Jaypee Institute of Information Technology

INTEGRATED M. TECH BIOTECHNOLOGY

Course Descriptions

SEMESTER 9

PLANT DISEASE AND BIOTECHNOLOGY

Detailed Syllabus

Lecture-wise Breakup

Course Code	15B1NBT833	**Semester** Odd **(specify Odd/Even)**	**Semester** Summer **Session** 20 Month from **…**
Course Name	Plants Diseases & Biotechnology		
Credits	3	**Contact Hours**	3

Faculty (Names)	**Coordinator(s)**	1. Prof. S Krishna Sundari
	Teacher(s) (Alphabetically)	1. Prof. S Krishna Sundari

S.No.	Description	Cognitive level (Blooms taxonomy)
CO833.1	Summarize different types of plant diseases, classification of pathogens and host responses.	Understanding Level Level II
CO833.2	Compare different disease control mechanisms, identify Risks involved, prepare disease fact sheets	Understanding Level Level II
CO833.3	Apply modern tools for disease management and achieve sustainable agricultural productivity	Applying Level Level III
CO833.4	Examine advances in the field of plant biotechnology to develop disease resistant plants	Analysing Level Level IV

Module No.	**Title of the Module**	**Topics in the Module**	**No. of Lectures for the module**
1.	Introduction	Agriculture productivity & Global food prospects, Impact of disease on crop productivity, existing methods (chemical pesticides, insecticides) of plant disease control	3
2.	Plant Physiology & plant genome	Plant physiology, Genetic basis of Plant genes, growth and development, response to disease/infection in plants, plant signaling pathways	8
3.	Plant diseases	Plant pathology and disease cycle, principle groups of plant pathogens belonging to:Bacteria, fungus, virus, nematodes, insect pests, other factors, diseases with major impact on plant productivity	10
4.	Molecular plant pathology	Molecular basis of genetic modification and crop improvement, RNAi technology, Baculovirus mediated bio-control and other tools to generate disease resistance	5
5.	Plant disease control	Classical breeding to modern genetic engineering tools for plants, plant secondary metabolites and their role in	5

		systemic acquired resistance (SAR)	
6.	GM plants	Enhancing resistance with plant genes, developing genetically modified plants with improved disease resistance	5
7.	Bio-control methods	Integrated pest management, Pathogen derived resistance, Antimicrobial proteins, Plant bodies, PGPR (plant growth promoting rhizobacteria) and their role in disease control	6
		Total number of Lectures	**42**

Evaluation Criteria

Components	**Maximum Marks**
T1	20
T2	20
End Semester Examination	35
TA	25 (…)
Total	**100**

Recommended Reading material: Author(s), Title, Edition, Publisher, Year of Publication etc. (Text books, Reference Books, Journals, Reports, Websites etc. in the IEEE format)	
1.	Plants, genes and crop biotechnology. Maarten Chrispeels, David Sadava, 2nd edition, published by American society of plant biologists & ASPB foundation.
2.	Molecular Biotechnology: principles and Applications, Bernard Glick, Jack J Pasternack, Cheryl Patten, 4th edition, ASM press

PBL Component: A research paper based analysis and study on advances in the field of plant biotechnology plant disease management to develop disease resistance in plants and achieve goals of sustainable crop protection

AQUACULTURE
Detailed Syllabus
Lecture-wise Breakup

Course Code	15B1NBT834	**Semester Summer**	**Semester Summer Session** 2021-22 Month from May- July
Course Name	Aquaculture		
Credits	**4**	**Contact Hours**	**9**

Faculty (Names)	**Coordinator(s)**	Dr. Priyadarshini
	Teacher(s) (Alphabetically)	1.Dr. Priyadarshini, 2.Dr. Ashwini Mathur

COURSE OUTCOMES		**COGNITIVE LEVELS**
C511.1	Explain scope & significance of aquaculture at global and Indian scenario	**Understand level (C2)**
C511.2	Compare different cultivation techniques for aquatic organism	**Understand level (C2)**
C511.3	Apply sustainable aquaculture practices related to environment, community, business and farm management	**Apply Level (C3)**
C511.4	Identify hatchery and cultivation technology	**Analyze level (C4)**

