

Syllabus for
Pre-Ph.D. Course Work
In
Forensic Science
2020-2021

FORENSIC SCIENCE

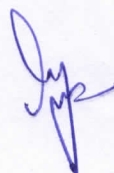
School of Life Sciences
Department of Forensic Science
Guru Ghasidas Vishwavidyalaya
Bilaspur (C.G.)-495009

Pre-Ph.D. Course Work in Forensic Science

Pre-Ph.D. Course Work Forensic Science

(Scheme of Examination)

Course	Course Code	Name of the course	Credit	Hours / week
Paper-1	DFSC-PP-01	Research Methodology and Scientific Communication	02	02
Paper-2	DFSC-PP-02	Research and Publication Ethics (RPE)	02	02
Paper-3	DFSC-PP-03	Analytical Approaches in Forensic Techniques (Physical, Chemical & Biological)	04	04
Paper-4	DFSC-PP--04	Advance & Applied Forensic Science	04	04
<u>Seminar</u>				
		Total Credits	12	12



Pre-Ph.D. (S)
FORENSIC

SYLLABUS
(Pre-Ph.D. Coursework)
DEPARTMENT OF FORENSIC SCIENCE
Paper-1 (DFSC-PP-01)
Research Methodology and Scientific Communication

UNIT- I

Elements of a Quality Management System: Quality, Total Quality, Quality assurance, Quality control Quality system. Quality Planning, Quality Audit: Internal and External Audit & MRM, History and development of ISO, Terminology of NABL. Benefits of ISO standards and Requirements, IEC-17025.

UNIT -II

IPR Issues, Ethical Issues, Essential requirements for the competence of testing and calibration laboratories, LIMS, Introduction, scope, management Requirements: Organizational, Documents control, Review of requests and Calibrations, Laboratory Hazards, Good Laboratory Practices, Purchasing service and supplies, service to the clients, complaints, corrective and preventive action, control of records

UNIT -III

Meaning of research Problem: Research, definition, Objectives of research. Types of research-From the viewpoint of application, Hypothesis and its Testing, Objectives, Inquiry mode. Search for existing literature, Interpretation and Report Writing, Research Communication, Plagiarism.

UNIT- IV

Sampling: sampling procedures (random and non random), sampling statistics, Physical state, homogenization, size and hazards in sampling, Sampling Error, Significance of statistics in forensic science. Descriptive Statistics- Basic concepts of frequency distribution, Measure of Central Values - Mean, median and mode, Measures of Dispersion- Range, Mean deviation and Standard deviation, Standard Error.

UNIT- V

Inferential Statistics-Correlation and Regression analysis. Probability- Definition, Theory, Classical and types, Chi Square Test of Association and Independence, t-test, z-test, One-way and Two-way ANOVA, AMOVA, Relative Risk and Path Analysis. Understanding Statistical Software packages- SPSS Software, XL Stat, MS Excel, R-Package Software's, Genetic Software's.

Recommended Books:

1. ISO/IEC/17025:2005, NABL -113, NABL -113A, 131, guidelines of NABL.

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2. International Standard on General requirements for the competence of testing and calibration laboratories, 1st Ed., 1999-12-15, ISO/IEC 17025:1999(E). C.G.G.
3. Kothari, C.R. Research Methodology Methods and Techniques. Wiley Eastern Limited, New Delhi.
4. Saferstein R. Forensic Science Handbook I, II, III.
5. William L. Duncan: Total Quality, Key Terms and Concepts.
6. Murray S. Cooper: Quality control in the Pharmaceutical Industry.
7. John T. Rabbitt, Peter A Bergh: The ISO 9000Book.
8. Willard Merritt, Dean & Settle: Instrumental Methods of Analysis.
9. Jami St. Clair Crime Laboratory Management: Academic Press.
10. Thomas A The laboratory Quality Assurance system: A manual of Quality Procedures and forms.
11. Ratliff. 2003 3rd ed. John Wiley & Sons.
12. Gary B Clark Systematic Quality Management. Practical Laboratory Management Series.

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Pre- Ph.D. Course Work Syllabus 2020-2021
Paper-2 (DFSC-PP-02)

Research and Publication Ethics

Unit--01

Philosophy and Ethics: Introduction to philosophy: definition, nature and scope, concept, branches. Ethics: definition, moral philosophy, nature of moral judgements and reactions

Unit--02

Scientific Conduct: Ethics with respect to science and research, Intellectual honesty and research integrity, Scientific misconducts: Falsification, Fabrication" and Plagiarism (FFP), Redundant publications: duplicate and overlapping publications, salami slicing, Selective reporting and misrepresentation of data.

