

COURSE STRUCTURE AND SYLLABI

Diploma in Forensic DNA Analysis

2025-26 Batch



Centurion
UNIVERSITY

Shaping Lives...
Empowering Communities...

SCHOOL OF FORENSIC SCIENCES
CENTURION UNIVERSITY OF TECHNOLOGY & MANAGEMENT
Odisha-761211, India

Web Site: - www.cutm.ac.in

**CENTURION UNIVERSITY OF TECHNOLOGY AND MANAGEMENT,
ODISHA**

CERTIFICATE



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**This is to certify that the syllabus of the Programme Diploma in Forensic DNA
Analysis of the School of Forensic Sciences is approved in the 15th Academic
Council Meeting held on _____ 2025.**

**Dean
School of Forensic Sciences
CUTM, Odisha**



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TITLE OF THE PROGRAMME

DIPLOMA IN FORENSIC DNA ANALYSIS

SYLLABUS

Effective from 2025

AS PER NEP 2020

SCHOOL OF FORENSIC SCIENCES

**CENTURION UNIVERSITY OF TECHNOLOGY AND MANAGEMENT,
ODISHA**

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CENTURION UNIVERSITY OF TECHNOLOGY AND MANAGEMENT

Centurion University is duly recognized as a pioneer in ‘Skill Integrated Higher Education”. Its unique model lays specific emphasis on creating sustainable livelihoods on a national scale in challenging geographies through education that results in employability and sparks entrepreneurship. This model has been recognized by multiple Governments (Central and State), International Organizations such as UNESCO and the World Bank, as well as Policy think tanks such as the Niti Ayog.

The founders, faculty, and staff are fully committed to its credo: Shaping Lives. Empowering Communities.

This credo is underpinned by a value system of Inclusivity, Integrity, Equity, Respect, and Sustainability in everything we do.

Since its inception in 2005 and subsequent establishment as a University in 2010 (vide Odisha Act 4 of 2010), Centurion has created a unique environment that ensures a tailored learning and employability path for youth in some of the poorest and underserved geographies in Odisha and Andhra Pradesh.

SCHOOL OF FORENSIC SCIENCES

Centurion University established the School of Forensic Sciences in the year 2017 with M.Sc. Forensic Science Programme and Gujarat Forensic Science University (GFSU) as a knowledge partner.

VISION:

To be an inclusive centre for education, training, and research in Forensic Science and allied professions to create sustainable livelihoods.

MISSION

- To create much-required forensic experts in the field of investigative science.
- Developing a robust platform for students to interact with experts and develop problem-solving approaches.
- Sensitize students to harness their potential for the application of various scientific technologies in investigative Science.
- Be a potential support to strengthen the justice delivery system leading towards equality, integrity, and peace.

PREAMBLE

The Diploma in Forensic DNA Analysis at Centurion University of Technology and Management (CUTM) is meticulously designed to equip students with advanced knowledge and practical skills in the ever-evolving field of Forensic DNA Profiling. As we navigate through an era marked by rapid technological advancements and an increasing reliance on DNA technologies, the importance of forensic DNA investigation has never been more critical.

Our curriculum is a comprehensive blend of theoretical foundations and hands-on experiences, ensuring that our graduates are well-prepared to tackle contemporary challenges in DNA Forensics. The program covers a wide range of topics, including Biological crime scene management, Collection and preservation of biological samples for forensic DNA analysis, Fundamentals of Forensic genetics, understanding a forensic DNA profile, and evaluating the statistical weightage of DNA evidence.

At CUTM, we emphasize a multidisciplinary approach, integrating principles from Genetics, law, and criminology. This holistic perspective enables our students to develop a well-rounded understanding of the complexities of forensic DNA analysis and the legal and ethical implications of genetic investigations.

