

Unit V: Blood Pattern Analysis

History of Bloodstain Pattern interpretation, target surface considerations, Size, Shape and Directionality of bloodstains, interpretation of Bloodstain on clothing and footwear, Documentation and Photography for Bloodstain Pattern Analysis. Preservation of blood evidence; procedures and precautions thereof.

Text & References:

- Eckert, W.G., & James S.H., Interpretation of bloodstain evidence at crime scene, CRC Press, Florida, 1989.
- James, S.H. and Nordby, J.J. (Eds.), Forensic Science - An introduction to Scientific and investigative Techniques, CRC Press, London, 2003.
- Kirk, P.L., Introduction in crime investigation (2nd), John Willey and, New York, 1974.
- Saferstein, R. (1998). Criminalistics, An Introduction to Forensic Science, 6th Ed. Prentice –Hall. New Jersey.
- M K Bhasin, A Laboratory Manual for Human Blood Analysis
- Richard Li, Forensic Biology: Identification and DNA Analysis
- Tom Bevel, Bloodstain Pattern Analysis with and Introduction to Crime Scene Reconstruction

Mode of Evaluation

Quiz, Assignment, Seminar and Attendance etc.:
Minors:

20 Marks
20 Marks

Major:
Total:

60 Marks
100 Marks

Version: 1.0
Academic Council Approval date:

Course Code	Course Name	L	T	P	C
BFS-302	APPLIED FORENSIC BIOLOGY	3	0	0	3

Course Objective:

The students would learn the different aspects of Forensic Biology and some very specific areas such as Forensic Botany, wild life forensics, Palynology, and Forensic Entomology. The students will also study in detail the forensic examination of hair samples.

Course Outcome:

On completion of this course, the students would be able to know the different aspects of Forensic Biology like Forensic Botany, wild life forensics, Palynology, and Forensic Entomology, their significance in investigative aspects etc. The students will also be able to use the knowledge about Forensic Hair Examination in criminal Investigative techniques.

Course Contents:

Unit I: Forensic Botany

Identification of Plant specimen; Techniques for dating specimens using plant material, Algal colonization, Application of plant ecology; Different botanical evidences of forensic significance: Leaves, seeds, etc .Diatoms: Classification, basic structure and morphology, Isolation of diatoms from various samples and its forensic significance

UnitII: Wild Life Forensics

Introduction and importance of wild life, Protected and endangered species of Animals and Plants. Identification of wild life materials such as skin, fur, bones, nails, horn, teeth, flowers and plants by conventional and modern methods. Identification of Pug marks of various animals, census of wild life population.

UnitIII: Forensic Palynology

Study of spore, powdered minerals and pollens of forensic importance, Use of pollen grains & spores in criminal or civil investigation, Applications of Forensic Palynology.

Unit IV: Forensic Entomology

Basic Principle of Insect Biology, Life Cycle, Estimation of Time of Death, Preservation of Sample

Unit V: Hair

Importance, nature, location, collection, evaluation; Human & Animal Hair morphology and its biochemical properties, Phases of hair growth, types of hair.Differences between animal and human hair, Forensic examination of different types of hair

Text & References:

- James, S. H. And Nordby, J. J. (Eds), Forensic Science; An Introduction to Scientific and Investigative Techniques, CRC Press, London, 2003.
- Saferstein, Richard, Criminalistics - An Introduction to Forensic Science, 6th Ed. Prentice-Hall, New Jersey, 1998.
- Sharma, B. R., Forensic Science in Criminal Investigation and Trials (3rd Ed) Universal Law Publishing Co. Ltd. New Delhi, 2001.
- Bryant, V.M. Jr, Mildenhall, D.C. and Jones, J.G., Forensic Polynology in the United States of America Polynology. 1990, 14.PP.193-208
- Faegri, K. Iverson, J. and Krzywinski, K. Textbook of Pollen Analysis 4th Edition. John Wiley & Sons, New York 1989.
- Microbial forensics By Roger Breeze, Bruce Budowle, Steven E. Schutzer. Elsevier Academic Press
- The Forensic Laboratory Handbook Procedures and Practice By Ashraf Mozayani, Carla
- Noziglia. 2nd edition. 2011. Human Press.

- Forensic Science in Wildlife Investigations. Adrian Linacre Taylor and Francis, 2009
- Forensic Entomology: The Utility of Arthropods in Legal Investigations Jason H. Byrd, James L. Castner Taylor and Francis, 2009
- Forensic entomology: an introduction By Dorothy E. Gennard Wiley.
- Forensic palynology Dallas Mildenhall, Patricia Wiltshire, Vaughn Bryant Elsevier, 2006
- Forensic palynology: An in-depth look at its indispensable value National University, San Diego, 2002

Mode of Evaluation

Quiz, Assignment, Seminar and Attendance etc.:

20 Marks

Minors:

20 Marks

Major:

60 Marks

Total:

100 Marks

Version: 1.0

Academic Council Approval date:

Course Code	Course Name	L	T	P	C
BFS-303	APPLIED FORENSIC CHEMISTRY	3	0	0	3

Course Objective:

The students would be able to understand the various types of drugs and toxic substances encountered in an investigation. They would know the various techniques by which these toxic substances can be isolated and then analyzed to determine their type. They would also know the varied toxicological signs and symptoms of different toxins on the body when administered.

Courses Outcome:

On completion of this course, the students would be able to describe the various types of drugs and other toxic substances and the different types of symptoms displayed by these drugs on the human body. They would be able to assess the Legal aspect of Poisoning by means of NDPS Act. The knowledge of Arson cases would help them in criminal Investigations.

Course Contents:

Unit I: Forensic Toxicology

Introduction and concept of toxicology: LD 50, LC 50, Lethal dose, lethal period, Fatal period and its forensic significance; Poisons: classification of poisons, types of poisoning, Absorption, Metabolism and Extraction of toxins, collection and preservation of toxicological exhibits in fatal and survival cases, medico-legal aspects.

Unit II: Drugs of Abuse

Sedatives, Narcotics, Stimulants and Hallucinogens: Classification, administration, symptoms, postmortem findings and medico-legal aspects; Signs and symptoms of addiction, the identification of an addict.

Unit III: Legal Provisions

Narcotic Drugs & Psychotropic Substances Act 1985 (Definition, Licit Opium Cultivation, Minimum and Commercial Quantity in Narcotic Drugs, Offences and Penalties), Prevention of Illicit Trafficking in NDPS Act 1985 (Detention of a Person Under the Act), Drugs Control Act 1950 (Definition, Power of Chief Commissioner Under the Act), Drugs & Cosmetics Act 1940 (Definition, Adulterated, Misbranded, Spurious Drugs and Cosmetics, Offences and Penalties.)