Module No.	**Title of the Module**	**Topics in the Module**	**No. of Lectures for the module**
1.	**Introduction**	History, definition, scope and significance of aquaculture, comparison of aquaculture with agriculture and commercial fisheries. Different aquaculture systems. Aquaculture - Global and Indian Scenario.	**2**
2.	**Pond ecology**	Ecology of culture ponds. Nutrient cycles, Laws of limiting factor. Fertilizations and manuring. Liming and application of fertilizers and manures. Significance and important groups of phytoplankton, zooplankton and benthos in culture ponds. Nutrient dynamics, algal blooms.Management of water and soil quality parameters. Correction of pH, measures for increasing the concentration of oxygen and reducing the concentration of ammonia and hydrogen sulphide.	**4**
3.	**Cultivable Freshwater fishes**	Criteria for the selection of species, Cultivable freshwater fishes- carps, airbreathing fishes, tilapia, trout, freshwater prawn, frogs.	**4**
4.	**Brackishwater culture and mariculture**	Brackishwater resources and fishes of commercial importance – Milk fish, mullet, pearl spot, seabass, shrimps, crabs; selection of site. Major brackish water culture systems in India, prawn filtration, Basabhanda, kharlands – Different organisms in Mariculture – mussel, edible oyster, pearl oyster and sea weeds. Scope of open sea farming in	**4**

		India. Important fin fishes cultured in the open seas and the culture systems. Present status and recent developments in mariculture.	
5.	**Culture of Prawns, Molluscs and Frog**	Cultivable species of freshwater prawns and their biology – culture of Macrobrachium rosenbergii, Freshwater pearl culture – Present status of freshwater pearl culture and production in India. Prospects of culturing frog in India.	**4**
6.	**Aquaculture for stable environment**	Sewage fed fish culture, sewage treatment, Sewage cum fish culture in India. Fish in relation to public health, Larvivores fishes and mosquito eradication using fishes.	**4**
7.	**Reservoir fisheries**	Major reservoirs in India, measures for increasing production from reservoirs in India and abroad, Game fishery.	**2**
8.	**Integrated Farming**	Recent development in integrated farming, Rice cum fish culture, Duck cum fish culture, Poultry cum fish culture and Pig cum fish culture. Organic aqua farming. Fish culture in cages and pens. Running water fish culture.	**6**
9.	**Systems in freshwater Aquaculture**	Fish culture in cages and pens, race way, indoor tanks, canals, silo culture, Aquaponics. Monoculture, polyculture, composite fish culture.	**4**
10.	**Hatchery technology, design and managment**	Criteria for site selection of hatchery and nursery, design and function of incubators, hatchery system-design and operation, hatchery protocols, rearing technology.	**4**
11.	**Culture of aquatic plants**	Cultivation of different aquatic plants.	**2**
12.	**Economics**	Marketing and economics of fish seed and fish.	**2**
Total number of Lectures			**42**

Evaluation Criteria

Components	**Maximum Marks**
T1	20
T2	20
End Semester Examination	35
TA	25 (Asignment1, Assignment2)
Total	**100**

Recommended Reading material: Author(s), Title, Edition, Publisher, Year of Publication etc. (Text books, Reference Books, Journals, Reports, Websites etc. in the IEEE format)

1.	T.V.R. Pillay, Aquaculture: Priciples & Practices, Fishing News Books, New Book, Cambridge University Press, Cambridge, UK
2.	New M B, Freshwater prawn farming, 2000, CRC Publication.
3.	R. L. Welcomme: Inland Fisheries: Ecology & Management, 2001, Fishing News Books.
4.	S De Silva (ed): Reservoir and culture based Fisheries: Biology & Management, 2001, ACAIR Proceedings.
5.	M. C. M. Beveridge and B. J. McAndrew: Tilapias: Biology & exploitations, 2000, Kluwer Academic Publishers, London.

PBL: Students can prepare a report on current scenario of fish industry. They can also prepare report on site selection of hatchery and nursery.

BIOTECHNIQUES LAB-II

Course Code	**14M17BT271**	**Semester** Even **(specify Odd/Even)**	**Semester** II **Session** Month from January
Course Name	**Biotechniques Lab-II**		
Credits	3	**Contact Hours**	6

Faculty (Names)	**Coordinator(s)**	Prof. Pammi Gauba
	Teacher(s) (Alphabetically)	Dr. Chakresh K. Jain, Prof. Indira P. Sarethy, Prof. Pammi Gauba, Prof. Reema Gabrani, Dr. Shweta Dang

COURSE OUTCOMES		**COGNITIVE LEVELS**
CO1	Experiment with high end analytical techniques in biotechnology	**Apply (Level C3)**
CO2	Develop basic and applied skills in cell culture	**Apply (Level C3)**
CO3	Examine and analyse disease-specific drug targets	**Analyze (Level C4)**
CO4	Analyse bioactive compounds from plant and microbial systems	**Analyze (Level C4)**

Module No.	**Title of the Module**	**List of Experiments**	**CO**
1.	Analytical techniques	To run High-performance liquid chromatography (HPLC); prepare and analyse curcumin extract by HPLC; purification of plant extract	3
2.	Cell culture techniques	Preparation and sterilization of media for cell culture; subculture of animal cell lines; analysis and counting of adherent cells; cell cytotoxicity determination	3
3.	Drug target analyses	SDS-PAGE analysis and fluorescent staining	3
4.	Natural product analyses	Extraction of antioxidant compound from *in vitro* grown plant and bacteria; purification of compound; antioxidant capacity analyses of extracts	3

Evaluation Criteria

Components	**Maximum Marks**
Mid-Term Viva	20
Day-to-Day (Lab record, attendance, performance)	60
Final Viva	20
Total	**100**

Project Based Learning: The students learn HPLC, cell culture techniques, natural products characterization, which are required for Biotech and pharmaceutical industry.