The faculty at CUTM comprises experienced professionals and researchers who bring knowledge and expertise to the classroom. Through interactive lectures, practical labs, and real-world case studies, students gain valuable insights and develop critical thinking and problem-solving skills. Additionally, our state-of-the-art laboratories and partnerships with industry leaders provide students access to cutting-edge tools and technologies, fostering an environment of innovation and continuous learning. Upon completion of the program, the students will be equipped to pursue a wide range of careers in forensic DNA profiling, as consultants to the judiciary, DNA-based investigations, and related fields. They will be capable of collecting and preserving biological samples for DNA examination, performing routine DNA investigation, and analyzing a DNA report for its admissibility in the court of law.

Centurion University of Technology and Management is committed to nurturing the next generation of Forensic DNA professionals who will contribute to the criminal justice system. We invite you to embark on this challenging and rewarding journey with us and become a vital part of the global effort for disseminating justice through forensic DNA analysis.

PROGRAM EDUCATIONAL OBJECTIVES (PEOS) FOR DIPLOMA IN FORENSIC DNA ANALYSIS

The Diploma program in Forensic DNA Analysis at Centurion University of Technology and Management aims to produce students who will:

1. **Professional Expertise:** Develop technical expertise and practical skills in Forensic DNA profiling and result interpretation, and provide solutions to the void of Forensic DNA experts.
2. **Leadership and Innovation:** Become leaders and innovators in the field, capable of managing and leading forensic DNA profiling projects, driving technological advancements, and implementing effective DNA profiling solutions.
3. **Lifelong Learning:** Engage in continuous professional development and lifelong learning to stay abreast of evolving technologies, and best practices in Forensic Genetics.
4. **Ethical Responsibility:** Uphold high ethical standards and demonstrate a strong sense of responsibility in their professional conduct, ensuring compliance with legal frameworks and promoting ethical practices in Forensic DNA profiling.
5. **Multidisciplinary Integration:** Integrate knowledge from various disciplines, including Genetics, law, and criminology, to develop holistic solutions to complex criminal cases by forensic DNA analysis.
6. **Effective Communication:** Exhibit excellent communication skills, capable of articulating complex technical concepts to diverse audiences, including technical teams, management, and non-technical stakeholders.
7. **Research and Development:** Contribute to the body of knowledge in Genetics and forensic DNA profiling through independent research, innovation, and development of new tools, techniques, and methodologies.
8. **Global Perspective:** Understand and address challenges in DNA profiling, considering the cultural, legal, and ethical differences that influence Forensic DNA practices and policies worldwide.
9. **Collaboration and Teamwork:** Work effectively in multidisciplinary and multicultural teams, demonstrating strong collaboration skills to achieve common goals in Forensic DNA Profiling and result interpretation.



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Centurion University of Technology and Management

School of Forensic Sciences

Diploma in Forensic DNA Profiling

Syllabus 2025

10. **Adaptability and Problem-Solving:** Develop the ability to adapt to rapidly changing technological landscapes and solve complex criminal cases through creative and analytical approaches.

PROGRAMME OUTCOMES FOR DIPLOMA IN FORENSIC DNA ANALYSIS

Upon successful completion of the Diploma in Forensic DNA analysis at Centurion University of Technology and Management, students will be able to:

1. **Advanced Knowledge of Forensic DNA:** Demonstrate a comprehensive understanding of forensic genetics principles, including genetic markers, technological advancements, and legal and ethical issues in forensic DNA profiling.
2. **Forensic DNA Expertise:** Apply forensic DNA techniques to investigate and analyze heinous crimes, collecting and preserving biological evidence in a manner that is admissible in legal proceedings.
3. **Result Interpretation:** Interpret a forensic DNA profile and draw conclusions on the basis of the obtained results, and compare a DNA profile between the questioned and reference samples.
4. **Understanding a DNA Report:** Scientifically understand a DNA report generated and produced by a laboratory to assess its admissibility in the court of law.
5. **Legal and Ethical Understanding:** Demonstrate a strong understanding of laws, regulations, and ethical considerations, ensuring compliance with legal standards and promoting ethical practices in Forensic DNA profiling.
6. **Critical Thinking and Problem-Solving:** Utilize critical thinking and problem-solving skills to analyze complex heinous cases, developing innovative solutions to address emerging threats and challenges.
7. **Communication Skills:** Communicate effectively with diverse stakeholders, including technical and non-technical audiences, through written reports, presentations, and collaborative discussions.
8. **Research and Innovation:** Engage in independent research and contribute to the body of knowledge in DNA forensics, fostering innovation and advancements in the field.
9. **Teamwork and Leadership:** Work collaboratively in multidisciplinary teams, demonstrating leadership and project management skills to complete DNA-based forensic investigations.
10. **Lifelong Learning and Professional Development:** Commit to continuous learning and professional development, staying abreast of the latest trends, technologies, and best practices in Forensic DNA profiling.