Unit IV: Food adulteration

Introduction, Prevention of food adulteration, Analytical techniques for analysis of exhibits involved in food. Prevention of Food Adulteration Act 1954 (Definition, Power of Food Inspector, Offences and Penalties)

Unit V: Arson

Chemistry of fire, investigation and evaluation of clue material, analysis of arson exhibits by instrumental methods, Management of Arson cases.

Text & References:

- Benjamin, D. M., Forensic Pharmacology. In Forensic Science Handbook (vol – 3), Saferstein, R. (Ed.), Prentice-Hall, Englewood Cliffs, New Jersey, 1993.
- Caplan, Y. H., The Determination of Alcohol in Blood and Breath, In Forensic Science Handbook (vol – 3), Saferstein, R. (Ed.), Prentice Hall, Englewood Cliffs, New Jersey, 1982.
- James, S. H. and Nordby, J. J. (Eds.), Forensic Science - An Introduction to Scientific and Investigative Techniques, CRC Press, London, 2003.
- Karch, S. B., The Pathology of Drug Abuse. (2ndEdn.) CRC Press, Boca Raton, Florida, 1996.
- Saferstein, Richard, Criminalistics, An Introduction of Forensic Science, 6thEd. Prentice-Hall, New Jersey, 1998.
- Moffat (Clarke's), Clarke's Analysis of Drugs and Poisons
- Indian Pharmacopoeia, Govt Pub.
- Dr. M P Goutam, Analysis of Plant Poisons

- Modi, Medical Jurisprudence
- Parikh, Medical jurisprudence and Toxicology
- David R. Redsicker, Practical Fire and Arson Investigation

Mode of Evaluation

Quiz, Assignment, Seminar and Attendance etc.:

20 Marks

Minors:

20 Marks

Major:

60 Marks

Total:

100 Marks

Version: 1.0

Academic Council Approval date:

Course Code	Course Name	L	T	P	C
BFS-304	APPLIED FORENSIC PHYSICS	3	0	0	3

Course Objective:

On completion of this course, the students would be able to understand the physics of speech which is important in speaker identification, Causes and investigation of vehicular accidents, and its legal implications. Photography is another aspect that will be covered in this paper; parts of a camera, forensic importance of Forensic photography and different types of photography used in the investigation of crime will be covered in this course.

Course Outcome: At the end of this course the students would be able to understand the physics of sound production, its application in Forensic Science, causes and investigations done in vehicular accidents and the legal provisions in it also about forensic photography, the various methods of photographing a crime scene etc.

Course Contents:

Module I: Speaker Identification

Human Vocal cord anatomy, Production of voice, Speaker identification and authentication, Voice analysis, Forensic Significance

Module II: Causes and Investigation of Vehicular Accidents-an overview

Automobile accidents-Introduction, sources of information: eye witnesses, Tire and other mark, Pedestrian impacts and vehicle speed, vehicle condition, vehicle speed and damage, curvedscuffmarks, Time and distance, reaction time,Vehicular Accident Photography.

ModuleIII: Legal Aspects of Vehicular accidents

Relevant Provisions of Motor Vehicle Act, 1988 (Offenses and Penalties); Relevant Provisions of Indian Penal Code, 1860, (Sections 337 (causing hurt), 304 A (causing death due to negligence) and 279 (rash and negligent driving)

Module IV: Forensic Photography-I:

Introduction, 35 mm film Camera, Digital SLR camera, Digital photo imaging, ISO number, Exposure Index, Photo imaging evidence: angle, scale, depth of field, light, ambient light, color, temperature, flash/strobe.Surveillance photography and Aerial photography and accessories used for the same. Various Methods for developing photographs; High-speed photography; Image magnification, U. V. and I. R. illumination,legal aspects of visual evidence

Module V: Tool Marks

Types of tool marks: compression marks, striated marks, combination of compression and striated marks, repeated marks: class characteristics and individual characteristics, tracing and lifting of marks, Photographic examination of tool marks.Restoration of Erased / Obliterated Marks:Methods of making-cast, punch, engrave; methods of obliteration, methods of restoration- etching (etchings for different metals), magnetic, electrolytic etc., recording of restored marks.

Text & References:

- Redsicker, D. R., The Practical methodology of Forensic Photography, CRC Presss, London, 1994.
- Encyclopedia of Forensic Science, Volume 1-3: Jay A Siegel, Pekka J Saukko, GeofferyKnufer. Academic Press.
- Criminalistics, An Introduction to Forensic Science: Richard Saferstein, 10th Edition, Pearson Education International.
- Forensic Science An Introduction to Scientific and Investigative Techniques : Stuart H. James and Jon J. Nordby., 3rd Edition CRC Press, Taylor & Francis Group.
- Edward M Robinson, Crime Scene Photography
- Herbert L Blitzer, Forensic Digital Imaging and Photography

- Tom Ang, Digital Photography, 1999

Mode of Evaluation

Quiz, Assignment, Seminar and Attendance etc.:

Minors:

Major:

Total:

20 Marks

20 Marks

60 Marks

100 Marks

Version: 1.0

Academic Council Approval date:

Course Code	Course Name	L	T	P	C
BFS-305	BASICS OF DIGITAL AND CYBER FORENSICS	3	0	0	3

Course Objective:

The objective is to impart students the basic knowledge of computers and its application in forensic science and the different types of computer based crimes encountered in the society.

Course Outcome:

On completion of the course, the students will learn about the basics of computers, the different types of operating systems, networking and introduction to internet. This would also help the students to attain the basic knowledge regarding cyber crime and digital evidence.

Course Contents:

Module I: Basics of Computers

Computer organization, Components of computers – Input & Output devices, CPU Memory Hierarchy and types of Memory (RAM and ROM and their types) external storage devices, Application Software and System Software.

Module II: Data Representations

Integers, real, binary, octal, hexadecimal & their conversions, Logic gates – Negation, OR, AND, XOR etc. and their combinations.

Module III: Introduction to Operating System

Basics of Operating System, memory structure, concurrency, scheduling, synchronization & memory management, process description and control. Introduction to Operating System (Batch Operating System, Distributed operating system, etc) Introduction to Windows and Linux operating System.

Module IV: Networking & Introduction to Internet

Basics of Networking – Introduction to Networking Types of topologies, LAN, MAN, WAN and related terminologies, Networking Devices (Switches, hub, bridge). World Wide Web, E-mails, Chat, Search Engines, Network Security – Threats, Vulnerabilities, Access Control, Malicious Code (Virus, Worms, Trojans, etc.) Introduction to Security and Security model (CIA triad)

Module V: Cyber Crime & Digital Evidence

Definition of cyber crime, types of cyber crimes, Digital evidence, Digital Vs Physical evidence, nature of digital evidence, precautions while dealing with digital evidence.