Unit-03

Publication Ethics: Publication ethics: definition" introduction and importance, Best practices / standards setting initiatives and guidelines: COPE, WAME, etc; Conflicts of interest, Publication misconduct: definition, concept, problems that lead to unethical behaviour and vice versa, types. Violation of publication ethics, authorship and contributorship, Identification of publication misconduct, complaints and appeals, Predatory publishers and journals

Unit—04

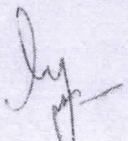
Open Access Publishing: Open access publications and initiatives, SHERPA/RoMEO online resource to check publisher copyright & self-archiving policies, Software tool to identify predatory publications developed by SPPU, Journal finder / journal suggestion tools viz. JANE, Elsevier Journal Finder, Springer, Journal Suggester, etc.

Unit—05

Publication Misconduct: A. Group Discussions: Subject specific ethical issues, FFP, authorship, Conflicts of interest, complains and appeals: examples and fraud from India and abroad. **B. Software tools:** Use of plagiarism software like Turnitin, Urkund and other open source software tools.

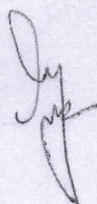
Unit—06

Databases and Research Metrics: A. Databases: 1. Indexing databases, 2. Citation databases: Web of Science, Scopus, etc. **B. Research Metrics:** 1. Impact Factor of journal as per Journal citation Report, SNIP, SJR, IPP, Cite Score. Score, 2. Metrics: h-index, g index, i10 index, altmetrics



Suggested Readings:

1. Bird, A. (2006). Philosophy of science. Routledge.
2. MacIntyre, Alasdair (1967) A Short History of Ethics. London.
3. P. Chaddah, (2018) Ethics in Competitive Research: Do not get scooped; do not get plagiarized, ISBN: 97E. 9387480865
4. National Academy of Sciences National Academy of Engineering and Institute of Medicine. (2009). On Being a Scientist: A Guide to Responsible conduct in Research: Third Edition National Academies Press.
5. Resnic DB (2011). What is ethics in research & why is it important. National Institute of Environmental Health sciences, 1-10. Retrieved from <https://www.niehs.nih.gov/research/resource/bioethics/whatis/index.cfm>
6. Beall J, (2012). Predatory publishers are corrupting open access. Nature, 489(7415)179-179 <https://doi.org/10.1038/489179a>
7. Indian National Science Academy (INSA), Ethics in Science Education, Research and Governance (2019), ISBN:978-81-939482-1-7. http://www.insaindia.res.in/pdf/Ethics_Book.pdf



Paper-3 (DFSC-PP-03)

Analytical Approaches in Forensic Techniques (Physical, Chemical & Biological)

UNIT-I

Nature, Scope, Basic principles & Forensic Applications of Microscopy, Comparison microscope, Stereoscopic microscope, Fluorescent Microscopy, Infra Red Microscopy, Scanning Electron Microscope (SEM) & Transmission Electron Microscope (TEM). General principles of Immuno chemical technique, Antigen-Antibody binding, Precipitation, Agglutination, Complement fixation, Gel immuno diffusion, Immuno electrophoresis, Radio Immuno assay, ELISA, Fluorescent immuno assay, Fluorescent Activated Cell Sorting (FACS).

UNIT-II

Nature, Scope, Concepts, Basic Principles & Forensic Science Applications of UV-Visible spectroscopy, Infra Red (IR) Spectroscopy, Fourier transform Infra Red (FTIR) Spectrophotometer Atomic Absorption Spectrophotometry (AAS), Atomic emission Spectrometry (AES), Inductive coupled plasma (ICP), X-ray spectroscopy, Auger emission spectroscopy, Mass spectrometry.

UNIT-III

Nature, Scope, Concepts, Basic Principles & Forensic Science Applications of Chromatography, Thin Layer chromatography (TLC), High Performance Liquid Chromatography (HPLC), Gas Chromatography (GC) and High performance Thin layer Chromatography (HPTLC).

UNIT-IV

Nature, Scope, Basic principles & Forensic Applications Electrophoretic Technique, General principles, Factors affecting electrophoresis, High voltage electrophoresis, polyacrylamide gel electrophoresis, Isoelectric focusing (IEF), Isoelectrophoresis, Preparative, Horizontal and Vertical Electrophoresis.

UNIT-V

Molecular Biology Techniques: Genetic Manipulations, Restriction enzymes, Gene cloning, Cloning strategies, cloning vectors- Plasmids, Cosmids, phagemids, BAC, YAC, DNA extraction, Polymerase chain reaction, DNA sequencing methods and its advances, Mutagenesis, Gene Libraries, Colony Hybridization, Nick translation, Expression of Genes etc.

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Tissue culture techniques, Cell lines maintenance, Cryopreservation etc.

