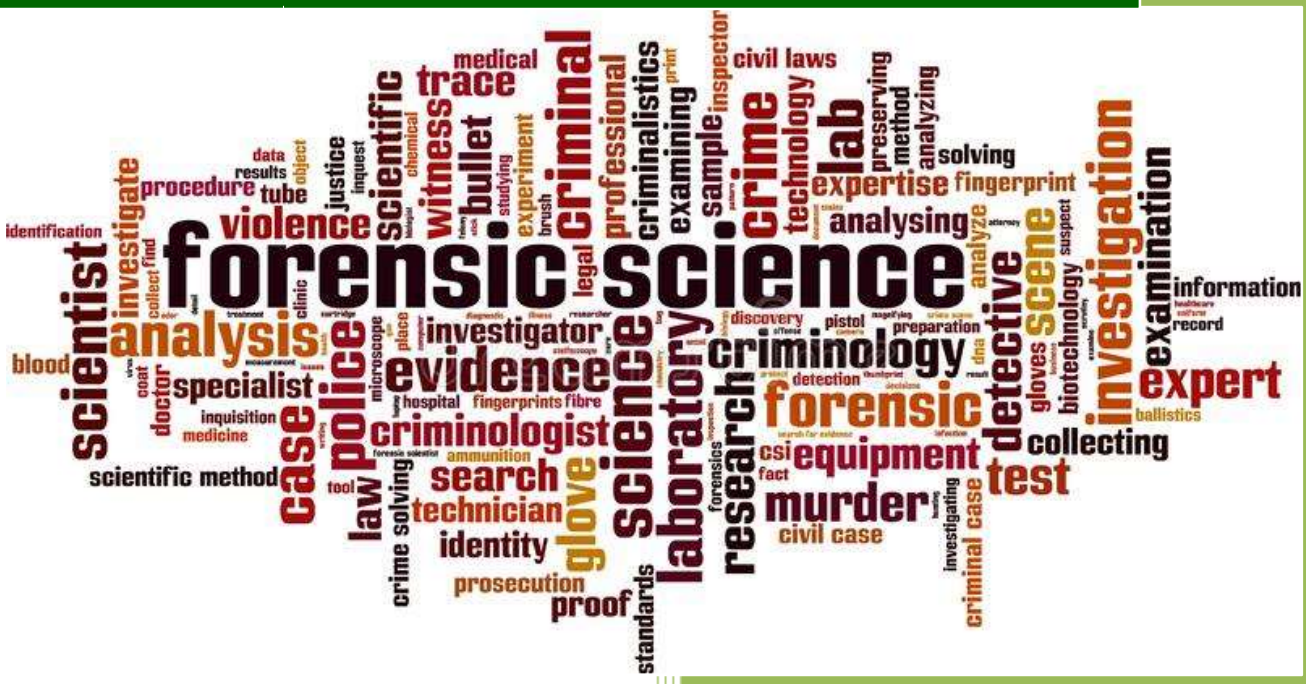
2021

SYLLABUS (CBCS) M.Sc. FORENSIC SCIENCE
KUMAUN UNIVERSITY, NAINITAL, UTTARAKHAND.



Department of Forensic Science

Faculty of Biomedical Sciences

8/12/2021

SYLLABUS (CBCS) M.Sc. FORENSIC SCIENCE

KUMAUN UNIVERSITY, NAINITAL, UTTARAKHAND.

1.	**Name of the Programme**	M.Sc. Forensic Science
2.	**Type of Course (U.G/P.G)**	Post Graduate
3.	**Duration of Course**	4 Semester (2 Year course) CBCS
4.	**Objectives of Course**	➢ To produce competent manpower in the field of **Forensic Science**s to meet the challenges of crime and investigative research using recent tools and techniques of Science and technology. ➢ Provide opportunity to the Scienc graduates towards job and industry driven professional studies.
5.	**Outcome of Course**	The detail study of the subject will help to understand about the basics and different branches of **Forensic Sciences** and will help to know about the working and functioning of **Forensic Science** laboratories. Course will generate trained manpower for Police **Science** its role in **criminal** investigation and Prevention of crime. A **forensic scientist** increases public safety by contributing to the capture of dangerous criminals. They help to achieve justice for victims and their families by using a range of techniques like DNA analysis, psychological theories and profiling approaches. You can get jobs in various governments & private sectors.
	Number of Proposed seats (Intake)	20 (Twenty)

M. Sc. in Forensic Science

FIRST SEMESTER(ODD SEMESTER)

Course Code	Course Type	COURSE (PAPER/SUBJECTS)	Credits	Maximum Marks		
				Internal	External	Total
FSC	CCC	Elemntary Forensic Science	4	20	80	100
FSC	CCC	Fundamentals of Fingerprint examination	4	20	80	100
FSC	CCC	Forensic tools and techniques	4	20	80	100
FSC	CCC	Investigation techniques	4	20	80	100
FSC	LAB	Lab (lab course 1)	4	20	80	100
Minimum credits in complete semester it would be 20			**Total: 20**			

The M.Sc. program will be divided into four semesters each being of six months duration. Each semester comprises of compulsory core courses (CCC) Lab course (LC) will be based on CCC. Each theoretical course will be divided into Internal Assessment of 20 marks and semester end examination of 80 marks.

Duration of Theoretical and Practical Examination Time: 03 Hours

M.Sc. FORENSIC SCIENCE I SEMESTER	
COURSE CODE: FSC COURSE TYPE: CCC	
COURSE TITLE: ELEMENTARY FORENSIC SICNECE	
CREDIT: 04	**TEACHING HOURS:**90
MARKS: 100THEORY EXAM. : 80 CCA: 20	
UNIT-1 18 Hours	Definition of Forensic Science, History, Organization of Forensic Science Laboratories and other allied institutions (FSL, CFSL, GEsQD, FPB), Development of Forensic Science in India & Abroad, Pioneers in Forensic Science, Multidisciplinary nature, Role of Forensic science in crime investigation with advanced technology, Forensic intelligence and Interviews. Concise of Forensic Physical, Biological, Chemical and Psychological evidences, Court Testimony Admissibility of expert testimony, Expert and lay witnesses, Laws and principals of forensic science, branches of forensic sciencess
UNIT-2 18 Hours	Nature of Evidence; What is Evidence? Kind of evidence, Levels of evidence, Forensic science is History, Basis of evidence; Transfer & Persistence, contamination, Identity, class and Individualisation. Known and questioned items, Relationship and context, comparison of evidence, controls, Analysis of evidence: Controls, Analysis of evidence: Some preliminary considerations.
UNIT-3 18 Hours	Relationship between police and forensic expert, Role of Police at the Crime scene, scientific help at crime scene, handling of various types of crime scenes by police, forensic teaching of police personals, forensic case documentation by Police, Technological Advance and Police. Criminal Justice system in India, Introduction , Administration of civil and criminal justice, Hierarchy of courts, Powers of courts , Types of courts Lok Ayukta system.Forensic Report: Forensic Expert, Forensic Report, Formats of Forensic Report, Court Testimony, Pre-Court Preparations & Court appearance, Examination in chief, Cross Examination and Re-examination, Ethics in Forensic Science