Text & References:

- Leshin, C.B., Internet Investigation in Criminalistics, Prentice Hall, New Jersey, 1997.
- Tessarolo, A.A. and Marignani, A., Forensic Science and the Internet. The Canadian Society of Forensic Science Journal, Vol. 29, 1996.
- BernadJahne: Digital Image processing, Springer Verlag (1993)
- Incident Response and Computer Forensic by *Kelvin Mandia*, TMH Publication.
- Digital Forensics: Digital Evidence in Criminal Investigations by *Angus McKenzie Marshall*
- Cyber Forensic A Field Manual for Collecting, Examining and Preserving Evidence of Computer Crimes by *Albert J Menendez*. Auerbach Publications.
- First Responder's Guide to Computer Forensics by *Richard Nolanetal.* - Carnegi Mellon, 2005.
- Cyber Forensic by *Marecella Menendez*.
- Computer Forensic by *Newman*.
- Cyber Crime Investigation Field Guide, by *B Middleton*.

- John. R.Vacca, 2005, Computer Forensics: Computer Crime Scene Investigation, Cengage Learning

Mode of Evaluation

Quiz, Assignment, Seminar and Attendance etc.:

20 Marks

Minors:

20 Marks

Major:

60 Marks

Total:

100 Marks

Version: 1.0

Academic Council Approval date:

Course Code	Course Name	L	T	P	C
BFS-306	PRACTICAL - III	0	0	6	3

Objective:

The objective of this course is to give practical exposure to the students in the different aspects of Forensic Biology, Serology, Photography etc.

Outcome:

The students will gain hands-on experience in the different aspects of Biology, Serology and Photography which are taught by way of conduction of practicals in the Laboratory

Course Contents:

1. Blood Group analysis from fresh blood
2. Blood group analysis from old blood stains
3. Catalytic tests for Blood
4. Crystal tests for Blood
5. Blood stain pattern analysis
6. Analysis of Biological Fluids (Semen, Saliva, Sweat, Urine)
7. Photography of bite marks and skid marks
8. Study of pollen grains of forensic significance.
9. Identification of diatoms
10. Study of life cycle of blowflies
11. Microscopic study of structure of hair
12. Identification of human and animal hair.
13. Finding results of different logic gates & their combinations.
14. Working with Windows – File (creation, modification, deletion, attributes), Folder (creation nesting, attributes).
15. Working with Linux – File (creation, modification, deletion, attributes), Various commands onLinux (basic utility commands e.g. Date, Cal etc.).
16. Obtaining the system and process information (Windows).

Mode of Evaluation:

Conduction of Practical, Practical file assessment, Internal and External Viva-Voce

Version: 1.0

Academic Council Approval date:

SEMESTER IV

Course Code	Course Name	L	T	P	C
BFS-401	FINGERPRINTS	3	0	0	3

Course Objective:

The objective of the course is to impart knowledge of fingerprints as an important physical evidence at the scene of crime. The students would be able to study the manner in which it is developed, identified, classified, collected, packed and forwarded to the Fingerprint Bureau.

Course Outcome:

On completion of this course, the students would acquire knowledge regarding fingerprint patterns, the different types of fingerprint classification, the various methods of fingerprint development and their recording.

Course Contents:

Module I: History of Fingerprinting

History and Development of fingerprints; important figures in the field of fingerprint, Principles of Fingerprints, Importance, nature and location, Fingerprints as evidence: Its recognition, Collection and Preservation.

Module II: Introduction to Fingerprints and its Patterns

Biological significance of skin pattern, Ridge formation, Composition of Sweat, Fingerprint patterns, Pattern Areas, General and Individual characteristics of fingerprints;

Module III: Classification of Fingerprints

Classification of fingerprints- Henry System of classification, Single digit Classification, Fingerprint Bureau.

Module IV: Recording and Examination of Fingerprints

Ridge Counting and tracing, filing and searching. Taking fingerprints from living and dead persons. .

Module V: Latent Fingerprints

Latent fingerprint and Chance Fingerprints in criminal investigation, investigating latent fingerprints, various methods of development of fingerprints: physical and chemical methods, fluorescent method, laser method, lifting of latent fingerprints. Photography of latent traces and presentation of fingerprint evidence in court.

Text & References:

- Bridges, B. C., Vollmar, A. Monir, M., Criminal Investigation, Practical Fingerprinting, Thumb Impression, Handwriting, Expert Testimony Opinion Evidence, The University Book Agency, Allahbad, 2000.
- James, S. H. and Nordby, J. J. (Eds), Forensic Science - An Introduction to Scientific and Investigation Techniques, CRC Press, London, 2003.
- Nanda, B. B., and Tewari, R. K., Forensic Science in India. Select Publishers, New Delhi, 2001.
- Saferstein, Richard, Criminalistics, An Introduction to Forensic Science, 6th Ed. Prentice-Hall, New Jersey, 1998.
- Sharma, B. R., Forensic Science in Criminal Investigation and Trials (3rd Edn) Universal Law Publishing Co. Ltd. New Delhi, 2001.
- Speculation in Fingerprint Identification By Chatterjee S. K.
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Mode of Evaluation

Quiz, Assignment, Seminar and Attendance etc.:

Minors:

Major:

Total:

20 Marks

20 Marks

60 Marks

100 Marks

Version: 1.0

Academic Council Approval date:

Course Code	Course Name	L	T	P	C
BFS-402	FORENSIC ANTHROPOLOGY AND ODONTOLOGY	3	0	0	3

Course Objective:

The objective of the course is to impart the students' knowledge about the importance of Anthropology in Forensic Science. The students would be equipped with this knowledge to determine the age, sex, and stature of an individual using various parameters.

Course Outcome:

On the completion of this course, the students would be able to understand the application of Anthropology in Forensic Science, the various ways in which it can be used for identifying the deceased using only the skeletal remains, measuring the skull and hence to determine the age and sex and also to reconstruct the face using various advanced techniques.

Course Contents:

Module I: Forensic Anthropology

Introduction, definition & History of Physical Anthropology scope and application of Forensic Anthropology.

Module II: Study of Skeletal Material

Human and animal remains: Study of burned bones and bone fragments. Assessing and determining the time and cause of Death using the skeletal remains.

Module III: Identification

Establishment of Partial and Complete identity of skeletal remains and dead bodies: Attribution of Sex, Estimation of Age and reconstruction of stature from long bones and their medico legal implication.

Module IV: Craniometry and Facial reconstruction

Identification of human skull, and its measurement. Facial reconstruction using photography, clay modeling etc. and its importance. Importance of tissue depth to reconstruct various facial features.

Module V: Forensic Odontology

Introduction & History of Odontology, Body Identification by Dental Records, Post Mortem Examination & Records, Antemortem examination & records, Record Analysis & Processing, Forensic Dentistry in Mass Disasters, Bite Mark Analysis – Time of Death, Collection of Bite mark evidence & comparison. Expert Witness Testimony.

