Gyanmanjari Innovative University

Course Syllabus
Gyanmanjari Science College
Semester-5 (B.Sc)

Subject: Forensic Chemistry-BSCFS15306

Type of course: Major

Prerequisite: Basic understanding of forensic science and chemistry recommended.

Rationale: This course covers analytic study of substances that could easily be misidentified or confused, and finding their identity and analyze the physical and chemical properties of different materials in order to identify them correctly where one or more materials may have similar properties.

Teaching and Examination Scheme:

Teaching Scheme			Credits	Examination Marks					Total Marks
				ESE		CCE			
CI	T	P	C	Theory	Practical	MSE	LWA/V	ALA	
3	0	2	4	75	25	30	20	50	200

Legends: CI-Class Room Instructions; T – Tutorial; P - Practical; C – Credit; SEE - Semester End Evaluation; MSE- Mid Semester Examination; LWA - Lab Work Assessment; V – Viva voce; CCE-Continuous and Comprehensive Evaluation; ALA- Active Learning Activities.

3 Credits * 25 Marks = 75 Marks (each credit carries 25 Marks) Theory
1 Credits * 25 Marks = 25 Marks (each credit carries 25 Marks) Practical
SEE 100 Marks will be converted in to 50 Marks
CCE 100 Marks will be converted in to 50 Marks
It is compulsory to pass in each individual component.

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Course Content:

Unit No	Course Content	Hrs	% Weightage
1	**Forensic Chemistry-** Introduction to forensic chemistry, history, definition, role of a forensic chemist, scope and significance in forensic chemistry, techniques commonly used, cases encountered in forensic chemistry.	10	25%
2	**Alcohol and alcoholic beverages -** Introduction alcohol and laws in India, types of alcohol and alcoholic beverages, brief description of beverages, country made liquors, illicit liquor, effects of alcohol, drunken driving, field sobriety testing, forensic analysis of evidence, collection of samples, method for BAC determination, breath analysis.	10	25%
3	**Petroleum products and adulteration-** Introduction, composition of petroleum products, chemical properties of petroleum products, fractional distillation Food adulteration: adulterants, adulteration in milk and milk products, in cereals, grains, spices, water, injurious adulterants, notable incidents, tests for detection of adulterants, standards and acts.	10	25%
4	**Forensic analysis-** Theory of forensic analysis, collection of samples, sample integrity, instrumental techniques like NMR, NAA, GC-MS, FTIR, UV-VIS-NIR Spectrophotometry, microscopy. Cases encountered in forensic chemistry -drugs: classification, drug abuse, analysis through color tests, microcrystal test and confirmatory tests.	15	25%

Continuous Assessment:

Sr. No	Active Learning Activities	Marks
1	**Case Study Analysis on Adulterated Food**: Divide students into groups and provide case studies involving adulterated food products. Ask them to analyze the potential health risks and suggest forensic methods to detect the adulterants. Each group can present their findings and detection methods to the class.	10

2	**Petroleum Fractions Poster Presentation**: Assign each student a different petroleum product fraction (e.g., gasoline, kerosene, or diesel) and ask them to create a poster explaining the fraction's composition, distillation process, and its commercial applications. Students can present their posters to the class for discussion.	10
3	**Field sobriety test**: students will Set up a mock crime scene in the classroom involving a suspect under suspicion of drinking and driving. They will conduct field sobriety testings and upload the images of crime scene on the GMIU web portal	10
4	**Mock Courtroom Trial: The Case of the Contaminated Evidence** students will take on roles such as forensic chemist, lawyer, witness, defendant, or jury member in a mock trial. The case involves questionable forensic evidence that may have been tampered with. Their task is to present, challenge, or evaluate the evidence to decide if it's reliable enough for conviction and the trial images will be uploaded on the GMIU web portal.	10
5	**Attendance**	10
Total		50

List of Practical:

Sr. No	Descriptions	Unit No	Hrs
1	Determination of Percentage of Proof Sprit of Ethyl Alcohol in sample.	Unit-1	3
2	Examination of Different concentrations of alcohol by UV-VIS Spectrophotometer.	Unit-1	3
3	Preliminary & Confirmatory Examination of the Chemicals Seized in Case of Acid Attack.	Unit-2	3
4	Preliminary & Confirmatory Examination of Chemicals Used in Trap Cases.	Unit-2	3.
5	Examination of Petroleum Products by UV-VIS Spectrophotometer.	Unit-3	3
6	Detection of Adulterants in cereals and milk Samples.	Unit-3	3
7	Chemical Examination of the Component of Crackers.	Unit-3	3
8	Preliminary Examination of Black Powder.	Unit-4	3
9	To identify the adulteration of petrol with kerosene using density, distillation, or TLC methods.	Unit-4	3
10	To understand how spectroscopic techniques are used to identify unknown substances in forensic labs.	Unit-4	3
		Total	30

Suggested Specification table with Marks (Theory):75

Distribution of Theory Marks (Revised Bloom's Taxonomy)						
Level	Remembrance (R)	Understanding (U)	Application (A)	Analyze (N)	Evaluate (E)	Create (C)
Weightage	30%	40%	30%	00	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	Identify and understand commonly used forensic chemistry techniques such as chromatography, spectrophotometry, and presumptive testing..
CO2	Differentiate between licensed, country-made, and illicit liquors and recognize their forensic significance.
CO3	Apply basic chemical tests to detect adulteration in petroleum-based samples.
CO4	Describe the correct procedures for collection, preservation, and maintaining integrity of forensic samples.

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] Medicinal Chemistry & Drug Discovery, Burger A. (2004). 6 Vol Set, 6th Ed. NY, John Wiley & Sons.
[2] Vogel's Textbook of Quantitative Chemical Analysis. Bassett M. (2004). England, Longman Essex.
[3] Arson & Arson Investigation, Survey & Assessment National Institute of Law Enforcement, Boudreau J.E. (1977). U.S. Department of Justice. USA, USA Govt. Printing Press.
[4] Vogel Textbook of Practical Organic Chemistry. Brean S. F. (1998). Edinburg, Addison Wesley Longman.
[5] Medicinal Chemistry, Burger A. (1970). Vol. II. NY, Wiley Inter-Science.
[6] Kirk's Fire Investigation. Dettean J. D. (2002). NY, Prentice Hall, Eaglewood Cliffs, w.e.f. 2005-2006.