UNIT-4 18 Hours	Recent Trends in Forensic Science-Environmental Forensics: Definition, Legal processes involving environmental forensic science. Geo-forensicsGlobal Positioning System; Basic principles and applications. Biometrics in Personal Identification: Introduction, Concepts of Biometric Authentication, Role in person Identification, Techniques and Technologies (Finger Print Technology, Face Recognition,IRIS, Retina Geometry,Hand Geometry, Speaker Recognition, Signature Verification and other forensic related techniques). Bioterrorism-Definition, Concepts of Biosecurity and microbial forensics, Weapons of mass destruction (WMD), mass-casualty weapons (MCW), NBC and CBRNE, Dirty Bombs
SUGGESTED READINGS	• *Nanda, B.B. and Tewari, R.K. (2001) Forensic Science in India: A vision for the twenty first century Select Publisher, New Delhi.* • *James, S.H and Nordby, J.J. (2003)Forensic Science: An introduction to scientific and investigative techniques CRC Press,* • *Saferstein : Criminalistics (1976) Prentice Hall Inc., USA.* • *Deforest, Gansellen&Lee : Introduction to Criminalistics.* • *Sharma, B.R. (1974) Forensic Science in Criminal Investigation and Trials, Central Law Agency, Allahabad,1974.* • *Bruce A. Arrigo (2000) Introduction to Forensic Psychology Academic Press, London* • *J A Siegel, P.J Saukko (2000) Encyclopedia of Forensic Sciences Vol. I, II and III, Acad. Press.* • *Virginia A. Lynch (2011) and Janet Barber Duval: Forensic Nursing Science*

M.Sc. FORENSIC SCIENCE I SEMESTER	
COURSE CODE: FSC COURSE TYPE: CCC	
COURSE TITLE: FUNDAMENTALS OF FINGERPRINT EXAMINATION	
CREDIT: 04	**TEACHING HOURS: 90**
MARKS: 100THEORY EXAM: 80 CCA: 20	
UNIT-1 18 Hours	Introduction: Biometrics and Forensic Science- face, Iris & retinal imaging, speech recognition, Fingerprinting in India, What are friction ridges? Friction ridges pattern visualization techniques, Taking of finger prints from living & dead persons, preserving prints for analysis, principles of friction Ridge analysis, Classifying Fingerprints, Comparison of finger prints, Automated Fingerprint Identification System (AFIS), Identification, How long do friction ridge prints last, Elimination prints, Lip print, ear print.
UNIT-2 18 Hours	Chemistry of latent fingerprint residue, factor contributing to latent fingerprints, Methods of Development of latent fingerprints using conventional methods–Powdering (Black andgrey, fluorescent and magnetic), Fuming method, Vacuum Metal Deposition (VMD) Method, Chemical method, Reagent chemistry and formulations, Sequential Treatment and Enhancement., Photography of fingerprints, Digital Transmission
UNIT-3 18 Hours	Impression Evidence: Types of Impression Evidence, Significance of Impression Evidence, Footwear Impressions (General Characteristic), Footwear Impressions at the Crime Scene, Casting three Dimensional Footwear impressions, Lifting imprints, Comparison of footwear impressions, Tire Impressions Evidence skid mark, Serial numbers restoration. Basic principles and techniques of black & white and colour photography. Camera and lenses, exposing, development & printing, different kinds of developers & fixers, modern developments in photography. Digital photography, How digital camera work and basics of digital imaging videography, photomorphing, Crime Scene photography, Laboratory photography. Brief about speaker identification & tape authentication techniques and their applications in forensic science.

UNIT-4 16 Hours	Forensic Document Examination and its scope & importance; Classification of documents; Care, handling, preservation of documents; Observation tests and their application in handwriting examination; Preliminary examination of documents; examination of paper & inks, Process of comparison of handwriting; Principle of handwriting examination; Importance of natural variations and disguise in hand writing examination; Latest technological developments in the field of document examination with reference to office automation; Quality Assurance in document Examination; Document Expert in trial courts.
SUGGESTED READINGS	*1. Saferstein, R.(1990) Criminalistics, Prentice Hall, New York.* *2.David R. Ashbaugh (1999) Quantitative and Qualitative Friction Ridge Analysis, CRC Press.* *3.E. Roland Menzel (1999) Fingerprint Detection with Lasers, 2ndEd., Marcel Dekker, Inc. USA.* *4.James F. Cowger (1993) Friction Ridge skin, CRC Press London.* *5.Mehta, M.K (1980) Identification of Thumb Impression & Cross Examination of Finger Prints, N.M. Tripathi Pub. Bombay.* *6.Moenssens (1975) Finger Prints Techniques, Chitton Book Co. Philadelphia, NY.* *7.Chatterjee S.K. (1981) Speculation in Finger Print Identification, Jantralekha Printing Works, Kolkata.* *8.Cowger, James F (1993) Friction ridge skin-Comparison and Identification of fingerprints, CRC Press, NY.* *9.J A Siegel, P.J Saukko (2000) Encyclopedia of Forensic Sciences Vol. I, II and III, Acad. Press.*

M.Sc.FORENSIC SICNECE I SEMESTER	
COURSE CODE: FSC	**COURSE TYPE: CCC**
COURSE TITLE: FORENSIC TOOLS AND TECHNIQUES	
CREDIT: 04	**THEORYHOURS: 90**
MARKS: 100THEORY EXAM: 80	**CCA: 20**
UNIT-1 20 Hours	Meaning and Terminology of Instrumentation: Definition, Need of Instrumentation in Forensic Science, Qualitative and quantitative methods of analysis, Destructive and Non-Destructive Methods, Separatorary techniques, Hyphenated techniques, Accuracy, Precision, Signal to noise ratio, Sensitivity and detection limit, sources of noise, Instrument calibration.Scientific Calculations: Scientific volume and weight measurements, Centrifugation, Extraction, Filtration, Distillation, Density, Specific Gravity, Specific Volume, Percentage, Ratio Strength, and other Expressions of Concentration.
UNIT-2 20 Hours	Schematic analysis of Chemical, Biological and Physical samples, Preliminary and Confirmatory methods of analysis, Colour spot tests in Forensic Biological, Chemical and Physical analysis, Microcrystalline test.Centrifuge Techniques: Centrifugation Techniques, Basic principles of sedimentation, Various types of centrifuges, Density gradient centrifugation, Preparative centrifugation, Ultra-centrifuge-Refrigerated Centrifuges. Introductory Chromatography: Definition, Chromatographic Techniques, History of Chromatography, Theoretical principles of Chromatography, Classification of Chromatographic Methods, Adsorption and Partition Chromatography.Thin Layer Chromatography: Basic Principle, Setup, visualization and Forensic applications etc.
UNIT-3 15 Hours	Microscopy: Theory and basic principles, setup and Forensic applications of Compound, Comparison, Fluorescence, Polarized, Stereo-zoom microscope. Introduction, Geometrical optics, Image formation, Magnification and Resolution, Lens aberrations, Distortion of image and curvature of field, Polarised Light Microscopy, Fluorescence Microscopy, Comparison Microscope.Electron Microscopy-Theoryand basic principles of Electron Microscopy, Structure and Forensic applications of Scanning Electron microscope (SEM), Transmission Electron Microscope (TEM).