Recommended Reading material: Author(s), Title, Edition, Publisher, Year of Publication etc. (Text books, Reference Books, Journals, Reports, Websites etc. in the IEEE format)	
1.	Biotechnology Procedures and Experiments Handbook **http://site.iugaza.edu.ps/mwhindi/files/BIOTECHNOLOGY-PROCEDURES-AND-EXPERIMENTS-HANDBOOK.pdf**
2.	Cornelia Kasper, Verena Charwat, Antonina Lavrentieva, "Cell Culture Technology" Springer, 2018
3.	ChukwuebukaEgbuna, Jonathan ChinenyeIfemeje, Jaya VikasKurhekar, Stanley ChidiUdedi, Shashank Kumar, "Phytochemistry Volume 2" Apple Academic Press, 2019
4.	Methods standardized in lab
5.	Lab manual on Biotechniques http://inpressco.com/lab-manual-on-biotechniques/

Course Code	**18M11G E11 1**	**Semester** Odd	**Semester** I **Session** 2021-2022
Course Name	**Research Methodology & Intellectual Property Rights**		
Credits	2	**Contact Hours**	2-0-0

Faculty (Names)	**Coordinator(s)**	Prof. B. P. Chamola
	Teacher(s) (Alphabetically)	Prof. B. P. Chamola

COURSE OUTCOMES:		**COGNITIVE LEVELS**
After pursuing the above-mentioned course, the students will be able to:		
C101.1	explain the basic concepts and types of research	Understanding Level (C2)
C101.2	define a research problem, its formulation, methodologies and analyze research related information	Analyzing Level (C4)
C101.3	explain research ethics, understand IPR, patents and their filing related to their innovative works.	Understanding Level (C2)
C101.4	explain and analyze the statistical data and apply the relevant test of hypothesis in their research problems	Analyzing Level (C4)

Module No.	Title of the Module	Topics in the Module	No. of Lectures for the module
1.	Research	What is research? Types of research. What is not research? How to read a Journal paper?	3
2.	Report writing	How to write report? Use of Mendeley in report writing. How to write a research paper? Problem identification and solving.	4
3.	Ethics, IPR and Research methodologi es	Research ethics, patents, intellectual property rights, plagiarism regulation 2018. Steps in research process and common methodologies to attempt solution to research paper.	8
4.	Basics of statistics and probability distributions	Basic statistical concepts. Handling of raw data, Some common probability distributions.	7
5.	Test of hypothesis and regression analysis	Hypothesis testing. Parametric and non-parametric data, Introduction to regression analysis.	8
Total number of Lectures (Course delivery method: open ended discussion, guided self-study, lectures)			**30**

Evaluation Criteria
Components Maximum Marks
Mid Term Examination 30
End Semester Examination 40
Assignments 30 (Quiz, Assignments)
Total 100

Project-based learning: Students divided in small groups will be assigned topics related to patents, intellectual property rights, plagiarism, and statistics. Students can write a report/review paper and find its similarity through plagiarism software available online. Students may collect data and test the relevant hypothesis. They may study some data set and do its regression analysis. The main purpose is to expose students to a wider arena of applicable knowledge of the subject.

Recommended Reading material: Author(s), Title, Edition, Publisher, Year of Publication etc. (Text books, Reference Books, Journals, Reports, Websites etc. in the IEEE format)
Stuart Melville and Wayne Goddard, Research Methodology: An Introduction for Science & Engineering Students, Kenwyn, South Africa: Juta & Co. Ltd., 1996.
Kothari, C.R., Research Methodology: Methods and Techniques, New Age International, New Delhi, 2009.
Kumar, Ranjit, Research Methodology: A Step-by-Step Guide for Beginners, 2nd Edition, Sage Publications Ltd., 2005.
Ramappa, T., Intellectual Property Rights Under WTO, S. Chand, New Delhi, 2008.
Wayne Goddard and Stuart Melville, Research Methodology: An Introduction, Kenwyn, South Africa: Juta & Co, 2001.