Gyanmanjari Innovative University

Course Syllabus
Gyanmanjari Science College
Semester-1(M.Sc.)

Subject: Forensic Pharmacology and Drug Analysis – MSCFS11505

Type of course: Minor

Prerequisite: Students should have a basic knowledge of drugs of abuse and biology.

Rationale: The Prerequisite provides the foundation for understanding of drug analysis with pharmacological view.

Teaching and Examination Scheme:

Teaching Scheme			Credits	Examination Marks					Total Marks
				Theory Marks		Practical Marks		CA	
CI	T	P	C	ESE	MSE	V	P	ALA	
3	0	0	3	60	30	10	00	50	150

Legends: CI-Class Room Instructions; T – Tutorial; P - Practical; C – Credit; ESE - End Semester Examination; MSE- Mid Semester Examination; V – Viva; CA - Continuous Assessment; ALA- Active Learning Activities.

GYANMANJARI INNOVATIVE UNIVERSITY BHAVNAGAR

Course Content:

Unit No.	Course content	Hrs	% Weightage
1	**Forensic Pharmacology:** Concept of pharmacology, Basic concepts of pharmacokinetics, absorption- First-pass metabolism, bioavailability, Distribution, elimination of drug- drug half life, excretion. **Drug Metabolism-** Phase-1 and Phase-2 (conjugation) reactions. Metabolism of ethanol, methanol, Benzodiazepines barbiturates, Amphetamines, heroin, codeine, morphine, detection of metabolits. Factors affecting the pharmacokinetics of drugs. Pharmacodynamics and pharmacogenesis.	15	25
2	**Narcotic Drugs and Psychotropic Substances:** Classification of narcotic substances, NDPS act. Drugs of abuse. Opiate: extraction of alkaloids from plant materials, analysis of opium alkaloids, datura alkaloids- using spot tests, microcrystal tests, TLC, spectroscopy, GC-MS. **Barbiturates and Benzodiazepines:** Chemistry, types, extraction and isolation, characterization by spot tests, TLC, and IR spectrometry, HPLC – MS.	20	25
3	**Stimulants and Hallucinogen Compounds:** Stimulants - Amphetamines, cocaine, nicotine, caffeine, chemistry and identification. Hallucinogens – cannabis, LSD, psilocybine and mescaline: Introduction, analysis: spot tests, TLC, and IR spectrometry, HPLC – MS, GC- MS.	10	25
4.	**Extraction and Purification of Drugs/Poisons from Biological Samples:** Extraction of volatile compounds (distillation methods, head space-GC). Principle of solvent extraction method, extraction and isolation of Neutral nonvolatile compounds, acidic and basic nonvolatile compounds from viscera, blood, urine and hairs - Stas-otto method, Dovbriey Nickolls (Ammonium sulphate) method, acid digest and Valov (Tungstate) methods.	15	25

Continuous Assessment:

Sr. No	Active Learning Activities	Marks
1.	**Drug abuse: A real world problem** Prepare a report on drug of abuse problem increasing in India and how to prevent its prevalence. Upload it on GMIU Web portal.	10
2.	**Data Interpretation from HPLC-MS and GC-MS:** Provide students with chromatograms and spectra data from HPLC-MS and GC-MS analyses of stimulants or hallucinogens. Have them interpret the data to identify the substances. Upload the same in GMIU Web portal.	10
3.	**Chemical Structure Identification Challenge:** Present students with chemical structures of various stimulants (e.g., amphetamines, cocaine) and hallucinogens (e.g., LSD, cannabis) and have them identify the compound. Upload the same in GMIU Web portal.	10
4.	**Case Study Analysis:** Present students with real or hypothetical forensic cases involving drug overdoses or poisoning (e.g., ethanol, methanol, opioids). Analyze pharmacokinetics, drug metabolism, and identify the role of pharmacogenetic factors in these cases. Prepare a report and upload in GMIU Web portal.	10
5.	**Literature Review:** Provide atleast 3 research papers to students and tell them to prepare a short note from the papers and upload it on GMIU Web portal.	10
Total		**50**

Suggested Specification table with Marks (Theory):60

Distribution of Theory Marks **(Revised Bloom's Taxonomy)**						
Level	Remembrance (R)	Understanding (U)	Application (A)	Analyze (N)	Evaluate (E)	Create (C)
Weightage	30%	30%	30%	10%	00	00

Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

Course Outcome:

After learning the course the students should be able to:	
CO1	Equips students with a foundational understanding of pharmacokinetics and pharmacodynamics, drug metabolism, and the forensic detection of drug metabolites, essential for analyzing the impact of various substances in legal and medical contexts.
CO2	Provides students with an in-depth understanding of drug classification, NDPS Act regulations, and the chemical analysis, extraction, and detection methods of narcotics and psychotropic substances using various analytical techniques.
CO3	Train students with the knowledge of the chemistry, identification, and forensic analysis of stimulants and hallucinogens using various analytical techniques, including TLC, IR spectrometry, HPLC-MS, and GC-MS.
CO4	Extract, isolate, and purify volatile and nonvolatile compounds from biological matrices using various techniques, including solvent extraction, distillation, and specialized forensic methods.

Instructional Method:

The course delivery method will depend upon the requirement of content and need of students. The teacher in addition to conventional teaching method by black board, may also use any of tools such as demonstration, role play, Quiz, brainstorming, MOOCs etc.

From the content 10% topics are suggested for flipped mode instruction.

Students will use supplementary resources such as online videos, NPTEL/SWAYAM videos, e-courses, Virtual Laboratory

The internal evaluation will be done on the basis of Active Learning Assignment.
Practical/Viva examination will be conducted at the end of semester for evaluation of performance of students in laboratory.

Reference Books:

[1] Handbook of Forensic Drug Analysis, Fred Smith, Jay A. Siegel, Academic Press Inc

[2] Handbook Of Forensic Analytical Toxicology, Jaiswal Ak, Jaypee Brothers Medical Publishers

[3] Forensic Pharmacology, Morris Zedeck , Beth Zedeck, Chelsea House Publishers