UNIT-4 20 Hours	Introduction to radiation biology, techniques and radiotracer technology, type, handling and applications of radioisotopes. Indian and International Regulations on radiation. Case studies related to breach of regulatory norms.
SUGGESTED READINGS	• *Borrow (1980) Molecular Spectroscopy.* • *Willdard, H. H (1974) Instrumental Methods of Analysis. 3.Moonesens A.A. (1979) Scientific Evidence in Criminal Cases.* • *Lundquist & Curry (1963) Methods of Forensic Science. 5.Settle,F.A.(1997) Handbook of Instrumental Techniques for Analytical Chemistry, Prentice Hall.* • *E. Stahl (1969) Thin Layer Chromatography: A Laboratory Handbook.* • *Sue Jickells and Adam Negrusz (2008) Clarke's Analytical Forensic Toxicology.* • *Forensic Chemistry: Max M Houck (2015)* • *Tilstone, W. J. and Lothridge, K.: Crime Laboratory Management, Taylor and Francis, 2004* • *Clair, J. S: Crime Laboratory Management, Academic Press, 2003* • *Siegel, J. A, Saukko, P. J and Knupfer, G. C (Eds.): Encyclopedia of Forensic Sciences, Academic Press, 2000* • *Uma Devi, P, Satish Rao, B.S, Nagarathnam, A (2000). Introduction to radiation biology. India: N. p., 2000. Web.* • *Radiation Biology: A Handbook for Teachers and students. Interantional Atomic Energy Agency (IAEA), Vienna, 2010* • *Thomas, C &Woolnough, L. (2014). Understanding and using the light microscope. Milton Contact. Ltd.*

M.Sc. FORENSIC SCIENCE I SEMESTER	
COURSE CODE: FSCCOURSE TYPE: CCC	
COURSE TITLE: INVESTIGATION TECHNIQUES	
CREDIT: 04	TEACHING HOURS: 90
MARKS: 100THEORYEXAM:80 CCA: 20	
UNIT-1 15 Hours	Pathology: Introduction: Cause and manner of death, medico legal examination, Postmortem examination (AUTOPSY) : the external, or visual, examination, other evidence collected, determining time since death, Laboratory Analysis, consultations
UNIT-2 15 Hours	Anthropology and Odontology, Introduction: The human skeleton, Collecting Human remains, analysis of skeleton materials, facial reproductions, Interpretations, case studies.
UNIT-3 20 Hours	Entomology, Introduction: Insects and their Biology, Life cycles of insects, collecting insects at a crime scene, the postmortem interval, the classification of insects, rearing insects, calculating A PMI, other forensic uses for insects, case studies.
UNIT-4 20 Hours	Serology and Bloodstain, pattern analysis, Introduction: Collection Body Fluids, the major body fluids, presumptive tests or blood, confirmatory tests or blood, species origin, semen, presumptive tests for semen, confirmatory tests for semen, saliva, urine, bloodstain pattern analysis, determining point of origin, documenting bloodstains at the scene, case studies. DNA Analysis, Introduction, the nature of DNA, DNA typing, Mitochondrial DNA (mt DNA), Interpretation of DNA typing results, DNA database the FBI Codis system, codis success stories, case studies. Forensic hair examinations , introduction: Growth of hairs, Microanatomy, human vsnon human hairs, body area determination, ancestral estimation, damage, disease and treatments, comparison of human hairs, DNA and hairs, case studies.

SUGGESTED READINGS

1. *Houck, M.M. & Siegel, JA; Fundamentals of Forensic Science, Academic Press, London, 2006.*

2. Sharma, B.R., Forensic Science in Criminal Investigation & Trials, Universal Publishing Co., New Delhi, 2003

3. James, SH and Nordby, J.J., Forensic Science- An Introduction to Scientific and investigative Techniques, CRC Press, USA (2003)

4. Saferstein; Criminalistics- An Introduction of Forensic Science, Prentice Hall Inc, USA,2007.

5. Barry, A.J. Fisher; Techniques of Crime Scene Investigation, 7th Ed, CRC Press, NY, 2003.

6. Seigel, JA ,Sukoo, R.J, &Knupfer, G.L. Encyclopaedia of Forensic Science, Vol I,II and III, Academic Press, 2000

7. O'Hara CE and Osterburg, JW; An Introduction to Criminalistics, Indiana Univ. Press,London, 1972.

8. Swansson,CR, Chamelin, NC, & Territ, L., Criminal Investigator, McGrawhill, NY,2000.

9. Becker; Criminal Investigation, ASPEN Publishing, Inc. Maryland, 2000.

10. Modi, JP, Textbook of Medical Jurisprudence & Toxicology, N.M. Tripathi Pub,2001

11. Chadha, PV; Handbook of Forensic Medicine & Toxicology, Jaypee Brothers, New Delhi,2004

12. Parikh, C.K; Text Book of Medical Jurisprudence, Forensic Medicine & Toxicology, CBS Pub. New Delhi,1999

13. Eckett, WG & James, SH; Interpretation of Blood Stains Evidence of Crime Scene, Elsevier Pub. NY,1989

M.Sc. FORENSIC SCIENCE	I SEMESTER
COURSE CODE: FSC	COURSE TYPE: PRACTICAL
COURSE TITLE: LAB (Lab Course 1)	
CREDIT: 04	PRACTICAL HOURS: 90
MARKS: 100	

LABORATORY WORK

1. Field test for narcotic drugs
2. TLC of drugs
3. TLC of pesticides
4. Test for ethanol and methanol
5. Preliminary test for explosives
6. Preliminary tests for: **(a)** identification of bloodstain **(b)** identification of seminal stain **(c)** identification of saliva stain.
7. Microscopic examination of semen
8. Sketching of Outdoor crime scene
9. Sketching of Indoor crime scene
10. Photography of crime scene
11. Collection and packing of physical evidence at the scene of crime
12. Forwarding of physical evidence
13. Reconstruction and evaluation of indoor crime scene
14. Reconstruction and evaluation of outdoor crime scene
15. Physical evidence and Locard's principle
16. Polygraphy (Demonstration only)

M. Sc. in Forensic Science

SECOND SEMESTER (EVEN SEMESTER)

Course Code	Course Type	COURSE (PAPER/SUBJECTS)	Credits	Maximum Marks		
				Internal	External	Total
FSC	CCC	Forensic Engineering & Ballistics	4	20	80	100
FSC	CCC	Instrumental Methods of Analysis	4	20	80	100
FSC	CCC	Forensic Biology & Biological Techniques	4	20	80	100
FSC	CCC	Forensic Medicine	4	20	80	100
FSC	LAB	Lab (Lab Course 2)	4	20	80	100
Minimum credits in complete semester it would be 20			**Total: 20**			

The M.Sc. program will be divided into four semesters each being of six months duration. Each semester comprises of compulsory core courses (CCC) Lab course (LC) will be based on CCC. Each theoretical course will be divided into Internal Assessment of 20 marks and semester end examination of 80 marks.

