Indian Institute of Technology Guwahati Proposal for a New Course / Revision of a Course

Course Number & Title: BT 607 & Plant Biotechnology

L-T-P-C: 3-0-0-6

Type of Letter Grading (Regular Letter Grades / PP or NP Letter Grades): Regular Letter Grades

Kind of Proposal (New Course / Revision of Existing Course): Revision of Existing Course

Offered as (Compulsory / Elective): Electives

Offered to: B Tech/M Tech/PhD

Offered in (Odd/ Even / Any):Any

Offered by (Name of Department/ Center):BSBE

Pre-Requisite: Nil

Preamble / Objectives (Optional): The purpose of this course is to educate students about the fundamental concepts of plant cell system, plant transformation, genetic engineering, bioprocess technology and their related applications, thus preparing them to meet the challenges of the new and emerging areas of plant biotechnology industry.

Course Content/ Syllabus

Plant Development; Plant culture media and growth regulators; Cellular totipotency and micropropagation: clonal propagation, organogenesis, shoot-tip and meristem culture, somatic embryogenesis; Haploid production: Androgenesis, Gynogenesis; Triploid production; Callus culture and somaclonal variation; Somatic hybridization: protoplast fusion and culture. Plant Metabolic Engineering; Secondary metabolite production: plant products of industrial importance, cell suspension culture, growth kinetics and cell viability, nutrient media optimization; Scale-up studies: elicitors and precursors; Modes of culture: batch, fed-batch and continuous cultures, cell immobilization, biotransformation; Principles, design and operation of bioreactors: instrumentation, agitation, aeration system, temperature, foam control; Downstream processing: extraction, cell disruption, chromatography and purification of metabolites. Plant transformation: Vector design: classical/ gateway, marker genes, marker-free technology; transformation methods: Physical, chemical and biological; Transgenic plant characterization; Genome editing; Molecular markers and marker assisted breeding; Genetic engineering approaches for biotic and abiotic tolerance, improvement of vield and nutritional stress quality. Plant gene structure, function and regulation; Forward and reverse genetics for gene mining, Functional characterization of plant genes:overexpression and gene silencing, RNA interference, virus-induced gene silencing (VIGS) tools, Plant microRNAs and their targets; Whole genome and single cell expression profiling, transcriptomics, bioinformatics tools for plant functional genomics.

Books (In case UG compulsory courses, please give it as "Text books" and "Reference books". Otherwise give it as "References".

Texts book and References: (Format: Authors, *Book Title in Italics font,* Volume/Series, Edition Number, Publisher, Year.)

1.	Bhojwani S. S. and Dantu P. K. Plant Tissue Culture: An Introductory Text. Springer, India, 2013
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2. Davey M. R. and Anthony P. Plant Cell Culture:Essential Methods (1st Edn.). John Wiley and Sons Ltd. Publishers. West Sussex, UK, 2010

3. Grotewold E. Methods in Molecular Biology – Plant functional genomics. Humana Press, Totowa, New Jersey, USA, 2003.

4. A. Slater, N. Scott and M. Fowler, Plant Biotechnology: The genetic manipulation of plants, Oxford University Press, 2003.

5. Brown T.A. Gene cloning a DNA analysis – An Introduction (6th Edn.). John Wiley and Sons

	Ltd. Publishers. West Sussex, UK, 2010.
6.	Bhojwani S. S. and Razdan M. K. Plant Tissue Culture-Theory and Practice. Elsevier,
	Amsterdam, 1996
7.	M. L Shuler and F. Kargi., Bioprocess Engineering, Prentice Hall Inc., 2002.