Course contents for Plant Molecular Biology and Crop Improvement

1. **Faculty:** FLSB
2. **Course Code:**
3. **Course Title:** Plant Molecular Biology and Crop improvement
4. **Number of Credits:** Three
5. **Course objectives:**

   Plants are indispensible part of human life. For food and sustainability of the environment there is no alternative of plants. It is really important to understand the basic molecular mechanism underneath plant physiology, their growth and development. This course mainly focuses on various molecular techniques and tools which are used in crop improvement eg. Marker assisted selection in plant breeding, production and analysis of plant transgenics. Genetic engineering of plants for improvement of crop productivity and understanding the genetic basis of biotic and abiotic stress tolerance are also discussed in this course.

6. **Minimum prerequisites for taking this course, if any:**

   Basic knowledge of genetics, biochemistry and molecular biology is required.

7. **Course structure with units, if applicable:**

   a. **Plant Genome Organization and its Analysis:** Organization of nuclear, mitochondrial and chloroplast genome, linkage map, physical mapping of genome, use of molecular markers in genome mapping, genome sequencing and genome annotation. Maker assisted breeding and selection of quantitative trait loci.

   b. **Analysis of the plant gene expression:** Microarray, SAGE, Dot-blot analysis, Northern, Semi-quantitative RT-PCR, Real-time PCR/qRT-PCR.

   c. **Genetic Transformation of Plants:** Agrobacterium mediated gene transfer, Agrobacterium based vectors, Genetic organization of Ti plasmids, Viral vectors and their application. Direct gene transfer methods; chemical methods, electroporation, microinjection, particle bombardment. Selection of clones, marker and reporter genes in screening methods.

   d. **Engineering Plants:** Genetic engineering to improve crop productivity; alleviation of abiotic stress such as drought, flood, temperature and soil salinity. Manipulation of photosynthesis**.** Application of biotechnology in biotic stress tolerance; e.g, herbicide resistance, insect resistance and disease resistance.

   e. **Molecular pharming and industrial products:** Application of Plant biotechnology for the production of high value recombinant protein in the plant system.

8. **Suggested Readings**:

   a. Introduction to Plant Biotechnology: H. S. Chawla
   b. Biochemistry & Molecular Biology of Plants: Bob. B. Buchanan
   c. Molecular Plant Breeding: Yunbi Xu
   d. Principles of plant genetics and breeding: George Acquaah
   e. Plant Biotechnology: Nigel Halford

9. **Evaluation:**

Theory:	Mid-semester Written Examination	: 40% Marks
	End-semester Written Examination	: 40% Marks
	Quiz / Assignment/Presentation (oral / poster)/other	: 20% Marks