Text & References:

- Krogman, W. M. and M. Y. Iscan: Human Skeleton in Forensic Medicine.
- Modi: A Text Book of Medical Jurisprudence & Toxicology.
- Nath, S.: Forensic Anthropology
- Stewart, T. D.: Essentials of Forensic Anthropology
- I. P. Singh, A Laboratory Manual on Biological Anthropology
- Paul G Stimson, Forensic Dentistry

Mode of Evaluation

Quiz, Assignment, Seminar and Attendance etc.:

Minors:

Major:

Total:

20 Marks

20 Marks

60 Marks

100 Marks

Version: 1.0

Academic Council Approval date:

Course Code	Course Name	L	T	P	C
BFS-403	FORENSIC TOXICOLOGY	3	0	0	3

Course Objective:

The objective is to impart to the students knowledge regarding the various types to toxic substances in nature, their effect on the human body and the medico-legal aspects of poisoning.

Course Outcome:

On completion of this course, the students would be able to understand the various types of drugs and toxic substances encountered in an investigation. They would know the various techniques by which these toxic substances can be isolated and then analyzed to determine their type. They would also know the varied toxicological signs and symptoms of different toxins on the body when administered.

Course Contents:

Module I: Metallic Poisons

Arsenic, Mercury, Lead, Cadmium: Nature, administration, symptoms, postmortem findings, Detection and medicolegal aspects

Module II: Insecticides

Organophosphorous compounds, Organochloro Compounds and Carbamates- Nature, administration, symptoms, post-mortem findings, isolation, detection, estimation and medico-legal aspects.

Module III: Volatile Poisons & corrosive poisons

Methyl alcohol, Chloroform, Ethyl alcohol, Acetone; Nature, administration, symptoms, post-mortem findings, isolation, detection and estimation, medico-legal aspects, Mineral Acids: HCl, H₂SO₄, HNO₃, Alkalies: hydrates and carbonates of Sodium and potassium, NaOH, KOH

Module IV: Toxicology of Alcohol

Introduction, definition of alcohol and illicit liquor, Proof spirit, absorption, de-toxification and excretion of alcohol, Breath test instruments, field sobriety testing, analysis of blood for alcohol. Analytical techniques in the analysis of alcohol Cases of drunken driving

Module V: Miscellaneous Poisons:

Animal poisons: Snake, scorpions and Cantharides; Vegetable Poisons: Dhatura, Oleander, Madar, Abrus precatorius, Castor, Cannabis, Nux vomica, cyanide, etc. Nature, administration, symptoms, post-mortem findings, isolation, detection and medico-legal aspects.

Text & References:

- Benjamin, D. M., Forensic Pharmacology. In Forensic Science Handbook (vol – 3), Saferstein, R. (Ed.), Prentice-Hall, Englewood Cliffs, New Jersey, 1993.
- Caplan, Y. H., The Determination of Alcohol in Blood and Breath, In Forensic Science Handbook (vol – 3), Saferstein, R. (Ed.), Prentice Hall, Englewood Cliffs, New Jersey, 1982.
- James, S. H. and Nordby, J. J. (Eds), Forensic Science - An Introduction to Scientific and Investigative Techniques, CRC Press, London, 2003.
- Karch, S. B., The Pathology of Drug Abuse. (2nd Edn.) CRC Press, Boca Raton, Florida, 1996.

Mode of Evaluation

Quiz, Assignment, Seminar and Attendance etc.:

20 Marks

Minors:

20 Marks

Major:

60 Marks

Total:

100 Marks

Version: 1.0

Academic Council Approval date:

Course Code	Course Name	L	T	P	C
BFS-404	BASIC CONCEPTS IN INSTRUMENTAL METHODS-PHYSICAL	3	0	0	3

Course Objective:

To impart knowledge on the basic principles of different instruments utilised in forensic case samples.

Course Outcome:

On completion of this course the students will have a thorough knowledge of the various basic concepts of instrumental analysis used in the analysis of different substances encountered during a criminal investigation. They would be able to understand the various types of spectra, their application in instruments, their Forensic application, their methods of sample analysis and the different types of detectors used for detecting the various substances.

Module I: Interaction of radiation with matter:

Reflection, absorption, transmission, fluorescence, phosphorescence and their forensic applications, radiation filters. Detection of radiations; photographic detectors, thermal detectors, photoelectric detectors etc.

Module II: Atomic spectra:

Introduction to Atomic spectra, energy levels, quantum numbers and designation of states, selection rules, qualitative discussions of atomic spectra.

Module III: Atomic Spectroscopy

What is spectroscopy, electromagnetic spectrum, sources of radiation; their utility and limitations- conventional sources for UV, visible and infrared rays, sources for shorter wavelength radiations (X-ray tubes) radioactivity, types of rays.

Module IV: Elements of X-ray spectrometry:

Fluorescence, energy Dispersive X-ray analysis (EDX), wavelength Dispersive X-ray analysis (WDX), X-ray diffraction, Auger effect

Module V: Molecular spectra:

Qualitative discussions of molecular binding, molecular orbital, types of molecular energies, qualitative discussions of rotational, vibrational and electronic spectra, spectra of polyatomic molecules,

Text & References:

- D.R Lide; Handbook of Chemistry & Physics C.R.C. 75th ed. CRC Press Washington D.C., (1994)
- R.M. Silverstein, G.C. Baster & T.C. Morsill; Spectrometric identifications of Organic Compounds, 4th Edn., Wiley, New York; (1981)
- Dollisth, F.R., W.G. Fateley & F.F. Bentley; Characteristic Roman frequencies of organic compounds, Wiley, New York (1974)
- Lin – Vien, D & Other – Infrared & Raman Characteristics frequencies of organic molecules; San Diego Acad, Press (1991)
- Friebolin, H. Berik; One & Two Dimensional NMR spectroscopy; Weinheim Germany, VCH (1991)
- Senders, I & B Hunter; Modern Spectroscopy- A center for Chemists; 2nd ed. Oxford Univ. Press, UK, (1993)
- L.V. Azaroff; Elements of X-Ray Crystallography, McGraw Hill, New York, (1968)
- G.H. Stout & L.H. Jensten; X-ray Structure Determination – A practical Guide; 2nd Edn., Wiley, New York,

- (1989)
- J Sneddon; Advances in Atomic Spectroscopy, Vol. I & II, JNIPress (1992 & 1994)
 - S.J. Haswell; Atomic Absorption spectrometry; Elsevier, Amsterdam, (1992).
 - Lindsay, S.; High Performance Liquid Chromatography, New York, Wiley (1992)
 - Baker, D.R.; Capillary – Electrophoresis, New York (1995)
 - Marcel Dekker; Handbook of TLC, 2nded, New York (1995)
 - Jarris, K.E., A.L. Gray & R.S. Hock, EDS, Handbook of Inductively Coupled Plasma Mass Spectrometry; GlasgowBlockie,(1992)
 - ChatwalAnand, Instrumental Analysis

Mode of Evaluation

Quiz, Assignment, Seminar and Attendance etc.:

20 Marks

Minors:

20 Marks

Major:

60 Marks

Total:

100 Marks

Version: 1.0

Academic Council Approval date:

Course Code	Course Name	L	T	P	C
BFS-405	MICROSCOPY	3	0	0	3

Course Objective:

To impart knowledge regarding the various types of Microscopes used in analyzing samples obtained in the Forensic Science Laboratory and the different principles governing it

Course Outcome:

On completion of this course, students would learn about the various types of microscopes like Simple microscope, Compound microscope, Comparison microscope, Stereo microscope, SEM and Fluorescence microscope and their important parts, functions and their application in Forensic Science.

