**UNIVERSITY OF GONDAR**

**INSTITUTE OF BIOTECHNOLOGY**

**DEPARTMENT OF BIOTECHNOLOGY**

**COURSE SYLLABUS FOR MOLECULAR BIOLOGY (BIOT 603)**

**Course Title: Molecular Biology**

Course code: Biot. 603

ECTS: 9

Lecture: 4 hours/wk

Laboratory: 4 hours/wk

Collaborative learning: 3 hours/wk

Independent learning: 6 hours/wk

Length of time: 16 weeks

Co-requisite module: None

Pre-requisite module: None

Barred combination module: None

**Course description Description**

This module covers DNA and RNA structures, functions; various types of RNA; detailed DNA replication, transcription and post-transcriptional processing; translation; protein structure and function; organization of the genetic material; chemical synthesis, sequencing and amplification of DNA. The module consists of lectures, laboratory sessions and independent student activities. In the laboratory sessions, the students will learn basic and advanced molecular biology techniques including DNA, RNA and protein extraction; electrophoresis; PCR; Southern, Northern and Western blotting.

**Learning outcomes**

Upon successful completion of this module students will be able to:

* Discuss the chemical compositions, physical and chemical properties and functions of DNA
* Explain the structure and function of RNA
* Become familiar with how DNA replication, transcription, mRNA post-transcriptional processing and translation
* Describe the structure and function of different types of proteins
* Acquire knowledge of internal organization of the structural genes, repetitive sequence, clusters of related genes and gene family
* Discuss regulation of gene expression
* Demonstrate how DNA is synthesized using PCR and RT-PCR and how DNA is sequenced
* Explain how restriction enzymes work
* Extract DNA, RNA and protein from bacteria, plants and animals
* Carry out electrophoresis, PCR, Northern, Southern and Western blotting

**Course content Content**

DNA structure and function

RNA structure and function

DNA replication, transcription and posttranscriptional processing

Translation, post-transcriptional modification

Protein structure and function

Organization of the genetic material

Chemical synthesis, sequencing and amplification of DNA

**Course Delivery**

This module is based on lectures, group discussions, laboratory exercises, student mini-projects, student collaborative learning and student self-learning.

**Assessment Criteria**

There will be regular student assessment of module assignments, oral presentations, laboratory reports and final written exam. Grades are computed based on the results of these module assignments, presentations, laboratory reports and the final exam.

**Role of Instructors and Students**

***Instructors***

Give lectures

Moderate and guide interactive learning

Supervise student self and collaborative learning

Instruct laboratory sessions

Assess the performance of students

***Students***

Attend lectures

Actively participate in interactive, self and collaborative learning

Work laboratory exercises

Read materials that enrich their knowledge of subject area such as books, journal articles, etc.

Prepare term papers in groups or individually and present orally

Prepare laboratory reports

**Teaching Support and Inputs**

***Class room teaching-learning***

White board

White board markers and other stationeries

Board erasers

LCD projector

Transparency projector

Laptop

***Practical***

All molecular biology apparatus, kits and various types of chemicals including reagents, plasmid vectors, autoclave, centrifuges, PCR machines, 4 °C refrigerator, -20 °C freezer, -80 °C deep freezer, pipettes (various volumes), laminar airflow cabinet, incubator (37 °C), water bath (that can be adjusted to different temperatures), shaker, heating blocks, magnetic stirrers, pH meter, sensitive balance, electronic balance, various glassware, disposable items.

**Module requirements**

Students are expected to:

Attend lectures regularly

Actively participate in student self and collaborative learning

Read books, journal articles, etc. of the subject area

Work on assignments and make oral presentations

Carry out laboratory exercises regularly and prepare laboratory reports

**Reading Materials:**

1. Brown, T., A. (2001). *Gene cloning and DNA analysis: An introduction*. 4th edition. Blackwell Science Ltd.
2. Glick, B. R. and Pasternak, J., J. (1998). *Molecular biotechnology: Principles and applications of recombinant DNA*. 2nd edition. ASM press. Washington, D.C.
3. Primrose, S., Twyman, R., M. and Old, R., W. (2001). *Principles of gene manipulation*. 6th edition. Blackwell Science Ltd.