Duration of Theoretical and Practical Examination Time: 03 Hours

M.Sc. FORENSIC SCIENCE		II SEMESTER
COURSE CODE: FSC COURSE TYPE: CCC		
COURSE TITLE: FORENSIC ENGINEERING & BALLISTICS		
CREDIT: 04	TEACHING HOURS:90	
MARKS: 100THEORY EXAM: 80 CCA: 20		
UNIT-1 18 Hours	Glass: Types of glass and their composition - Forensic examination of glass fractures under different conditions - Determination of direction of impact: cone – Fracture, rib marks, hackle marks, backward fragmentation - Color and fluorescence - Physical matching - Density comparison - Physical measurements - Refractive index by refractometer - Elemental analysis - Interpretation of glass evidence. Paint: Types of paint and their composition - Macroscopic and microscopic studies - Pigment distribution - Micro-chemical analysis – Solubility test, pyrolysis chromatographic techniques, TLC, UV-Vis and IR spectrophotometric and X-Ray diffractometric methods - Elemental analysis - Interpretation of paint evidence.	
UNIT-2 18 Hours	Soil: Formation and types of soil - Composition and color of soil - Particle size distribution - Turbidity test - Microscopic examination - Density gradient analysis - Ignition loss - Differential thermal analysis -Elemental analysis - Interpretation of soil evidence - Discussion on important case studies of glass and soil. Tool Marks: Types of tool marks - Class characteristics and individual characteristics - Tracing and lifting of marks - Photographic examination of tool marks and cut marks on clothes and walls, etc. - Restoration of erased/ obliterated marks - Method of marking - Methods of obliteration - Method of restoration -Recording of restored marks – Restoration of marks on wood, leather, polymer, etc.	
UNIT-3 18 Hours	Elements of Forensic Engineering: Building materials - Cement and its composition – Determination of adulteration in cement – Reinforced Cement Concrete – Bitumen and road tar - Examination of electrical appliances and installations. Regulations regarding construction of commercial and residential buildings including ISO guidelines.	

UNIT-4 18 Hours	Introduction, Classification of fire arms based onvarious parameters, Techniques of dismantling/assembling of fire arms, Identification of origin, Improvised/country made /imitative fire arms and their constructional features – Ammunition and their components, Types of ammunition. Classification and construction features of different types of cartridges, Types of primers, priming compositions, Propellants and their compositions, Velocity and pressure characteristics, Various types of bullets and compositional aspects, Improvised ammunition and safety aspects of handling fire arms and ammunitions. Internal and external ballistics,Direction of fire, Time of fire, Range of fire, Post mortem and anti-mortem firearm injuries.
SUGGESTED READINGS	*1. Saferstein, R., Criminalistics. An Introduction to Forensic Science, 5thed., Prentice Hall, 1998* *2. Saferstein, R., Handbook of Forensic Science (Vol. 1,2,3)* *3. Kirk, P.: Criminal Investigation, Interscience, 1953* *4. James, S. H. and Nordby, J. J.: Forensic Science: An Introduction to Scientific and Investigative Techniques, CRC Press, 2003 & 2005* *5. Siegel, J. A., Sukoo, R. J, and Knupfer, G. C: Encyclopedia of Forensic Science, Vol, I, II and III, Academic Press, 2000* *6. Hara, C.E.O., &Osterburg, J.W., An Introduction to Criminalistics Indiana University Press, (1972)* *7. Working Procedure Manual: Physics, BPR&D Publication (2000)* *8. Caddy, B., Forensic Examination of Glass & Paints. Analysis and Interpretation ISBN (2001)* *9. Mathews, H.J., & Thomas, C.C., Firearms Identification (Vol1,2,3) , Springfield, (1973)* *10. Hatcher, Jury & Weller, Firearms Investigation, Identification and Evidence, Stackpole Books, (1977)* *11. Heard, B.J., Handbook of Firearms and Ballistics, John Wiley & Sons, (1997)* *12. Warlow, T.A. , Firearms: The Law and Forensic Ballistics, Taylor & Francis , (1996)* *13. Johari, M., Identification of Firearms, Ammunition and Firearm Injuries; BPR&D,*

(1980)

14. Sellier, K.G. et.al., Wound ballistics and The Scientific Background, Elsevier, (1994)

15. Jahne, B., Digital Image Processing, Heidelberg Springer (1996)

16. Jacobson, B.H.E., Sidney, R.G., Attridge, G., The Manual of Photography, focal Press, (1998)

17. Horeustein, H., Colour Photography; A Working Manual, Little Brown Company, (1995)

18. Red Sicker, D. R., The Practical Methodology of Forensic Photography, CRC Press, (1994)

19. Brain J. H., Hand Book of Fire arms and Ballistics, John Wiley

20. Sharma B. R., Fire arms in Criminal Investigation and Trials, 3rdEdn. Universal (2002)

21. Kumar K., Forensic Ballistics in Criminal Justice, Eastern Book Co (1987)

M.Sc. FORENSIC SCIENCE	II SEMESTER
COURSE CODE: FSC COURSE TYPE: CCC	
COURSE TITLE: INSTRUMENTAL METHODS OF ANALYSIS	
CREDIT: 04	TEACHING HOURS:90
MARKS: 100THEORY EXAM: 80 CCA: 20	

UNIT-1 18 Hours	Molecular Mass Spectrometry, Molecular mass spectra, Ion sources, Interpretation of mass spectra, Applications of mass spectrometry, Atomic mass spectrometry,Inductively coupled plasma Mass spectrometry
UNIT-2 18 Hours	Chromatographic Techniques-Principles and applications of Adsorption and Partition Chromatography, Thin Layer Chromatography. High Performance Liquid Chromatography, Instrumentation - Detectors – Columns and Stationary Phases, Applications of Liquid Chromatography, Super Critical Fluid Chromatography, Columns Detectors, Applications, Principle, instrumentation and applications of Capillary electrophoresis and CE-MS.
UNIT-3 18 Hours	Gas Chromatography, Instrumentation – Detectors, Adsorption, Partition, Gas-Solid, Gas-Liquid, Isothermal, Linear Temperature Programming, Chiral, Pyrolysis and Derivatization Chromatography - Columns and Stationary Phases, Column Efficiency, Method Development, Forensic Applications of Gas Chromatograph. Hyphenated techniques: Principle, instrumentation, techniques and applications of GC-FTIR, GC-MS, LC-MS and MS-MS.
UNIT-4 16 Hours	Laboratory Information Management system (LIMS): Classification of LIMS, Functions, Sub-division by functional area, Definition of LIMS, Strategic design of LIMS, System development life cycle, Review of the laboratory, Project proposal, Definition of system requirements, Specifications, Commercial or Bespoke LIMS, Evaluation, Purchase and installation, Demonstration, Validation, User training and implementation, good laboratory practices-laboratory safety and handling of hazards.

SUGGESTED READINGS

1.Skoog, D. A., Holler, J. F., and Neiman, T. A.: Principles of Instrumental Analysis, Thomson, 1997.

2. Willard, H. H., Merritt, L.L. Jr., Dean, J. A. and Settle, F. A. Jr.: Instrumental Methods of Analysis, 7thedn., Wadsworth, 1998.