Course Contents:

Module I: Introduction

Definition of microscopy, different types of microscopes its important parts and their functions, Scope of microscopy in Forensic Science, elementary theory of microscope: light and lenses

Module II: Microscopes - 1

Simple microscope: Components, performance criteria and uses

Compound microscope: Components, performance criteria and uses

Module III: Microscopes - 2

Comparison microscope: Components, performance criteria and uses

Stereomicroscope: Components, performance criteria and uses

Module IV: Microscopes - 3

SEM microscope: Components, performance criteria and uses

TEM microscope: Components, performance criteria and uses

Module V: Microscopes - 4

Polarizing Microscope, components, performance criteria and uses

Fluorescence microscope: Components, performance criteria and uses

Phase-contrast Microscope: Components, performance criteria and uses

Text & References:

- Sharma, B. R., Forensic Science in Criminal Investigation and Trials (3rd Ed) Universal Law Publishing Co. Ltd. New Delhi, 2001.
- Saferstein, R., Forensic Science Handbook, Prentice Hall, New Jersey, 1982.
- Nicholas, Microscopy for criminalist Chemist and conservation
- John R. Vacca, Computer Forensics : Computer Crime Scene Investigation, 2003
- Edward M Robinson, Crime Scene Photography
- Herbert L Blitzer, Forensic Digital Imaging and Photography,

Mode of Evaluation

Quiz, Assignment, Seminar and Attendance etc.:

Minors:

Major:

Total:

20 Marks

20 Marks

60 Marks

100 Marks

Version: 1.0

Academic Council Approval date:

Course Code	Course Name	L	T	P	C
BFS-406	PRACTICAL – IV	0	0	6	3

Course Objective:

The objective of this course is to give practical exposure to the students in the different aspects of Fingerprinting, methods of developing it and lifting it. Also they will be imparted knowledge regarding the estimation of various aspects of Forensic Anthropological studies.

Course Outcome:

The students will gain hands-on experience in the different aspects of fingerprinting and toxicological analysis and anthropological studies which are taught by way of conduction of practicals in the Laboratory

Course Contents:

1. Making of fingerprints on fingerprint cards and identifying the pattern
2. Development of fingerprints using physical methods
3. Development of fingerprints using chemical methods
4. Classification of fingerprints
5. Lifting and identification of latent fingerprints
6. Analysis of metallic poisons
7. Analysis of volatile and non-volatile poisons.
8. TLC of insecticides and pesticides.
9. TLC of Barbiturates and other drugs
10. Analysis of vegetable poisons
11. Estimation of stature using long bones
12. Determination of age from skull sutures.
13. Determination of age from mandible.
14. Determination of sex from skull.
15. Determination of sex from Pelvis.
16. Demonstration of different parts of microscopes.

Mode of Evaluation:

Conduction of Practical, Practical file assessment, Internal and External Viva-Voce

Version: 1.0

Academic Council Approval date:

SEMESTER V

Course Code	Course Name	L	T	P	C
BFS-501	INTRODUCTION TO QUESTIONED DOCUMENTS	3	0	0	3

Course Objective:

To impart students the knowledge regarding various types of questioned documents. To detect different types of alterations in the [documents.To](#) analyze the documents by analyzing paper, ink, and handwriting examinations.

Course Outcome:

On completion of this course, the students would be able to know the different types of questioned documents, the types of forgery generally encountered, methods of their detection and examination, composition and examination of ink, paper and pencil. Identification of handwriting and signatures and forming opinion will be taught to the students.

Course Contents:

Module I: Questioned Documents Types

Definition of documents, questioned documents and the type of cases encountered; Importance, nature and problems of documents, Location, collection, handling and presentation of documents, adequacy of exemplars and standards.

Module II: Methods of Detection

Detection and deciphering of indented writing, charred documents, invisible/secret writing; **Ink Examination**
Composition of major types of writing inks (carbon ink, fountain pen ink, ballpoint pen ink, rolling ball marker inks, fiber or porous tips pen ink, analysis of writing inks and ink dating, Pencil lead examination.

Module III: Paper analysis

Physical characteristics, water mark examination, fiber analysis, chemical and trace elemental analysis; Equipments required: Camera, Microscope, Reference standards, TLC and HPLC.

Module IV: Examination of documents

Examination of alterations, erasures, overwriting, additions and obliterations. examination, Determination of age of the documents, Instruments and equipments used for examination of fraudulent documents; Identification and comparison of typescripts

Module V: Handwriting & Signature Identification

Principle of handwriting, individual and class handwriting characteristics. Identification, External, internal and physical characteristics affecting the handwriting of a person. Signatures: Authentic signatures, forged signatures, disguised signatures, traced signatures and their characteristics. Factors affecting the signature of individuals.

Text & References:

- James, S. H. And Nordby, J. J. (Eds), Forensic Science - An Introduction to Scientific and Investigative Techniques, CRC Press, London, 2003.
- Saferstein, Richard, Criminalistics - An Introduction to Forensic Science, 6th Ed. Prentice-Hall, New Jersey, 1998.

- Sharma, B. R., Forensic Science in Criminal Investigation and Trials (3rd Ed) Universal Law Publishing Co. Ltd. New Delhi, 2001.
- O'Hara & Osterburg: Introduction to Criminalistics, 1949, The MacMillan Co., 1964.
- Katherine M Koppenhaver, Forensic Document Examination, Principles and Practice
- B S Nabar, Forensic Science in Crime Investigation

Mode of Evaluation

Quiz, Assignment, Seminar and Attendance etc.:

20 Marks

Minors:

20 Marks

Major:

60 Marks

Total:

100 Marks

Version: 1.0

Academic Council Approval date:

Course Code	Course Name	L	T	P	C
BFS-502	INSTRUMENTATION – BIOLOGICAL	3	0	0	3

Course Objectives:

To impart knowledge regarding the various biological techniques adopted in the analysis of biological samples and the basic principles involved in their functioning.

