INDIAN ACADEMY
Degree College - Autonomous

Department of Life Sciences

Genetics

Value Added Course

‘DNA Fingerprinting Techniques’

Value Added Course

DNA FINGERPRINTING TECHNIQUES

Total Teaching Hours: 30

DNA fingerprinting, also known as DNA profiling or genetic fingerprinting, is a revolutionary forensic technique that enables the identification of individuals based on their unique DNA patterns. Developed in the 1980s by Sir Alec Jeffreys, this method exploits the inherent variations in the non-coding regions of an individual's DNA, known as short tandem repeats (STRs). Through processes like Polymerase Chain Reaction (PCR) and Gel electrophoresis, DNA fragments are amplified and separated, creating distinct profiles. These profiles, resembling barcodes, are virtually unique to each person, making DNA fingerprinting an unparalleled tool in criminal investigations, paternity testing, and identifying human remains. With its precision and reliability, DNA fingerprinting has become an indispensable tool in modern genetics, contributing not only to solving crimes but also to establishing familial relationships and unravelling the complexities of human genetics.

In 'DNA Fingerprinting Techniques' course, theory meets practice in the dynamic realm of genetic identification. In this 30 hour programme, participants will delve into the intricacies of DNA analysis, mastering techniques crucial for applications in forensics, paternity testing, and medical diagnostics. The course emphasizes experiential learning, covering Polymerase Chain Reaction (PCR), DNA extraction using cutting-edge kits, and Restriction Fragment Length Polymorphism (RFLP) methods. Participants will acquire essential skills in DNA manipulation, interpretation, and analysis, propelling them toward proficiency in the rapidly evolving landscape of genetic fingerprinting.

CObj	Course Objectives
CObj_1	To enable students to understand the methodology involved and the various techniques used in construction of DNA fingerprint.
CObj_2	To provide adequate knowledge on salient features of tools used in for extracting and analysing DNA.
CObj_3	To enable students to comprehend the various applications of DNA Fingerprinting.

CO	Course Outcomes After completion of this module, students should be able to:
CO1	Elucidate the features of various tools used in genetic engineering.
CO2	Analyze and implement the PCR principles, reagents, process and DNA sequencing techniques in molecular biology.
CO3	Discuss the ethical implications of using DNA data in various contexts, such as forensics, medicine and genetic research.
CO4	Apply the knowledge of DNA fingerprinting in practical scenarios, such as forensic investigations and medical diagnostics.
CO5	Analyze complex genetic data, troubleshoot experimental issues, interpret and evaluate the reliability of DNA fingerprinting results considering potential sources of error and propose solutions to enhance accuracy.

Course Content

Sl. No.	Unit/chapter title	Content	Number of hours	Skills developed
1	Unit- I	**DNA fingerprinting Technique** Introduction to DNA fingerprinting, scope and importance: Overview of the history and applications of DNA fingerprinting. **Basics of PCR technique:** Principles of Polymerase Chain Reaction (PCR), PCR primers. DNA extraction and purification methods. DNA amplification techniques, PCR technique. Agarose Gel electrophoresis.	05 Hrs.	Research/ Analytical/ Employability skills
2	Unit- II	**Introduction to Forensic DNA Extraction:** Understanding the challenges and considerations in extracting DNA from forensic samples. Practical demonstration and hands-on practice of DNA extraction and purification using forensic samples. Emphasis on minimizing contamination and maximizing DNA yield. Amplification of forensic DNA sample through PCR and Gel electrophoresis.	15 Hrs.	Analytical / Research/ Employable skills
3	Unit- III	Restriction Fragment Length Polymorphism(RFLP) Introduction, principle and method. Hands-on practice in DNA digestion and gel electrophoresis. Analysing RFLP pattern, comparing and matching RFLP profiles for identification purposes. Application of RFLP in mapping of genetic material and use in forensic sciences.	10 Hrs.	Research /Analytical/ Employable skills