PROGRAM SPECIFIC OUTCOMES (PSOS) FOR DIPLOMA IN FORENSIC DNA ANALYSIS

Upon successful completion of the Diploma in Forensic DNA Analysis at Centurion University of Technology and Management, students will be able to:

1. **Professional Careers in Forensic DNA Analysis:** Secure employment in various Forensic biology roles such as Analyst, Forensic Investigator, Crime Scene Officer, and Scientific Officer. Students will possess the practical skills and theoretical knowledge required to excel in these positions, addressing real-world challenges and contributing to the criminal justice system.
2. **Entrepreneurship and Innovation:** Leverage their expertise to start and manage their DNA profiling firms or consultancy services. Students will be equipped with the knowledge to develop DNA profiling solutions, create new DNA analysis tools, and provide specialized services such as report understanding, re-testing of samples, and fostering entrepreneurship in the forensic DNA profiling domain.
3. **Professionalism and Ethical Conduct:** Exhibit high standards of professionalism and ethical behavior in all aspects of their work. Students will understand and adhere to legal, ethical, and regulatory requirements in Forensic DNA profiling, ensuring responsible and ethical practices in their professional careers. They will also demonstrate effective communication, teamwork, and leadership skills, contributing positively to their organizations and the broader genetic community.
4. **Continuous Learning and Development:** Engage in lifelong learning and professional development to stay current with the rapidly evolving Forensic DNA profiling techniques. Students will pursue advanced certifications, attend industry conferences, participate in workshops, and engage in research activities to continuously enhance their knowledge and skills, ensuring they remain at the forefront of the field.

ELIGIBILITY

Bachelor's degree in any Science; Pursuing students of B.Sc. and M.Sc. of Forensic Science, Biotechnology, Zoology, Botany, prosecution Officers, Judiciary Officers, Investigating Officers

TEACHING METHODOLOGY:

- **Lectures:** In-depth theoretical discussions on each topic.
- **Case Studies:** Analysis of real-world Forensic DNA cases.
- **Group Discussions:** Encouraging student interaction and exchange of ideas.
- **Hands-on Exercises:** Practical exercises to apply theoretical concepts.
- **Guest Lectures:** Industry experts sharing their experiences and insights.

ASSESSMENT SCHEME

1. Evaluation for Theory papers (T, TP & TPP)

1.1. End semester theory examinations (50% weightage):

- Duration – 3 hours
- Full Mark – 100. During result processing, it will be proportionately added.
- Distribution of marks (should cover all COs)
 - a. 10 short questions x 2 marks = 20 marks
 - b. 5 long questions x 12 marks = 60 marks
 - c. 4 short notes x 5 marks = 20 marks

1.2. Continuous assessments: Details are as indicated in the table below:

SL No	Continuous Assessment	Score
	Individual / Group Presentation The rubric is as under: <ul style="list-style-type: none"> ● Content & creativity – 05 ● Presentation & Discussion – 05 	10
	Mid-semester (Written Examination) Mark Distribution: <ul style="list-style-type: none"> ● 5 short questions x 1 marks = 5 marks ● 2 long questions x 5 marks = 10 marks ● 2 short notes x 2.5 marks = 5 marks 	20
	Assignment (2 assignments x 5 marks each)	10
	Learning Record (Based on the parameters indicated in the learning record format, the course faculty to evaluate and award a score)	10
	TOTAL	50