Course Outcome:

On completion of this course the students will have a thorough knowledge of the various instruments used in the analysis of different substances encountered during a criminal investigation. They would be able to understand the various types of instrumentation, their Forensic application, their methods of sample analysis and the different types of detectors used for detecting the various substances.

Module I: General Principles of Biological/ Bio-chemical Analysis

pH and buffers, Physiological solution, Cell and tissue culture: types – Primary and secondary

Module II: Centrifugation Techniques

Basic principles of sedimentation, various types of centrifuges, Density gradient centrifugation, Preparative centrifugation, Cell fractionation, Analysis of sub-cellular fractions, Ultracentrifuge- Refrigerated Centrifuges

Module III: Enzyme Techniques

Enzyme kinetics, Purification and protein estimation, Enzyme assay technique, Visible & ultraviolet Spectrophotometric methods - Instrumentation, Automated enzyme analysis, Immobilized enzymes.

Module IV: Immuno-chemical Technique

Gel immuno-diffusion, Immuno-electrophoresis, Radio Immuno Assay (RIA), ELISA, Fluorescence immuno assay.

Module V: Chromatographic Techniques

Paper chromatography, TLC, Gas chromatography, HPLC, HPTLC,

Text & References:

- Friebolin, H. Berik; One & Two Dimensional NMR spectroscopy; WeinheimGermany, VCH (1991)
- Senders, I & B Hunter; Modern Spectroscopy- A center for Chemists; 2nded. Oxford Univ. Press, UK, (1993)
- L.V. Azaroff; Elements of X-Ray Crystallography, McGraw Hill, New York, (1968)
- G.H. Stout & L.H. Jensten; X-ray Structure Determination – A practical Guide; 2ndEdn., Wiley, New York, (1989)
- J Sneddon; Advances in Atomic Spectroscopy, Vol. I & II, JNI Press (1992 & 1994)
- S.J. Haswell; Atomic Absorption spectrometry; Elsevier, Amsterdam, (1992).
- Lindsay, S.; High Performance Liquid Chromatography, New York, Wiley (1992)
- Baker, D.R.; Capillary – Electrophoresis, New York (1995)
- Marcel Dekker; Handbook of TLC, 2nded, New York (1995)
- Jarris, K.E., A.L. Gray & R.S. Hock, EDS, Handbook of Inductively Coupled Plasma Mass Spectrometry; GlasgowBlockie,(1992)
- Maclafferty, F.W. & F. Turecek; Interpretation of Mass spectra; 4thedMillValley, C A Univ Science Books,(1993)
- Chapman, J.R; Practical Organic Mass spectrometry, A Guide for Chemical and Biochemical Analysis, Wiley, New York, (1993)
- H.H Willard et al; Instrumental methods of analysis; CBS Publishers and Distributors, Delhi (1986)
- J Bassett, et al; Vogel's Text Book of Quantitative Inorganic Analysis including Elementary Instrumental Analysis (Fourth Ed.), Long man Essex, (1978)

- Gray D Gchristian and Fredric J Feldman; Atomic absorption spectroscopy; Wiley-Interscience, London (1970)
- ChatwalAnand, Instrumental Analysis

Mode of Evaluation

Quiz, Assignment, Seminar and Attendance etc.:

20 Marks

Minors:

20 Marks

Major:

60 Marks

Total:

100 Marks

Version: 1.0

Academic Council Approval date:

Course Code	Course Name	L	T	P	C
BFS-503	RESEARCH METHODOLOGY AND STATISTICS	3	0	0	3

Course Objective: The objective of the course is to impart research based knowledge to the students. They would be taught the various ways of data collection, research methodologies adopted in different settings, and statistical methods.

Course Outcome:

The students will learn about research in the field of social science and behavioural sciences. They get a thorough knowledge of the, methods of research as to how to conduct a research, the types of tools for data collection and the statistics to be used to analyze the data.

Course Contents:

Module I: Introduction to Research Methodology

Definition, concept and research in science and forensic science; Introduction to Research Methodology, research methodology in science, social science and behavioural science.

Module II: Research in Scientific and Social Settings

Experimental research and non – experimental research design.

Module III: Tools of Data Collection

Observation, questionnaires, interview schedules, case study methods

Module IV: Introduction to Statics.

Introduction to statistics; parametric and non parametric statistics.

Module V: Descriptive Statistics

Measures of central tendency; Measures of dispersion; graphical representation of the data; simple correlation methods.

Text & References:

- Broota, K. D., Experimental designs in psychological research, Wiley eastern, New York, 1992.
- Guilford, Statistics in Psychology and Education, McGraw Hill, New York, 1986.
- J T Walker, Statistics in Criminology and Criminal Justice analysis and Interpretation

Mode of Evaluation

Quiz, Assignment, Seminar and Attendance etc.:

20 Marks

Minors:

20 Marks

Major:

60 Marks

Total:

100 Marks

Version: 1.0

Academic Council Approval date:

Course Code	Course Name	L	T	P	C
BFS-504	Minor Project	0	0	0	6

Course Objective:

A term (or research) paper is primarily a record of intelligent articulation through several sources on a particular topic of a given subject. The students will choose the topic at the beginning of the session in consultation with the faculty assigned/chosen. The progress of the paper will be monitored regularly by the faculty. At the end of the semester the detailed paper on the topic will be submitted to the faculty assigned/chosen. The evaluation will be done by Board of examiners comprising of the faculties.

Course Outcome:

A term paper will help to orient the students to research ideas. It will give them an idea how different research works are done. Also how they can formulate their own research ideas and draft them.

The procedure for writing a term paper may consist of the following steps:

1. Choosing a topic
2. Finding sources of material
3. Collecting the notes
4. Outlining the paper
5. Writing the first draft
6. Editing & preparing the final paper

Term papers should be composed of the following sections:

- 1) Title page
- 2) Abstract
- 3) Introduction
- 4) Review of the Literature
- 5) Discussion & Conclusion
- 6) References
- 7) Appendix

The Layout Guidelines for the Term Paper:

- A4 size Paper
- Font: Arial (10 points) or Times New Roman (12 points)
- Line spacing: 1.5
- Top and bottom margins: 1 inch/ 2.5 cm; left and right margins: 1.25 inches/ 3 cm

Assessment Scheme:

Continuous Evaluation:

30%

(Based on abstract writing, interim draft, general approach, research orientation, readings undertaken etc.)

Final Evaluation:

70%

(Based on the organization of the paper, objectives/ problem profile/ issue outlining, comprehensiveness of the research, flow of the idea/ ideas, relevance of material used/ presented, outcomes vs. objectives, presentation/ viva etc.)