Recommended Books

1. Working Procedure Manual Serology, DFS, New Delhi.
2. Danniell P. Stites, Abba I. Jerr, Tristram G. Parstow Medical immunology, Ninth edition; Prentice Hall International Inc. 1997.
3. Saferstein, R. (1982): Science Handbook, Vol. I, II, & III, Prentice Hall New Jersey.
4. Stern, C. (1964) : Principles of Human Genetics, Freeman, California.
5. Beerman, K.E.: Blood Group Serology, Churchill, and Lincoln, P.J. (1988)
6. Race, R.R, and Sanger, R. (1975) : Blood Groups in Man. Blackwell Scientific, Oxford.
7. Gilblet, E. (1969) : Markers in Human Blood, Davis, Pennsylvania
8. Culliford, B.E. (1971) The Examination and Typing of Blood Stains, US Deptt. of Justice, Washington
9. Chowdhari, S. (1971) : Forensic Biology, B P R & D, Govt, of India.
10. Dunsford, I and Bowley, C. (1967) : Blood Grouping Techniques, Oliver & Boyd, London

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Paper-4: (DFSC-PP-04)

UNIT-I

Nature, Scope & Definition of Forensic chemistry, Introduction to Narcotic drugs, Depressants, stimulants, and Hallucinogens their Active components and legal issues and method of analysis of Designer Drugs & Anabolic steroids, Forensic Medicine- Definition, Scope and Importance, Postmortem examination, Death: Definition, types, and nature, time since death, Injuries-Definition and Nature, Estimation of Age of injuries from Ante-mortem and Post mortem injuries, Burns-Classification, Ante-mortem and Post mortem Burns.

UNIT-II

Toxicology, Poisons-Definition & Classification, Collection and Preservation of Viscera and other relevant materials, Isolation and identification of Plant Poisons, opium and its derivatives, Benzodiazepine tranquilizers, Metallic Poison, Insecticides and Pesticides. Basic concepts of Poisonous Mushrooms, Poisonous fungi, Food Poisoning, Common vegetable abortifacients, Animal poison, Snake venom.

UNIT-III

Serology & Immunology, Blood: Composition and Histology, Examination & Identification of blood, blood stains & Analysis of Blood Pattern, and other body fluids/stains viz. menstrual blood, semen, saliva, sweat, tear, pus, vomit, hair, bone, nail, Secretors and Non-secretors. Immunology: Cell & Organ of Immune system, Haematopoiesis, immune response, innate and acquired immunity, Antigens, Immunoglobulin: Types, Physio-chemical properties and function. Antigen-Antibody Reactions: Precipitation, agglutination, complement fixation, Compliment system, Major Histo-compatibility Complexes (MHC) and antigen presentation, Autoimmunity, Apoptosis.

UNIT IV

An Introduction to Genetic Material, Structure of DNA, Chemical nature of DNA, Physiochemical properties of DNA, Denaturation and Renaturation kinetics of DNA, Central Dogma-DNA extraction and Quantification; Basic concept of sequence variation - VNTRs, STRs, Mini STRs, SNPs. Mitochondrial DNA Evaluation of results, frequency estimate calculations and interpretation, Allele frequency determination, STR Profiling: Structure of STR loci; The development of STR multiplexes; Detection of STR

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polymorphisms; Interpretation of result; Assessment of STR profiles: Stutter peaks. Sp. Pull-up; Degraded DNA; Statistical Assessment of STR profiles; estimating the frequencies of STR profiles. History of DNA profiling applications in disputed paternity cases, child swapping, missing person's identity, civil immigration, limitations of DNA profiling.

UNIT -V

Detection techniques- RFLP, PCR amplifications, Massive parallel sequencing, Y- STR, Advance Cloning methods, Analysis of SNP, DNA chip technology- Microarrays Cell free DNA, mi-RNA and its role in forensic science, RNAseq, Chip-Seq, Match probability – Database, DNA typing from blood, semen, bone and teeth and the use of DNA typing in wildlife investigations

Recommended Books:

1. Khan, Javed I., Ho, Mat H. Analytical Methods in Forensic Chemistry. New York: Working Procedure Manual Chemistry/Toxicology/Explosives/Narcotics, DFS Pub. New Delhi
2. Kennedy, Thomas J., Christian, Jr., Donnell Basic Principles of Forensic Chemistry, Springer
3. Saferstein, Criminalistics: An Introduction to Forensic Science. Prentice Hall
4. Maudham.B.et.al; Vogel's Textbook of Quantitative Chemical. Analysis, Longman
5. John D. DeHaan ; Kirk's Fire Investigation, Prentice Hall Eaglewood Cliffs, N.J
6. Yinon J; Modern Methods & Application in Analysis of Explosives, John Wiley.
7. C.A. Watson; Official and standardized Methods of Analysis. Royal Society of Chemistry UK

London

13. Coyle, H. (ed.) Nonhuman DNA Typing, International Forensic Science and Investigation Series, CRC Press, Boca Raton.
14. Niels Morling, Handbook of Forensic Genetics (Forensic Science and Medicine) Humana Press.
15. John M. Butle. Forensic DNA Typing, Second Edition: Biology, Technology, and Genetics of STR Markers Elsevier Academic Press.

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