**UNIVERSITY OF GONDAR**

**INSTITUTE OF BIOTECHNOLOGY**

**DEPARTMENT OF MEDICAL BIOTECHNOLOGY**

**FORENSIC BIOTECHNOLOGY COURSE OUTLINE-MSc. PROGRAM**

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| **Department** | **Biotechnology** | | |
| **Course Title** | Forensic Biotechnology | | |
| **Course Code** | Biot.646 | | |
| **Course Credit Point** | 3 EtCTS | | |
| **Course Credit** | 2 lecture hr/week | | |
| **Mode of Delivery** | Parallel | | |
| **Target Group** | 1st year MSc Medical Biotechnology Students | | |
| **Semester** | II | | |
| **Course Status** | Core | | |
| **Lecture Room** | Postgraduate building (F-2-6 & F-2-7) | | |
| **Pre-requisite** | | Molecular Biology, Advanced Biochemistry | | | |
| **Instructor’s contact information** | | Instructor’s Name: Aragaw Z.(*MSc., Asst. Prof.)*  Office address: Postgraduate Building | | |
|  | Consultation hours : Tuesday & Friday 8:30 – 11:30AM | | |
|  | E-mail : [zemenearagaw@gmail.com](mailto:zemenearagaw@gmail.com) | |  |
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1. **Course description**

Forensic biotechnology is a scientific technique employed by forensic scientists to identify the individual based on the DNA or other markers. Although 99% of DNA is similar to all human beings, enough of the DNA is different to differentiate one individual from another. This course introduces scientific evidence in criminal proceedings and chain of custody for evidentiary materials in crimes and terrorism; quality assurance in laboratory operations; threat containment; decontamination and remediation; health and safety of responders and analysts; and risk assessments, laboratory methods employed in the characterization and forensic analysis of biological (bacterial, viral, biological toxins, agricultural threats), general overviews of techniques and sample collection for classic biological and chemical agents (PCR, DNA sequencing methods, and immunological analyses.

1. **Course objectives**

After completing the course, the students should be able to:

* understand the application of biotechnology in forensics
* differentiate the different types of molecular markers used in forensics
* describe the biological basis of the latest DNA sequencing technology and other methods to analyze DNA
* interpret and analyze data generated from molecular markers

1. **Course Content**

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| * 1. **Introduction**   2. History of forensic science   3. Branches and application areas of Forensics |
| * 1. **Forensic Techniques and Sample collection**   2.1 General Overview  2.2 Classic, biological, and chemical agents (PCR, DNA sequencing methods, and immunological analyses   * 1. **DNA profiling structure and analysis**   2. DNA fingerprinting   3. Detailed concept of polymorphism and its classification   4. Analysis of SNP and Y-STR   5. Mitochondrial DNA |
| * 1. **Evaluation of result of DNA profiling**   2. Laboratory methods for forensic analysis   3. DNA isolation from blood   4. Purification   5. Quantification and preparation of DNA from blood   6. Frequency determination and calculations   7. Match probability and quality control |
| 1. **Forensic significance of DNA profiling**     1. Significance of profiling    2. Cases where DNA profiling is usual    3. Cases in paternity dispute, missing person identity, child swapping    4. Determination of origin of species of human and animal origin |
| 1. **Introduction to serology and genetic markers**     1. Biological macromolecules: carbohydrates, fats, serum proteins, cellular proteins    2. Concepts of Mendelian genetics    3. Structure of gene and gene mapping    4. Expression of a gene    5. Forensic significance of genetic markers |
| **6. Serogenetic markers**  6.1 History of blood groups  6.2 Biochemistry and genetics of blood groups  6.3 Polymorphic enzymes typing and HLA typing   * 1. Role of serogenetic markers in forensics |
| 1. **Legal perspectives in DNA evidence**     1. Legal standard for admissibility of DNA profiling    2. Limitations of DNA profiling    3. Procedural and ethical concern    4. Quality assurance in laboratory operations    5. Threat containment, decontamination and remediation    6. Status of development of DNA profiling in Ethiopia    7. New and future forensics technologies: DNA chips, SNPS, DNA cloning |
| 1. **The role of Microbial genetics in Forensics**     1. Dangerous bioterrorism and disease agents    2. Evidentiary materials in crimes and terrorism    3. Structure and function of microbial genome    4. Population genetics of microbial pathogens related to forensics    5. GM microorganisms: risks and detection    6. Current issues of bio-security and bio-safety    7. Health and safety of responders and analysts; and risk assessments. |

1. **Mode of Delivery**

* Lectures, group discussion and reflection, individual or group work reports, demonstrations, and self-directed assignment will be employed.

1. **Assessment Methods:**

* Assessment consists of writing term papers/seminars and individual assignments with presentation, tests, case reports and critic paper review (50%) and a two to three hour end of semester summative examination (50%)
* Students who might fail to perform well in a given assessment for different reasons will be supported through an ongoing remedial action taking into account individual cases as much as possible.
* An assessment/s might be dropped when the instructor believes there is a reason to take another assessment.

1. **Course Policies**

**a) Ground Rules:** The course is delivered based on the rules and regulations of the University and the following rules must be kept for classroom purpose.

* 100% attending is required by all students.
* There is no excuse for delay to come into the class room and late submission of assignments, laboratory reports and presentations.
* Students are highly encouraged to utmost their participation during discussion.
* Misbehaving at class is highly forbidden.
* All students are kindly requested to switch off their cell phones.

**b) Academic honesty policy:** Students are responsible for their work only. Students who cheat on exams, by whatever method, or guilty of plagiarism will, or may be given an” F” for course and dismissed permanently from class.

**c) Late work:** Students may take any missed exam by the consent of the department committee **(DC)** members. And students are expected to provide their evidence for missing exam since 5 days after the onset of the exam.

**d) Terms & conditions:** This syllabus represent a best plan for the course, but as with most plans, it is subject to changes made necessary by time, space and personal constraints as the course progresses.

1. **References:**

* ***No single text is required for the course, but several listed below and others (the not listed) are highly recommended as background information.*** 
  1. Breeze, Roger, Bruce Budowle, and Steven Schutzer. MICROBIAL FORENSICS 2nd Edition, Burlington Massachusetts: Elsevier Academic Press, 2010.
  2. Gunn, A. (2009). Essential Forensic Biology, 2nd ed. Wiley-Blackwell.
  3. Lincoln, P. J. and Thomson, J. (1998). Forensic DNA profiling protocols, 1st ed. Humana Press.

**\_\_\_\_\_\_\_\_*CLASS OPEN DAY*\_\_\_\_\_\_\_ // \_\_\_\_\_\_\_*GOOD LUCK!!\_\_\_\_\_***