Course Code	Course Name	L	T	P	C
BFS-505	PRACTICAL - V	0	0	6	3

Course Objective:

The objective of this course is to give practical exposure to the students in the different aspects of Document Examination, Various characteristics of handwriting, analysis of ink samples, and use of some instruments for qualitative and quantitative estimation.

Course Outcome:

The students will gain hands-on experience in the different aspects of Questioned document Examination, Instrumentation for quantitative and qualitative estimation.

Course Contents:

1. Examination and detection of fraudulent documents
2. Examinations of alterations in documents.
3. Identification of Indented writing
4. Identification of Invisible writing
5. Identification of class and individual characteristics in handwriting.
6. Identification of security features in currency notes.
7. TLC of different ink samples
8. Photography of documents
9. Quantitative analysis using Spectrophotometer.
10. Electrophoretic separation of different compounds.

Mode of Evaluation:

Conduction of Practicals, Practical file assessment, Internal and External Viva-Voce

Version: 1.0

Academic Council Approval date:

SEMESTER VI

Course Code	Course Name	L	T	P	C
BFS-601	FORENSICBALLISTICS	3	0	0	3

Course Objective:

The objective of the course is to impart students knowledge regarding the types of firearms and ammunition, characteristics of identification, the legal aspects involving firearms, Determination of range of firing and introduction to exterior ballistics.

Course Outcome:

On the completion of this course, the students will be able to understand the role of ballistics in Forensic Science, classification of firearms, determination of the range of firing, methods of laboratory examination of fired cartridges and fire arms. The students will also learn to reconstruct the sequence of events in cases involving firearms.

Course Contents:

Module I: Fire Arms

Introduction, brief history of fire arms, weapon types and their operations, proof marks.

Module II: Ammunition

A brief history of ammunition, ammunition components, types of propellants and their composition primers and its composition, head stamp marking on ammunition. Bullet comparisons, cartridge case examination, class and individual characteristics of identification.

Module III: Ballistics

Definition, Forensic Importance; Nature of firearms, parts of a firearm, classification of firearm, types of ballistics: internal, external and terminal ballistics. Velocity recoil, theory of recoil, barrel pressure measurement, ballistic coefficient, angle of elevation of the barrel, Ricochet. Legal Aspect: Arms Act, 1950, (Licensing, Offenses and Penalties).

Module IV: Range of Fire

Muzzle pattern, scorching, blackening, tattooing, wad distribution, pellet patterns, GSR analysis, and primer residues. Reconstruction of the sequence of events in a shooting case. Presentation of evidence in the court.

Module V: Wound / Terminal Ballistics

Introduction, Injuries and the quantity of energy of projectiles, Shock wave and cavitation effect, Elements of wound Ballistics; Nature of target, Velocity of projectile, Constructional features of projectile. Contact Range, Point blank range, near range, chips range, distant range. Penetration of shots in different regions of the body

Text & References:

- James, S. H. And Nordby, J. J. (Ed), Forensic Science - An Introduction to Scientific and Investigative Techniques, CRC Press, London, 2003.
- Modi, A Text Book of Medical Jurisprudence & Toxicology.
- Saferstein, Richard, Criminalistics - An Introduction to Forensic Science, 6th Ed. Prentice-Hall, New Jersey, 1998.
- Sharma, B. R., Forensic Science in Criminal Investigation and Trials (3rd Edn) Universal Law Publishing Co. Ltd. New Delhi, 2001.

- Handbook of Firearms and Ballistics, Examining and Interpreting Forensic Evidence: Brain J. Heard, John Wiley & Sons.
- Saxena & Gaur, Law of Arms and Explosives, 2002

Mode of Evaluation

Quiz, Assignment, Seminar and Attendance etc.:

20 Marks

Minors:

20 Marks

Major:

60 Marks

Total:

100 Marks

Version: 1.0

Academic Council Approval date:

Course Code	Course Name	L	T	P	C
BFS-602	FORENSIC MEDICINE	3	0	0	3

Course Objective:

To study the different types of injuries sustained by a person, examination of such wounds and their medico legal aspects. To understand the cause, dimensions and age of the injury. To study the causes of death, and post mortem examination, and identification of unknown bodies through various means.

Course Outcome:

On completion of this course, the students will be able to understand the different types of injuries sustained by a person, examination of such wounds and their medico legal aspects. The students will also acquire good knowledge regarding the cause, dimensions and age of the injury, Post mortem, personal Identification etc..

Course Contents:

Module I: Introduction

Medical Jurisprudence, Legal Procedure in India: -Police inquest, Magistrate's inquest, Coroner's inquest, Oath and affirmation. Documentary evidence: -Medical certificates, medical reports, dying declaration. Understanding laws and ethics of medical practice.

Module II: Death

Medico legal aspects of death: -Diagnosis of death-somatic & molecular, early and intermediate changes following death, late changes after death-putrefaction, autolysis, bacterial action, factors affecting these changes. Determination of time since death. Post-mortem examinations;external examination; internal examination.collection, preservation and packaging of viscera

Module III: Asphyxial Deaths.

Definition, violent asphyxial deaths- hanging, ligature strangulation, throttling, suffocation, Drowning.

Module IV: Wounds

Introduction to wounds; definition, types of injuries:Abrasions, grazes, lacérations,Bruises, contusion, Punctured wounds, incised wounds and identification ante – mortem, post – mortem injuries. Medico – legal aspects of wounds; Determining the age of the injury, Identifying,difference between suicidal, homicidal and accidental wounds.

Module V: Personal Identification

Importance and need for personal identification, Documents proof, scars, professional marks, personal articles, Finger printing, dentures, Portrait Parley and photographs, skeletal remains, ; identification in mass disasters, mutilated remains and decomposed bodies.

Text & References:

- Modi: A Text Book of Medical Jurisprudence & Toxicology.
- Sharma, B. R., Forensic Science in Criminal Investigation and Trials (3rdEdn) Universal Law Publishing Co. Ltd. New Delhi, 2001.
- James, S. H. and Nordby, J. J. (2003) Forensic Science: An introduction to scientific and investigative techniques CRC Press, USA.
- Guharaj, P. V., Chandran M. R. (2006) Forensic Medicine, 2nd Ed., Universities Press (India) Pvt. Ltd., Hyderabad.
- Di Maio J. M. Vincent, Dana S. E. (2006) Handbook of Forensic Pathology, VIVA Books Pvt. Ltd.,

India.

- Parikh C. K. (1999) Parikh's Textbook of Medical Jurisprudence

Mode of Evaluation

Quiz, Assignment, Seminar and Attendance etc.:

20 Marks

Minors:

20 Marks

Major:

60 Marks

Total:

100 Marks

Version: 1.0

Academic Council Approval date:

Course Code	Course Name	L	T	P	C
BFS-603	DNA FINGERPRINTING	3	0	0	3

Course Objective:

To understand the genetic basis of DNA Fingerprinting, types and techniques of DNA Fingerprinting, Polymerase Chain Reaction technique and the practical applications and forensic importance of DNA Fingerprinting. To know the types of evidences that are collected for conducting DNA Fingerprinting.