- ### 2. Evaluation of Practice/ Laboratory Components: The evaluation of the practice component will be carried out 50% by the concerned faculty and 50% by the external examiner and will be conducted as per the present policy. Details are as under:

	Internal	Score
A	Concept	10
B	Planning & Execution/ Practical/ Simulation/ Programming	10
C	Result and Interpretation	10
D	Record/ Report	10
E	Viva	10
	Total	50
	External	
A	Execution & Result	20
B	Record of Applied and Action Learning	10
C	Viva	20
	Total	50

3. Evaluation of Project Component: The evaluation of the project component will be completed 50% by the concerned faculty and 50% by the external examiner and will be conducted as per the present policy. The following guidelines may be referred to during the evaluation of internal and external components:

	INTERNAL	
A	Understanding the relevance, scope, and dimension of the project	10
B	Methodology	10
C	Quality of Analysis and Results	10
D	Interpretations and Conclusions	10
E	Report	10
	Total	50
	EXTERNAL	
A	Understanding the relevance, scope, and dimension of the project	10
B	Report	20
C	Viva	20
	Total	50

PASS CRITERIA

- A. **Theory papers:** students must secure a minimum of **30% in individual components** (both continuous assessment & end-semester theory), **along with 40% in aggregate**
- B. **Theory & practice papers:**
 - a. Theory component: minimum of 30% in individual components (both continuous assessment & end-semester theory) along with 40% in aggregate
 - b. Practice component: minimum of 50% marks both in internal & external
- C. **Theory & project type papers:**
 - a. Theory component: minimum of 30% in individual components (both continuous assessment & end-semester theory) along with 40% in aggregate
 - b. Project component: minimum of 50% marks both in internal & external
- D. **Theory, practice & project type papers:**
 - a. Theory component: minimum of 30% in individual components (both continuous assessment & end-semester theory) along with 40% in aggregate
 - b. Practice component: minimum of 50% marks both in internal & external
 - c. Project component: minimum of 50% marks both in internal & external
- E. **Practice & project type papers:**
 - a. Practice component: minimum of 50% marks both in internal & external
 - b. Project component: minimum of 50% marks both in internal & external
- F. **Workshop or Internship type papers:** 50% in aggregate

COURSE STRUCTURE

S. No.	Qualifications	Level	Credits	Credit Points
1	Diploma	6	28	

Credit distribution basket-wise

S. No.	Basket	Course	Credits	Total Credit per basket
1	I	Discipline Specific Core Courses (DSC)	20	20
3	IV	Research Project (RP): Minor	08	08
		Total		28

TEACHING SCHEME

Basket	Course Name	Teaching Hours/ week	Credits				Total Credits/ Semester
			T	P	Pr	PER	
Major	Biological Crime Scene Management	4	4	0	0	4	28
Major	Fundamentals and Techniques of Forensic Genetics	4	4	0	0	4	
Major	Interpretation of DNA Profile and Understanding DNA Report	4	4	0	0	4	
Research	Minor Project	16	0	0	8	8	
Major	Laboratory Course	8	0	4	0	4	

T: Theory; P: Practice; Pj: Project [1 Credit= 1 hour Theory; 1 credit= 2 Hrs Practice/ Project]

BASKET I: DISCIPLINE-SPECIFIC CORE COURSES

CUFSXXXX: BIOLOGICAL CRIME SCENE MANAGEMENT

CREDITS: 04 (4+0+0)

DURATION: 40 hrs

COURSE DESCRIPTION:

This course offers a foundational overview of a biological crime scene and its management. The collection and Preservation of biological samples for effecting DNA profile generation will be understood. The process of maintaining the chain of custody of the collected samples will be thoroughly understood.

COURSE OBJECTIVES

1. To understand and articulate the fundamentals of biological crime scene management.
2. To learn to identify and evaluate various biological evidence and methods for their safe collection and preservation.
3. To learn about presumptive and confirmatory tests for the identification of body fluids.