3. Kealey, D. and Haines, P. J.: Analytical Chemistry, Bios Scientific / Viva Books, 2002

4. *Settle, F. A.: Hand Book of Instrumental Techniques for Analytical Chemistry, Prentice Hall, 1997.*

5. Harris, D. C.: Quantitative Chemical Analysis, 5thedn., Freeman, 1999

6. Christian, G. D.: Analytical Chemistry, Theory and Applications, John Wiley, 2004

7. Chatwal, G. R. and Anand, S.: Instrumental Methods of Chemical Analysis

8. Sharma, B. K.: Instrumental Methods of Chemical Analysis

9. Gowenlock, A. H.: Practical Clinical Biochemistry, 6thedn., Butterworth / CBS, 1988

10. Townsends Allen (ed.): Encyclopedia of Analytical Science, Academic Press, 1995

11. Sane, R. T and Joshi, A. P: Electroanalytical Instruction

12. Goldsby, R. A., Kindt, T. J., Osborne, B. A and Kuby, J: Immunology, 5thEdn., Freeman, 2003.

13. Murray, R. K., Granner, D. K., Mayes, P. A and Rodsell, V. W: Harper's Biochemistry, 25thEdn., McGraw-Hill, 2000.

14. Gowenlock, A. H., Mc Murray and J. R, McLauchla, D. M: Varley's Practical Clinical Biochemistry, CBS Pub., 1996

15. Mukherjee, K. L (Ch. Ed): Medical Laboratory Technology, Vol I & II, Tata McGraw-Hill, 1988.

16. Gerstein, A.S (Ed): Molecular Biology - Problem Solver – A Laboratory Guide, Wiley-Liss, 2001

M.Sc. FORENSIC SCIENCE		II SEMESTER
COURSE CODE: FSC COURSE TYPE: CCC		
COURSE TITLE: FORENSIC BIOLOGY & BIOLOGICAL TECHNIQUES		
CREDIT: 04	THEORYHOURS: 90	
MARKS: 100THEORY EXAM: 80	CCA: 20	
UNIT-1 20 Hours	Forensic Biology, Introduction, Scope, Various forms of biological evidences like wood, timber varieties, seeds and leaves, their identification and matching Forensic Botany. Toxic principles of plants and their forensic significance - Identification of poisonous plants and mushrooms of India. Diatoms, Types, Morphology. Study and identification of pollen grains, Identification of starch grains, powder, stains of spices, Paper pulp identification.	
UNIT-2 20 Hours	Forensic Anthropology, History, Scope and development, Role of forensic anthropologist - Collection and preservation of evidences. Human osteology - Determination of age, sex, stature- Determination of personal identity by superimposition technique - Video image analysis, Facial reconstruction, Legal provisions and tools involved in it. Pathology of bones and its importance in identification -Identification of burnt bones, skeletal remains in accidents, crimes and mass disaster. Forensic Odontology: Introduction - Structure and types of teeth, Dentition and dental formula, Dental diseases, Determination of age, sex and race from teeth - Role of teeth in mass disaster, Forensic significance in identification	
UNIT-3 15 Hours	Hair Examination, Structure of hair - Growth and chemistry of hair - Identification and comparison of hair by microscopic – Chemical - Biochemical and instrumental methods - Identification of animal hair - Assessment of age, sex, race and site of hair - Analysis of drugs and elements in hair - Hair diseases - Hair transfer, persistence and recovery - DNA typing of hairFibre Examination Classification of fibres , Identification and comparison of fibres by physical, Chemical, Microscopic, Spectroscopic, Chromatographic methods, Persistence and recovery of	

	fibres, Forensic significanceForensic Entomology: Analyzing crime scene for entomological evidence - Collection of climatological data and specimen before body removal, Determination of time of death - Entomological succession in case of buried, drowned and buried bodies
UNIT-4 20 Hours	Wild Life Forensics: Importance of wild life, Wild life Protection Act, Endangered species, CITES, Census of wildlife population, Wild life crime, Methods of smuggling and poaching of wild life artifacts, Crime scene search, Criminal investigation, Determination of time of death, Sex determination from bones, Identification of teeth, claws, Ivory, Horns, antlers, furs, skin, bite marks, pug marks - Identification of blood, excreta and bones by biochemical and immunological methods
SUGGESTED READINGS	*1. Robertson, J., ed: Forensic Examination of Fibres. Chichester, West Sussex, England: Ellis Horwood Ltd., (1992)* *2. Saferstein, Richard: Criminalistics. An Introduction to Forensic Science, 5thed., Prentice Hall, 1998* *3. Robertson, J: Forensic Examination of Hair. Taylor and Francis. (1999)* *4. Saferstein, R: Handbook of Forensic Science (Vol 1,2,3),* *5. Eckert: An Introduction to Forensic Science* *6. Kirk, P: Criminal Investigation, Interscience, 1953* *7. James, S. H. and Nordby, J. J: Forensic Science: An Introduction to Scientific and Investigative Techniques, CRC Press, 2003 & 2005* *8. Siegel, J. A., Sukoo, R. J, and Knupfer, G. C: Encyclopedia of Forensic Science, Vol I, II and III, Academic Press, 2000.* *9. Becker, R. F: Criminal Investigation, Aspen Pub., 2000.* *10. Lee, H: Physical Evidence, Elsevier, 2000* *11. The Wild Life Protection Act, 1972., Universal Law Publishing* *12. Pillay, V.V: Handbook of Forensic Medicine and Toxicology, 12thed., Paras Publication2001.* *13. Smith, D.G.V: A Manual of Forensic Entomology and Death: A Procedural Guide, Joyce's Publications (1990)* *14. Byrd, J.H. &Castner, J, L: Forensic Entomology - The Utility of Arthropods in*

Legal Investigation, CRC Press, (2000)

15. Biology Methods Manual, Metropolitan Police Forensic Science Laboratory, London, (1978)

16. Castner James L (Ed.)., Forensic Entomology, CRC Press (2006)

17. Richard Li, Forensic Biology, CRC Press, 2008

18. Gunn Allen, Essentials of Forensic Biology; Animals, Plants & Microorganisms in Legal Investigations, J. Wiley (2006)

19. Coyle H. M. (Ed.), Forensic Botany – Principles and Applications to Criminal Case Work, CRC Press (2002)

M.Sc. FORENSIC SCIENCE		II SEMESTER
COURSE CODE: FSCCOURSE TYPE: CCC		
COURSE TITLE: FORENSIC MEDICINE		
CREDIT: 04		TEACHING HOURS: 90
MARKS: 100THEORY EXAM: 80	CCA: 20	
UNIT-1 15 Hours	Human anatomy and physiology, Structural levels of organization of human body, Cardiovascular system, Structure and Functions of heart, Arterial & Venous system.Digestive system and its parts, Process of digestion and absorption of food in the alimentary canal. Respiratory system and its parts, Mechanism and regulation of respiration.	
UNIT-2 15 Hours	Nervous system, Structure and functions of neuron, Transmission of nerve impulse, Central and Peripheral Nervous systems and their functions. Endocrine system Characteristics of hormones, Endocrine glands and their hormones. Urinogenital system -Structure and functions of kidneys, Formation and composition of urine. Male and female reproductive systems and their functions.	
UNIT-3 20 Hours	Forensic Medicine, Personal identification of living and dead, Postmortem examination (autopsy), Medico legal aspects of death, Causes of death, Postmortem changes and their importance in determination of time after death , Mechanical injuries, Thermal injuries, Medico legal aspects of injuries	
UNIT-4 20 Hours	Forensic pathology, Preservation of pathological evidence, Examination of decomposed, mutilated and burnt bodies, Exhumation procedure, Deaths from poisoning, Mechanical Asphyxia, Drowning, Starvation, Lightning, Electrocution. Sexual offences and medicolegal aspects, Abortion & Infanticide, Medico legal aspects, Medical Termination of PreganancyAct (MPT), Linkage with forensic science laboratory.	