Course Outcome:

On completion of this course, the students would understand the genetic basis of DNA Fingerprinting, types and techniques of DNA Fingerprinting, Polymerase Chain Reaction technique and the practical applications and forensic importance of DNA Fingerprinting. They would also know the types of evidences that need to be given importance for conducting DNA Fingerprinting.

Course Contents:

Module I: Introduction

Definition, importance in Forensic Science; collection and types of evidences for DNA fingerprinting, Genetic basis of DNA Fingerprinting, Chromosomes, DNA, Nuclear DNA and Mitochondrial DNA

Module II: Techniques of DNA Fingerprinting

Isolation, southern blots, radioactive probe, Hybridization reaction, visualization, FTA cards for isolation of DNA

Module III: Types of DNA Fingerprinting:

Single locus DNA fingerprinting, multi – locus DNA Fingerprinting, Mini satellite, micro-satellite, VNTR, HLA-DQ α , STRs, RFLP

Module IV: Polymerase Chain Reaction

Instrumentation, principle, significance in forensic case samples. Denaturation, annealing and extension, Detection of PCR products.

Module V: Practical application of DNA Fingerprinting

Paternity and maternity testing, personal identification, criminal identification and Forensic importance; DNA databank, limitations of DNA Fingerprinting, legality of DNA Fingerprinting in India

Text & References:

- Norah Rudin and Keith Inman, (2nd Ed): An Introduction to Forensic DNA Analysis, CRC Press, New York, 2002.
- Sharma, B. R., Forensic Science in Criminal Investigation and Trials (3rd Edn) Universal Law Publishing Co. Ltd. New Delhi, 2001.
- John M. Butler, Forensic DNA Typing

Mode of Evaluation

Quiz, Assignment, Seminar and Attendance etc.:

20 Marks

Minors:

20 Marks

Major:

60 Marks

Total:

100 Marks

Version: 1.0

Academic Council Approval date:

Course Code	Course Name	L	T	P	C
BFS-604	EXPLOSIVES	3	0	0	3

Course Objective:

To learn the kinetics and thermochemistry of explosives. To gain knowledge of the explosion effects and manufacturing of different explosives. To understand analysis of various explosive residues.

Course Outcome:

On the completion of the course the student will be able to learn the kinetics and thermochemistry of explosives. They also gain knowledge of the explosion effects and manufacturing of different explosives. They will also gain knowledge about the analysis of various explosives residues.

Module I: Classification of Explosives and Detonators

Primary explosives: lead azide, lead styphnate, mercury fulminate, tetrazene. Secondary explosives: TNT, RDX, PETN, Tetrayl, Gelatines, powders, ANFO, emulsion slurries. Introduction, plain and electric detonators, delay detonators, detonating and safety fuse, high explosive mixtures

Module II: Development of Explosives

Development of black powder, nitroglycerine, mercury fulminate, nitrocellulose, dynamite, ammonium nitrate, ANFO. Development of military explosives: picric acid, tetryl, TNT, PETN, RDX and HMX

Module III: Location, Collection and

Location and collection of fireworks, home-made bombs, booby traps and letter bombs. Disposal of an explosive device, dispatch of explosive device and exploded material.

Module IV: Examination of Explosive Residue

Chemical examination, Chromatographic techniques: TLC, HPLC, Vapor detection method: adsorption and concentration of explosive vapors, X-ray imaging.

Module V: Legal Aspects

Explosives Act 1984, (Definition, Powers of Central Govt. and Licensing Authority, Offences and Penalties) and Section 286 of IPC, 1860, (Negligent conduct with respect to explosive substance), Explosive Substances Act 1908, (Definition, Offences and Penalties).

Text & References:

- Boudreau, JE et al – Arson & Arson Investigation, Surevey & Assessment National Institute of Law Enforcement, U.S Dept of Justice, US Govt. Printing Press (1977)
- D.A. Skoog, D.M. West and F.J. Holler; Analytical Chemistry: An Introduction; Saunders College Publishing, Philadelphia, USA, (1994)
- Dettean, J D; Kirk's Fire Investigation, 5thed, Prentice Hall, Eaglewood Cliffs, N.J (2002)
- Working Procedure Manual: Chemistry, Explosives and Narcotics, BPR&D Pub (2000)
- Y. Lyalikov; Physicochemical Analysis; Mir, Moscow, USSR, (1968)

Mode of Evaluation

Quiz, Assignment, Seminar and Attendance etc.:

Minors:

Major:

Total:

20 Marks

20 Marks

60 Marks

100 Marks

Version: 1.0

Academic Council Approval date:

Course Code	Course Name	L	T	P	C
BFS-605	PRACTICAL – VI	0	0	6	3

Course Objective:

The objective of this course is to give practical exposure to the students in the different aspects of Ballistics like examination of cartridge cases, comparison of bullets, various parts of firearms, Electrophoresis of blood and blood enzymes, identification of bite marks, the students will also be taken for visit to the mortuary to witness autopsy.

Course Outcome:

The students will gain hands-on experience in the different aspects of blood analysis, explosives and firearm analysis, comparison of bullets. They also learn about autopsy through demonstration in the mortuary..

Course Contents:

1. Study of ammunitions (Bullet and cartridge)
2. Chemical analysis of explosive materials
3. Study of various parts of the firearms: - barrel, action, stock, caliber, choke etc.
4. Isolation of DNA
5. Visit for autopsy
6. Identification of Bite marks

Mode of Evaluation:

Conduction of Practicals, Practical file assessment, Internal and External Viva-Voce

Version: 1.0

Academic Council Approval date:

Course Code	Course Name	L	T	P	C
BFS-606	PRACTICAL - V	0	0	6	3

Course Objective:

The objective of this course is to give practical exposure to the students in the different aspects of Document Examination, Various characteristics of handwriting, analysis of ink samples, and use of some instruments for qualitative and quantitative estimation.

Course Outcome:

The students will gain hands-on experience in the different aspects of Questioned document Examination, Instrumentation for quantitative and qualitative estimation.

Course Contents:

1. Examination and detection of fraudulent documents
2. Scientific report writing
3. Identification of Indented writing
4. Identification of Invisible writing
5. Identification of class and individual characteristics in handwriting
6. TLC of different ink samples
7. Photography of documents
8. Quantitative analysis using Colorimeter.
9. Quantitative analysis using Spectrophotometer.
10. Immuno-diffusion technique.
11. Electrophoretic separation of proteins

Mode of Evaluation:

Conduction of Practicals, Practical file assessment, Internal and External Viva-Voce

Version: 1.0

Academic Council Approval date: July 2012