COURSE OUTCOMES:

By the end of this course, students will be able to:

1. Understand the fundamental concepts of biological crime scene management.
2. Identify the biological samples for their effective collection and preservation.
3. To understand the basic concepts and procedures of presumptive and confirmatory tests

CO'S AND PO'S MAPPING

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	2	1	3	3	2	1	1	1	1	1
CO2	3	3	3	2	3	3	2	2	1	3	2	3
CO3	3	3	2	3	3	3	3	2	2	3	3	3
CO4	3	3	3	3	3	3	3	3	1	3	3	3
CO5	3	3	2	2	3	3	3	3	1	3	3	3

COURSE CONTENT:

Module I: Origin and Nature of Biological Evidence

Locard's Exchange Principle, Origin of Biological Evidence, Biological Evidence collected from Crime Scene, Biological Evidence collected from Victim/ Suspect/ Accused, Biological Evidence Collected during Autopsy, Types of Biological Evidence, Body Fluid Stains, Postmortem Blood, Bone, Teeth, Hair, Tissue, Source of DNA, Approximate DNA content of biological evidence

Module II: Collection and Preservation, and Documentation of Biological Evidence

Questioned Sample and Reference Sample, Cutting, Swabbing, Scrapping, Tape lifting, vacuuming techniques, Druggist fold, Role of Preservatives, Appropriate preservatives for biological evidence, Transportation and Storage Conditions, Precautions during DNA evidence collection, Sealing and Forwarding of biological samples, Chain of Custody

Module III: Presumptive Tests

Forensic Examination of Body Fluids: Blood components, Blood grouping systems, Tests for identification of Blood, Semen, Saliva, Sweat, Urine, Vaginal secretions, Fecal matter, Blood Spatter Analysis: Bloodstain characteristics, impact patterns, cast-off patterns, projected patterns, contact patterns, drying times, and crime scene reconstruction

SUGGESTED READING:

1. Forensic Biology by Richard Li
2. Advanced Topics in Forensic DNA Analysis by J. M. Butler.

CUFSXXXX: FUNDAMENTALS AND TECHNIQUES OF FORENSIC GENETICS

CREDITS: 04 (4+0+0)

DURATION: 40 HRS

COURSE DESCRIPTION:

This course provides an in-depth understanding of the fundamentals of Genetics and its applications in solving crimes through forensic DNA profiling. The course will help the students to understand the principle and practice of various advanced tools and techniques used in forensic DNA profiling.

COURSE OBJECTIVES:

1. To understand the basic concepts of genetics.
2. To implement the advanced techniques of DNA profiling in crime solving.
3. To gain practical experience in genetic analysis techniques.

COURSE OUTCOMES:

By the end of this course, students will be able to:

1. Explain fundamental concepts of genetics.
2. Understand the technological advancements in Forensic DNA profiling.
3. Implement advanced molecular techniques in generating DNA reports.

CO'S AND PO'S MAPPING

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	1	1	1	1	1	2	2	1	1	1
CO2	3	3	3	2	2	3	3	3	1	3	2	3
CO3	3	3	3	3	2	2	3	3	2	2	3	3
CO4	3	3	3	3	2	3	3	3	1	3	3	3
CO5	3	3	3	3	2	3	3	3	2	3	3	3

COURSE CONTENT:

Module I: Fundamentals of Forensic Genetics

Organization of genome, Structure and Functions of Nucleic acids, Introduction to Mendelian inheritance and its extensions, Importance of DNA as evidence in forensic investigation, Mitochondrial DNA and its importance

Module II: Important Forensic Genetic Markers

Mutation and Polymorphism, Sequence and Length Polymorphism, VNTRs, STRs, SNPs, InDels, Autosomal Markers, Allosomal Markers, Mini STRs, RM Y-STRs, Amelogenin and other Sex determining markers, Characteristics of Forensically relevant genetic markers, Forensic and Paternity Parameters of STRs, Commercial kits and available markers

Module III: Techniques of Forensic Genetics

Principles and Procedures of Manual, Semi-Automated, and Automated DNA Extraction, DNA Quantification Techniques, Advantages of qRT-PCR Techniques in Forensic DNA Quantification, Multiplex PCR and Amplification of STR Markers, Capillary Electrophoresis and Genotyping, Conventional Sequencing, Library Preparation, and Next Generation Sequencing