SUGGESTED READINGS	
	1. *Pillay, V.V., Handbook of Forensic Medicine and Toxicology , 12thed., Paras Publication2001.* 2. *Modi, J. P., Textbook of Medical Jurisprudence &Toxicology , M.M. Tripathi Publication, (2001)* 3. *Parikh, C.K. , Textbook of Medical Jurisprudence & Toxicology* 4. *Reddy Narayn,. M., Textbook of Medical Jurisprudence & Toxicology5. James, P.J.: Encyclopedia of Forensic and Legal Medicine, Elsevier, 2005*

M.Sc. FORENSIC SCIENCE	II SEMESTER
COURSE CODE: FSC	COURSE TYPE: PRACTICAL
COURSE TITLE: LAB (Lab Course 2)	
CREDIT: 04	PRACTICAL HOURS: 90
MARKS: 100	

LABORATORY WORK

1. Verification of Beer's law and calculation of molar absorption coefficients for CuSO4
2. Verification of Beer's law and calculation of molar absorption coefficients for KMnO4
3. Conductometric titration of strong acid vs. strong base
4. Conductometric titration of weak acid vs. strong base
5. Conductometric titration of mixture of acids vs. strong base
6. Potentiometric titration of strong acid vs. strong base
7. Potentiometric titration of weak acid vs. strong base
8. Potentiometric redox titration of potassium dichromate-ferric ammonium sulphate
9. Separation of amino acids by Paper chromatography
10. Paper electrophoresis for separation of amino acids
11. Agarose gel electrophoresis for separation of proteins

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THIRD SEMESTER (ODD SEMESTER)

Course Code	Course Type	COURSE (PAPER/SUBJECTS)	Credits	Maximum Marks		
				Internal	External	Total
FSC	CCC	Forensic Toxicology	4	20	80	100
FSC	CCC	Biochemistry & Biochemical Techniques	4	20	80	100
FSC	CCC	Statistics and Forensic Applications	4	20	80	100
FSC	CCC	Forensic Criminology and Law	4	20	80	100
FSC	LAB	Lab Course (Lab 3)	4	20	80	100
Minimum credits in complete semester it would be 20			**Total: 20**			

The M.Sc. program will be divided into four semesters each being of six months duration. Each semester comprises of compulsory core courses (CCC) Lab course (LC) will be based on CCC. Each theoretical course will be divided into Internal Assessment of 20 marks and semester end examination of 80 marks.

Duration of Theoretical and Practical Examination Time: 03 Hours

M.Sc. FORENSIC SCIENCE		III SEMESTER
COURSE CODE: FSC COURSE TYPE: CCC		
COURSE TITLE: FORENSIC TOXICOLOGY		
CREDIT: 04	TEACHING HOURS:90	
MARKS: 100THEORY EXAM: 80 CCA: 20		

UNIT-1 18 Hours	Toxicology: Introduction, History, Scope.Role of forensic toxicologist. Poisons: Classification of poisons, Types of poisoning, Sample collection and preservation of toxicological exhibits in fatal and survival cases, Storage of samples,Signs and symptoms of poisoning. Toxicological investigation/examination of poisoned death, Interpretation of toxicological data, Courtroom testimony in toxicological cases. Case Histories.
UNIT-2 18 Hours	Principles of Toxicology: Introduction, Pharmacokinetics, Methods of transportation of toxicant. Toxicokinetics one and two compartmental model, Toxicodynamics, Spectrum of undesired (toxic) effects, Interaction of chemicals, Tolerance-Dose response relationship, Developmental and reproductive toxicity, Mutagenicity, Toxicity testing.
UNIT-3 18 Hours	Toxicological Analysis: Introduction, Sample preparation, Deproteinization, Deconjugation, Isolation and Clean-up procedures in toxicological analysis, Identification and quantitation of poisons by physical, chemical, chromatographic, spectrophotometric, electrophoretic, immunoassay and other methods (Metals, anions, volatile poisons, gases, drugs, pesticides and miscellaneous poisons), Field testing in toxicological work, Therapeutic drug monitoring, Emergency hospital toxicology.
UNIT-4 18 Hours	Management of acute poisoning: Introduction, Maintenance of vital functions, Measures to enhance elimination of poisons, Removal of unabsorbed poisons. Antidotes: Classification, Mechanism (cyanide, methanol, arsenic, opiate, carbon monoxide, nitrite, acetaminophen and pesticides). Identifying route of administration of poison, Estimation of time and dose after administration of poison, Recovery and after care of patients, Poison Information/Control Centre.

SUGGESTED READINGS

1. *Klaassen, C. D.,:Casarett and Doull's Toxicology: The Basic Science of Poisons, 5thed, McGraw-Hill, 1995.*
2. *Moffat, A.C. :Osselton, D. M. Widdop, B. : Clarke's Analysis of Drugs and Poisons in Pharmaceuticals, body fluids and postmortem material, 3rded., Pharmaceutical Press2004*
3. *Bogusz, M. J.,: Hand Book of Analytical Separations, Vol. 2: Forensic Science, 1st ed., Elsevier Science ,2000.*
4. *Siegel, J.A., Saukko, P. J., Knupfer, G.,: Encyclopedia of Forensic Sciences (Vol3), Academic Press, 2000.*
5. *Rang, P.H., Dale, M.M., Ritter, M.J.: Pharmacology, 4thed., Harcourt/Churchill Livingstone, 2000.*
6. *Paranjape, H.M., Bothara, G.K., Jain, M.M.: Fundamentals of Pharmacology, 1sted., Nirali Prakashan,1990.*
7. *Budhiraja, R.D.: Elementary Pharmacology and Toxicology, Popular Prakashan, 2nded., 1999.*
8. *Wiseman, H and Henry J.: Management Of Poisoning, A Handbook for Healthcare workers, 1sted., A.I.T.B.S, 2002*
9. *Hardman, J. G. and Limbird, L. E.,: Goodman and Gilman's The Pharmacological basis of Therapeutics, 9thedn., McGraw-Hill, 1996*
10. *Laboratory procedure Manual, Forensic Toxicology: DFS, 2005*
11. *Sunshine, I ; Methods for Analytical Toxicology, CRC Presss USA (1975)*
12. *Cravey, R.H; Baselt, R.C.: Introduction to Forensic Toxicology , Biochemical Publications, Davis, C.A. (1981)*
13. *Stolmen, A.; Progress in Chemical Toxicology: Academic Press, New York (1963)*
14. *Modi, Jaisingh, P.; Textbook of Medical Jurisprudence& Toxicology, M.M. Tripathi Publication (2001)*
15. *Eckert; An Introduction to Forensic Science, CRC Press*
16. *Pillay, V. V.; Handbook of Forensic Medicine and Toxicology, Paras Pub., 2001*

17. *Curry, A. S: Poison Detection in Human Organs*
18. *Levine Barry, Principles of Forensic Toxicology, 2ndEdn., (2006)*
19. *Hodgeon Emeet, A Text Book of Modern Toxicology, 3rd.Edn. (2004)*

M.Sc. FORENSIC SCIENCE		III SEMESTER
COURSE CODE: FSC COURSE TYPE: CCC		
COURSE TITLE: BIOCHEMISTRY & BIOCHEMICAL TECHNIQUES		
CREDIT: 04	TEACHING HOURS:90	
MARKS: 100	THEORY EXAM: 80	CCA: 20

