ST. JOSEPH'S COLLEGE (AUTONOMOUS)

BENGALURU - 27

DEPARTMENT OF CHEMISTRY

SYLLABUS FOR POSTGRADUATE COURSE
M.Sc. ANALYTICAL / ORGANIC CHEMISTRY
FOURTH SEMESTER - DEPARTMENT ELECTIVE

2021-2024

Re-accredited with 'A++' GRADE and 3.79/4 CGPA by NAAC
Recognised as "College of Excellence" by UGC

FROM 2021-2022 ONWARDS

Semester	IV
Paper code	CHDE 0421
Paper title	Dept. elective: FORENSIC CHEMISTRY
Number of teaching hours per week	4
Total number of teaching hours per semester	60
Number of credits	4

1. INTRODUCTION TO FORENSIC SCIENCE 11+2 hrs

Definition, historical aspects, scope, code of conduct of forensic science. Crime Scene-types-indoor and outdoor. Securing and isolating the crime scene. Crime scene search methods.

Case study - Amanda Knox: A Flawed Case of Murder

Legal aspects of crime- Role of Investigator.

Case study - Dr. Coppolino's Deadly House Calls

Classification of crime scene evidence – physical and trace evidence. Collection, labeling, sealing of evidence.

Case study - Bruce McArthur: A Mountain of Physical Evidence.

Criminal Profiling -Profile of victim and culprit, its role in crime investigation, Lie detection (Polygraphy), Narco analysis, Brain mapping.

2. FINGERPRINTS 9 hrs

Introduction- Basics of fingerprinting, Types of fingerprints. Fingerprint patterns. Development of Fingerprints- Latent prints. Latent fingerprints' detection by physical and chemical techniques.

Case study - Killer Twin: Ronald and Donald Smith

Case study - The Mayfield Affair

3. FORESNIC TOXICOLOGY 8 hrs

Significance of toxicological findings. Techniques used in toxicology. Toxicological analysis – detection alcohol in blood sample, chemical intoxication tests - breath testing for alcohol. Human performance toxicology.

Case study-Accidental overdose: The Tragedy of Michael Jackson and Mac Miller.

4. ANALYTICAL METHODS IN FORENSIC CHEMISTRY 19+1 hrs

Sample preparation for chromatographic and spectroscopic techniques. Chromatographic methods - forensic applications of thin layer chromatography, gas chromatography and liquid chromatography. Spectroscopic methods - forensic applications of ultraviolet-visible spectroscopy, infrared spectroscopy, atomic absorption spectroscopy, atomic emission spectroscopy. Mass spectrometry. X-ray diffraction. Colorimetric analysis of narcotics. Electrophoresis –forensic applications. Forensic photography- Basic principles and applications of photography in forensic science. 3D photography- Infrared and ultraviolet photography. *Digital photography. Videography.*

5. NANOTECHNOLOGY IN FORENSIC CHEMISTRY 10 hrs

Nanomaterials-Classification. Synthesis of nanomaterials-top-down and bottom-up synthesis - CVD. Application of nanotechnology in forensic evidence analysis- Collection and analysis of evidence of different types of crime scenes including explosive, drugs, DNA analysis, latent finger-marks.

References

1. W.J. Tilstone, M.L. Hastrup and C. Hald, Fisher's, *Techniques of Crime Scene Investigation*, CRC Press, Boca Raton (2013).
2. R. Saferstein, *Criminalistics: An Introduction to Forensic Science*, 13th Edition, Pearson Education, (2021).
3. M. Byrd, *Crime Scene Evidence: A Guide to the Recovery and Collection of Physical Evidence*, CRC Press, Boca Raton (2001).
4. S. B. Karch, *The Pathology of Drug Abuse*, CRC Press, Boca Raton (2002).
5. A. Poklis, Forensic toxicology in, *Introduction to Forensic Sciences*, 2nd Edition, W.G. Eckert (Ed.), CRC Press, Boca Raton (1997).
6. D.R. Redsicker, *The Practical Methodology of Forensic Photography*, 2nd Edition, CRC Press, Boca Raton (2001).
7. C. P. Poole, Jr. F. J. Owens, Introduction to nanotechnology, A John Willey & sons, INC., Publication (2003).
8. V. Chauhan, V. Singh, A. Tiwari, Applications of nanotechnology in forensic investigation, *Int. J. Life. Sci. Scienti. Res*., 2017, 3, 1047-1051.
9. L. Gabrielli, D. Rosa-Gastaldo, M.-V. Salvia, S. Springhetti, F. Rastrelli, F. Mancin, Detection and identification of designer drugs by nanoparticle-based NMR chemosensing, Chem. Sci., 2018, 9, 4777–4784.
10. S. J. Kwon, A. J. Bard, DNA Analysis by application of Pt nanoparticle electrochemical amplification with single label response, *J. Am. Chem. Soc.* 2012, 134, 26, 10777–10779.

11. W. Kemp, *Organic Spectroscopy*, 3rd Edition, Macmillan, Hampshire (1991).
12. Fundamentals of Molecular Spectroscopy by Colin N Banwell and Leaine McCash, Fourth Edition-2017, McGraw Hill Education Pvt. Ltd.

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Code number and Title of the paper: CHDE 0421: Forensic Chemistry

Chapter Number	Title	Number of teaching hours (As mentioned in the syllabus)	Maximum marks for which questions are to be framed from this chapter (including bonus questions)
1.	Introduction to forensic science	13	24
2.	Fingerprints	9	15
3.	Forensic toxicology	8	12
4.	Analytical methods in forensic chemistry	20	34
5.	Nanotechnology in forensic chemistry	10	18
Total marks excluding bonus questions			70
Total marks including bonus questions			103