Gyanmanjari Innovative University

Course Syllabus
Gyanmanjari Science College
Semester-4 (B.Sc)

Subject: Forensic Biology and Serology - BSCFS14303

Type of course: Major

Prerequisite: Students should have a basic understanding of biology, including cell structure, genetics, and human anatomy.

Rationale: This syllabus connects biological science to forensic investigations, equipping students with the skills to analyze and interpret biological evidence crucial for solving crimes and ensuring justice.

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.

Course Content:

Unit No	Course Content	Hrs	Weightage
1	**Blood** The overview of blood includes its introduction, historical context, and essential characteristics. Constituents of blood, including plasma, red blood cells, white blood cells, and platelets, and their roles within the circulatory system. functions of blood in supporting bodily functions, processes involved in collecting, preserving, and packaging blood for forensic investigation, and the evidential significance of blood in forensic contexts. **Bloodstain Pattern Classification and Analysis** Classification of bloodstain patterns, including passive patterns,	12	28%

	spattered patterns, and altered patterns. significance of different bloodstain types and patterns in forensic investigations. Impact spatter and mechanisms, importance and Legal aspects of BPA.		
2	**Identification of blood stains** Presumptive tests include the benzidine test, Phenolphthalein test, Leucomalachite test, TetraMethylbenzidine test, and O-Tolidine, Luminol test. Confirmatory tests- Haemochromogen test, Haematin test, and Haemin test. **Serogeneticmarkers** Blood groups– biochemistry and genetics of ABO, Rh, Mn Systems, Lewis antigen, Bombay Blood group.	10	20%
3	**Hair** Hair structure. Hair growth. Phases of growth and growth rate. Hair characteristics from various body parts. Sex, age, and race from hair Forensic examination and comparison of hair. Human vs. animal hair. Forensic significance of hair.	12	28%
4	**Semen** Forensic significance of semen. Composition, functions, and morphology of spermatozoa. Collection, evaluation, and tests for identification of semen. Individualization based on semen examination. **Other Biological Fluids** Composition, functions, and Forensic significance of saliva, sweat, urine, nails, tears, fecal stains, milk, and vomit. Tests for their identifications.	11	24%

Continuous Assessment:

Sr. No	Active Learning Activities	Marks
1	**Bloodstain Pattern Classification Chart** Faculty will distribute a set of descriptions or images of various bloodstain patterns (e.g., passive, spattered, altered) and students will classify these into the three main categories and create a summary chart and upload it on GMIU web Portal.	10
2	**Simulated Crime Scene Analysis** Faculty will present a hypothetical crime scene scenario where bloodstains are found and then students will propose a step-by-step procedure for identifying the stains, including which tests they would use and why, considering the pros and	10

	cons of each test in specific contexts and will upload it on GMIU web Poratl.	
3	**Chart of Human vs. Animal Hair Characteristics** Faculty will provide students with data or images of human and animal hair under magnification. Students will create a comparison chart noting differences in medullary structure, scale patterns, and pigment distribution, explaining how these features aid in forensic identification and will upload it on GMIU web Portal.	10
4	**Comparison Table of Biological Fluids** Students will create a table comparing the composition, functions, and forensic significance of saliva, sweat, urine, tears, milk, vomit, nails, and fecal stains. Include examples of forensic scenarios where each fluid might be critical and upload it on GMIU web Portal.	10
5	**Attendance**	10
Total		50

List of Practical:

Sr. No	Descriptions	Unit No.	Hrs
1	Analyze different blood groups from the blood found at the crime scene.	1	4
2	Perform catalytic & crystal tests for blood.	1	4
3	To study the correlation between impact angle and shape of bloodstain.	2	4
4	To examine hair morphology and determine the species to which the hair belongs.	2	4
5	To prepare slides of scale patterns of human hair.	3	4
6	Analyze saliva as a biological fluid.	3	4
7	To identify seminal stains by chemical tests.	4	4
8	To identify the given stain as sweat.	4	2
		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	25%	30%	30%	10%	5%	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	Evaluate the legal and scientific importance of bloodstain pattern analysis (BPA).
CO2	Interpret genetic and biochemical factors of blood types to support forensic identification and casework.
CO3	Apply forensic techniques to examine and compare human and animal hair samples.
CO4	Demonstrate techniques for collecting, evaluating, and testing semen in forensic contexts.

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] B.R.Sharma : Forensic science in criminal Investigation & Trails.

[2] S.H. James and J.J. Nordby, Forensic Science: An Introduction to Scientific and Investigative Techniques, 2nd Edition, CRC Press, Boca Raton

[3] B.B. Nanda and R.K. Tiwari, *Forensic Science in India: A Vision for the Twenty First Century*, Select Publishers, New Delhi.

[4] Forensic Serology: A Laboratory Manual by Beverly A. K. Duval.

[5] Forensic Biology by Richard Li.