UNIT-1 18 Hours	Biomolecules and cells, Biological fitness of organic compounds, Hierarchy of molecular organization of cells, Primordial biomolecules, Specialization and differentiation of biomolecules, The dimensions and shapes of biomolecules, Biomolecules supra molecular structures and cell organelles, Structural organization of cells.Proteins and peptides, Composition of proteins, Size of protein molecules, Confirmation of protein supra molecular assemblies of proteins, Denaturation, Estimation of proteins Functional diversity of proteins, Antibodies and immune response, The species specificity of proteins, Sequence isomerism in polypeptide chains, Genetic coding of amino acid sequences in proteins, Mutation, Structure of peptides, Optical and chemical properties of peptides, Steps in determination of amino acid sequence, Separation and analysis of peptides, Sequence analysis of peptide fragments
UNIT-2 18 Hours	Amino acids, Common amino acids of proteins, Rare amino acids of proteins, Non protein amino acids, Physicochemical properties of amino acids, Absorption spectra of amino acids, Chemical reactions of amino acids, Analysis of amino acid mixtures, Complete hydrolysis of polypeptide chains and determination of amino acid composition, Identification of N-terminal and C-terminal residues of peptides. Enzymes, Definition, types and classification - Biological activities, Kinetics, Inhibition, Types of inhibition, Poisoning, Micheles-Mentor's equation, Enzyme polymorphism, Purification of proteins and enzymes, Enzyme assay techniques: UV-Vis, Luminescence, Radio isotope and immunochemical methods, Automated enzyme analysis, Immobilized enzymes.
UNIT-3 18 Hours	Nucleotides, General structure of the nucleotides, Pyrimidines and purines, Nucleosides, Nucleotides, Nucleic acids – RNA and DNA, Short hand representation of nucleic acid back bones- Hydrolysis of nucleic acids by acids and bases, Enzymatic hydrolysis of nucleic acids, Analysis of nucleotide sequence in nucleic acids, Nucleic acid, Protein supra

	molecular complexes, DNA sequencing, PCR technique
UNIT-4 16 Hours	Electrophoretic Techniques,Principles, Factors affecting migration, Instrumentation, Techniques and Applications of: Zone Electrophoresis, Cellulose Acetate Membrane Electrophoresis, Agar Gel Electrophoresis, Acryl amide Gel Electrophoresis, Capillary electrophoresis, Isoelectric Focusing, Isotachophoresis, Biochemical techniques, General principles, pH and buffers, physiological solution, Cell and tissue culture,Cell fractionation, Centrifugation techniques.
SUGGESTED READINGS	1. *Nelson, D. L., and Cox, M. M.: Lehninger Principles of Biochemistry, 3rdedn., Macmillan Worth, 2000* 2. *Voet, D. and Voet, J.G.: Biochemistry, 2ndedn., John Wiley, 1995* 3. *Rao, P. Gundu,: Biochemistry, Vallabh Prakashan, 1995* 4. *White, A., Handler, P. and Smith, E.: Principles of Biochemistry* 5. *Turner, P.C, McLennan, A. G., Bates, A. D., and White, M. R. H.: Molecular Biology, 2ndedn. Bio Scientific/Viva Books, 2001.* 6. *Rao, Rama. A. V. S. S.: A Text Book of Biochemistry, 8thedn., L. K & S Pub,1998* 7. *Henry, B. J.: Clinical Diagnosis and Management by Laboratory Methods, 19thedn., Harcourt / Thomson, 1999.* 8. *Gowenlock, A. H.: Practical Clinical Biochemistry, 6thedn., Butterworth / CBS, 1988* 9. *Plummer, D. T.: An Introduction to Practical Biochemistry, 15thedn., Tata McGraw Hill,1988.*

M.Sc. FORENSIC SCIENCE		III SEMESTER
COURSE CODE: FSC COURSE TYPE: CCC		
COURSE TITLE: STATISTICS AND FORENSIC APPLICATIONS		
CREDIT: 04	THEORYHOURS: 90	
MARKS: 100THEORY EXAM: 80	CCA: 20	
UNIT-1 20 Hours	Statistics: Definition, Importance of statistics in interpreting forensic data in research work and quality control, Data, Population, Distribution, Location, Random experiment, Brief introduction to sampling and data collection: Frequency distribution, Concept of measures of central tendencies, Normal distribution, Arithmetic mean, Median & Mode concept of measures of dispersion, Variance, Normal distribution-Variance, Standard Deviation, Coefficient of variation.	
UNIT-2 20 Hours	Concept of probability, Definitions of probability, Discrete random variables and probability distributions, Addition, multiplication and Bayer's theorem & applications. Probability in Forensic Evidence, Concept of random variable, Discrete and continuous, Concept of probability distribution, Binomial, Poisson, Normal distribution, Definitions, statements of properties of above distribution and examples, Simple linear regression and correlation, Concept of computational methodology, Concept of tests of hypothesis, Null and alternative hypothesis, Critical region, Types of errors & level of significance.	
UNIT-3 15 Hours	Large samples tests, Test for single mean, Difference of means, Single proportion and difference of proportion examples, Chi square test for goodness of fit and test for independence of attributes, Hypothesis testing for one or two population means, Student t-test, t-test for simple mean, Difference of means, Hypothesis testing for small sample sizes and multinomial experiments, Fisher's exact test, Analysis of variance and multiple comparison tests, F-test for equality of variance, Concept of analysis of variance, Computational procedure for ANOVA one way and two-way classification.	

UNIT-4 20 Hours	Introduction to Scientific evidence and statistics, Data Bases, Type and geographical factors, Statistical approach to DNA fingerprinting, Loci and alleles, Simple case genotypic frequencies, Hardy Weinberg equilibrium, Simple case of allelic frequencies Accounting for sub-population, Paternity mother and father unrelated, Data base searches and value of evidence,Blood group frequencies, Clothing fibres, Shoe types, Air weapon projectiles, Height identification from eye witnesses, Uncertainty in scientific experimentation, Determination of uncertainty.
SUGGESTED READINGS	1. *David Lucy: Introduction to Statistics for Forensic Scientists, Wiley, 2004* 2. *Colin Aitken & Franco Taroni: Statistics and E valuation of Evidence for Forensic Scientists (Statics in practice)* 3. *Wing kam Fung & Yue-Quing Hu: Statistical DNA Forensics, Theory Methods & Computation, Wiley, 2008* 4. *I. W. Evett& B. S. Wier: Interpreting DNA Evidence – Statistical Genetics for Forensic Scientists, 1998* 5. *Miller, J. C. and Miller, J. N.: Statistics for Analytical Chemistry, Ellis Horwood, 1988* 6. *Fisher, R. A.: Statistical Methods for Research Workers, John Wiley, 1954* 7. *Sokal, R. R. and Rolf, F. J.: Biometry – Principles and Practices of Statistics in Biological Research, Freeman, 1981* 8. *Bhaskar Rao T.: Methods of Biostatistics, Paras, 2001* 9. *Rama Krishnan P., Biostatistics, Saras, 1995.* 10. *Meier, P. C. and Zund, R. E.: Statistical Methods in Analytical Chemistry, Wiley, 2000* 11. *Rao, V. K., Biostatistics – A Manual of Statistical methods for use in Health, Nutrition and Anthropology, Jaypee Medical Pub., 1996*

