**UNIVERSITY OF GONDAR**

**INSTITUTE OF BIOTECHNOLOGY**

**DEPARTMENT OF AGRICULTURAL BIOTECHNOLOGY**

**COURSE SYLLABUS FOR MOLECULAR PLANT BREEDING**

**Course Title:** **Molecular Plant Breeding**

**Course Code: Biot.614**

**ECTS: 5**

**Lecture: 3 hours/week**

**Independent learning: 4 hours/week**

**Collaborative learning: 2 hours/week**

**Length of time to complete module: 16 weeks**

**Pre-requisite module: Molecular Biology (Biot. 616)**

**Co-requisite: None**

**Barred combination module: None**

**Course Description**

This module first covers basic plant breeding principles such as different mating systems and factors controlling these mating systems, the genetic structures of plant populations, phenotypic variations in plants and their genetic bases, the basic schemes in plant breeding and genetic manipulations in plant breeding. Following this basic introduction of plant breeding, mutagenesis, genetic mapping, principles and methods of different molecular markers, marker assisted selection and genomics will be covered. The module has lecture component, student self and collaborative activities, assignments, oral presentations and laboratory activities.

**Learning outcomes**

* Discuss different mating systems and methods controlling these mating systems in plants
* Explain genetic structures of plant populations on the basis of mating systems
* Become familiar with the basic schemes in plant breeding
* Discuss genetic manipulations in plant breeding
* Explain principles and methods of different molecular markers and perform some of them
* Describe how to select mapping populations and construct genetic map
* Discuss how marker assisted selection contributes to improving crop plants

**Course Content**

Objectives of plant breeding

Mating systems and genetic structures of plant populations

Phenotypic variations in plants and their genetic bases

Genetic manipulations in plant breeding

Mutagenesis

Principles and methods of molecular markers

Genetic mapping

Marker assisted selection

Genomics

**Course Delivery**

This module is based on lectures, group discussions, laboratory exercises, 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 equipment and various types of chemicals including fume hood, autoclave, 4 °C refrigerator, PCR machines, -20 °C freezer, -80 °C deep freezer, pipettes (various volumes), double distiller, ovens, microwave , incubator (37 °C), water bath with temperature control, hot plate, centrifuge, vortex, microscope, shaker, heating blocks, magnetic stirrers, pH meter, sensitive balance, electronic balance, various glassware, disposable items, reagents.

**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 oral presentations

Carry out laboratory exercises regularly

**Reading Materials:**

1. Exegetics Ltd. Edington, Eilts. Glick, B. R. and Pasternak, J., J. (1998). *Molecular Biotechnology: Principles and Applications of Recombinant DNA*. 2nd edition. ASM Press. Washington, D.C.
2. Gupta, P. K. (2004). Elements of Biotechnology. Rastogi Publications. Meerut.
3. Satyanarayana, U. (2005). Biotechnology. Books and Allied (P) Ltd. Kolkata.
4. Varshney, R.K. and Tuberosa, R. (2007). Genomics-Assisted Crop Improvement. Genomics Approaches and Plant forms. Vol. 1. Springer…
5. Weising, K., Nybom, H., Wolff, K., Kahl, G. (2005). DNA Fingerprinting in Plants. Principles, Methods, and Applications. 2nd edition. CRC Press. Taylor and Francis. Boca Raton, London, New York, Singapore