SUGGESTED READING:

1. Forensic Biology by Richard Li
2. Advanced Topics in Forensic DNA Analysis by J. M. Butler.

CUFSXXXX: INTERPRETATION OF DNA PROFILE AND UNDERSTANDING DNA REPORTS

CREDITS: 04 (4+0+0)

DURATION: 50 HRS

COURSE DESCRIPTION:

This course introduces the principles and practices employed for the interpretation of a DNA profile. Students will learn how to analyze a DNA report produced by the Forensic DNA laboratories and to obtain legally acceptable conclusions from these reports.

COURSE OBJECTIVES:

1. Understand the fundamental principles of Forensic DNA profiling.
2. Learn tools and techniques for generating a DNA report.
3. Develop an understanding of the ethical and legal aspects of Forensic DNA evidence.

COURSE OUTCOMES:

By the end of this course, students will be able to:

1. Comprehend the fundamental principles of Forensic DNA profiling.
2. Understand a DNA profile and interpret it.
3. Ensure the integrity and admissibility of DNA evidence.

CO'S AND PO'S MAPPING

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	2	1	1	1	1	1	1	1	1	1
CO2	3	3	3	2	2	3	2	3	1	2	1	1
CO3	3	3	3	3	1	3	3	2	2	3	2	2
CO4	3	3	3	3	1	3	3	3	1	2	2	2
CO5	3	3	3	2	2	3	2	3	1	3	2	3

COURSE CONTENT:

Module I: Understanding a DNA Profile

Characteristics of an Ideal DNA Profile, Routinely Occurring Artifacts in a DNA Profile, Stutter, Dye Blob, Nontemplate addition, Spike, Noise, Threshold, Heterozygous Imbalance, Locus Balance, Degradation curve

Module II: Matching of DNA Profile

Matching between a questioned and reference DNA profile in a paternity trio case, a duo case, a case of identification, a case of sexual assault, Interpretation of Partial profile (Autosomal and Y), Analysis of atypical DNA profiling results

Module III: Statistical Weightage of DNA Evidence

Allele frequency, Genotype Frequency, Random Match Probability, Paternity Index in Trio and Duo case, Sibship Index, Likelihood Ratio, Components of a DNA report, Understanding a DNA report

SUGGESTED READING:

1. Forensic Biology by Richard Li
2. Advanced Topics in Forensic DNA Analysis by J. M. Butler.

BASKET IV: RESEARCH PROJECT [MINOR]

CUTMXXX MINOR PROJECT

CREDITS: 08

DURATION: 02-04 weeks

COURSE DESCRIPTION:

The Minor project will offer students practical experience in the field of forensic DNA profiling. Students can work with industry professionals on projects related to challenges in forensic DNA profiling, ethical issues, interpretation problems and associated challenges in the field of forensic DNA fingerprinting. This course aims to bridge the gap between academic learning and practical application, preparing students for careers in the field.

COURSE OBJECTIVES:

1. To provide students with real-world experience in applying forensic DNA profiling.
2. To develop professional skills and competencies relevant to forensic DNA profiling.
3. To facilitate the application of academic knowledge to practical scenarios, fostering a deeper understanding of real-world challenges and solutions.

COURSE OUTCOMES:

Upon successful completion of the minor project, students will be able to:

1. Apply theoretical knowledge of forensic genetics to practical, real-world problems and projects.
2. Develop and implement effective reporting strategies for cases solved by forensic DNA profiling.
3. Understand the historical cases solved by forensic DNA profiling.
4. Know the best ethical practice in generating a DNA profiling report.
5. Gain scientific knowledge in understanding and interpreting a DNA profiling result.



CO'S AND PO'S MAPPING

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	3	3	3	1	3	1	1	3	3
CO2	1	3	3	3	1	3	3	3		3	3	3
CO3	1	2	3	3			2		3		3	3
CO4	1	1	1	3	1	3	3	3	1	2	1	3
CO5	1	3	3	3	2	3	3	1	3		1	3