M.Sc. FORENSIC SCIENCE		III SEMESTER
COURSE CODE: FSC COURSE TYPE: CCC		
COURSE TITLE:FORENSIC CRIMINOLOGYAND LAW		
CREDIT: 04	THEORYHOURS: 90	
MARKS: 100THEORY EXAM: 80	CCA: 20	
UNIT-1 20 Hours	Crime Scenario in India: Concept and Definition of Crime, Introduction to crime, Sociological aspects of crime and criminals in society. Types of crime and its causes: Property crimes, public order crimes, violent crimes, cyber crimes, juvenile delinquency, Society-Criminal interaction and various types of crimes in India.	
UNIT-2 20 Hours	Forensic Criminology: Introduction of Forensic Criminology, Control and Prevention of Crime in context with Organization, Industrialization, Family set up, Psychology. Procedures involved in detection of crime: Latest evidence based research in detection and prevention of crime. Criminal Profiling: Definition, Need and Types, Forensic Scientific evidence, Crime and Psychopathology, Genetics and Crime, Serial murders, Modus Operandi	
UNIT-3 15 Hours	Indian Courts: Constitution of Courts-Hierarchy of Courts and their Powers. Lok Adalats, Lok Ayukts and Juvenile Courts. Constitution of India-Preamble, Fundamental Rights Article 20, 21, 22. Forensic Expert: Definition and related Laws & Issues, Expert Witness (Cr.P.C. 291-93), Indian Evidence Act – Section 45	
UNIT-4 20 Hours	Indian Penal Codes: Offences against the person-Sections:- 300, 302, 304B, 307, 309, 319, 320, 324, 326, 351, 354, 359, 362, 375 and 377. Offences against property-Sections:-378, 383, 390, 391, 415, 420, 441, 463, 489A, 497, 499, 503 and 511. Briefs of Information: Technology IT Act, cyber laws and cyber security, Narcotic Drugs & Psychotropic Substances Act, Dowry Prohibition Act, Arms Act, Wild Life Protection Act.	

SUGGESTED READINGS	
	1.Constitution of India 2. Indian Evidence Act 3. Criminal Procedure code. 4. Indian Penal Code. 5. Barak, Gregg : Integrative Criminology. 6. Johnson : Crime, Correction and Society. 7. Riderman : The Manipulation of Human Behaviour

M.Sc. FORENSIC SCIENCE	III SEMESTER
COURSE CODE: FSC	COURSE TYPE: PRACTICAL
COURSE TITLE: LAB (Lab Course 3)	
CREDIT: 04	PRACTICAL HOURS: 90
MARKS: 100	

LABORATORY WORK

1. Preliminary tests directly on blood / urine / vomitus / tissues for heavy metals, alkaloids, pesticides, cyanide, phenolic compounds and alcohol
2. Detection and determination of ethyl alcohol in blood / urine / visceral tissue by kozelka& Hine's method
3. Detection and determination of ethyl alcohol in blood / urine / visceral tissue by gas chromatography
4. Systematic extraction of basic substances from viscera
5. Systematic extraction of neutral & acidic substances from viscera
6. Identification of basic drugs (from the extract) by colour tests and TLC
7. Identification of neutral and acidic drugs (from the extract) by colour tests and TLC
8. Identification of pesticides (from the extract) by TLC
9. Determination of a drug in urine by visible / UV spectrophotometry
10. Determination of a drug / pesticide in toxicological specimen by GC
11. Determination of a drug / pesticide in toxicological specimen by HPLC
12. GC-MS / LC-MS of a poison of forensic interest (Demo only)

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FOURTHSEMESTER (EVEN SEMESTER)

Course Code	Course Type	COURSE (PAPER/SUBJECTS)	Credits	Maximum Marks		
				Internal	External	Total
FSC	Theory	Research Methodology and Intellectual Property Rights (IPR)	4	20	80	100
FSC	Prac	Dissertation Work	16	200*	200	400
Minimum credits in complete semester it would be 20			**Total: 20**			

The M.Sc. program will be divided into four semesters each being of six months duration. Each semester comprises of compulsory core courses (CCC) Lab course (LC) will be based on CCC. Each theoretical course will be divided into Internal Assessment of 20 marks and semester end examination of 80 marks.Duration of Theoretical and Practical Examination Time: 03 Hours.

The Dissertation will be of 16 credits and a total of 400 marks. The students would be assessed externally as per the following criteria.

i) Presentation and Viva-voce: 100 Marks
ii) Dissertation Report/Thesis: 100 Marks

*Internal marks for dissertation work would be assessed as per following criteria

i) Regularity and attendance : 50 Marks
ii) Research concept and hypothesis: 50 Marks
iii) Field and Lab work: 100 Marks

M.Sc. FORENSIC SCIENCE	IV SEMESTER
COURSE CODE: FSC COURSE TYPE: CCC	
COURSE TITLE: Research Methodology and Intellectual Property Rights (IPR)	
CREDIT: 04	THEORY HOURS: 90
MARKS: 100THEORY EXAM: 80	CCA: 20
UNIT-1 20 Hours	Understanding the language of research – Concept, Construct, Definition, Variable. Research Process, Problem Identification & Formulation – Research Question,Qualitative and Quantitative Research, Interpretation of Data and Academic Writing, Use of tools / techniques for Research: methods to search required information effectively, Reference Management Software like Zotero/Mendeley, Software for paper formatting like LaTeX/MS Office, Software for detection of Plagiarism
UNIT-2 20 Hours	Hypothesis – Qualities of a good Hypothesis –Null Hypothesis & Alternative Hypothesis. Hypothesis Testing – Logic & Importance, Research Design: Exploratory Research Design, Descriptive Research Designs, Experimental Design. Concepts of Statistical Population, Sample, Sampling Frame, Sampling Error, Sample Size, Sample types, Concept of Independent & Dependent variables, Levels of measurement – Nominal, Ordinal, Interval and Ratio. Data Analysis, Bivariate analysis – Cross tabulations and Chi-square test including testing hypothesis of association.
UNIT-3 15 Hours	Intellectual property rights and its types-Patents, Trademarks, Copyright & Related Rights, IndustrialDesign, Traditional Knowledge, Geographical Indications, Protection of new GMOs, Basics ofpatents (Types, patent application and Specifications), concept of Prior Art and patent fillingprocedures, Process patent vs product patent.
UNIT-4 20 Hours	Introduction to General Agreement on Tariffs and Trade (GATT), World Trade Organization (WTO),World Intellectual Property Organization (WIPO) and Trade Related Intellectual, Property Rights(TRIPS), Indian Patent Act.

SUGGESTED READINGS	1. Business Research Methods – Donald Cooper & Pamela Schindler, TMGH, 9th edition 2. Business Research Methods – Alan Bryman & Emma Bell, Oxford University Press. 3. Research Methodology – C.R.Kothari 4. Intellectual Propert Rights in India (2015) 2nd edition, V.K Ahuja . 5. Intellectual Propert Rights (2014), Neeraj Pandey and DharniKhushdeep, PHI Lerning Pvt Ltd.

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FOURTH SEMESTER (EVEN SEMESTER)

M.Sc. FORENSIC SCIENCE	**IV SEMESTER**
COURSE CODE: FSC	**COURSE TYPE: PRACTICAL**
COURSE TITLE: Dissertation Work (Major)	
CREDIT: 16	**PRACTICAL HOURS: 90**
MARKS: 400	