

**JAYPEE INSTITUTE OF
INFORMATION AND
TECHNOLOGY**

INTEGRATED M. TECH BIOTECHNOLOGY

(Summer Semester)

Detailed Syllabus
Lab-wise Breakup

Course Code	17M15BT112	Semester ODD (specify Odd/Even)	Semester: Summer Session 2023 -2024
Course Name	Biotechniques Lab-II		
Credits	3	Contact Hours	6

Faculty (Names)	Coordinator(s)	Dr Sonam Chawla
	Teacher(s) (Alphabetically)	

C170.1		Cognitive level
C170.2	Develop basic and applied skills in cell culture	Apply Level (C3)
C170.3	Examine and analyse disease-specific drug targets	Apply Level (C3)
C170.4	Analyse bioactive compounds from plant and microbial systems	Analyze (Level C4)
C170.1	Experiment with high-end analytical techniques in biotechnology	Analyze (Level C4)

Module No.	Title of the Module	List of Experiments	No. of Labs
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 <i>in vitro</i> 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

Recommended Reading material: Author(s), Title, Edition, Publisher, Year of Publication etc. (Text books, Reference Books, Journals, Reports, Websites etc. in the IEEE format)	
0.	Biotechnology Procedures and Experiments Handbook
1.	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	18M11GE111	Semester SUMMER	Semester IX Session 2023-24
Course Name	Research Methodology and Intellectual Property Rights		
Credits	2	Contact Hours	2-0-0
Faculty (Names)	Coordinator(s)		
	Teacher(s) (Alphabetically)		
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 methodologies	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.	

PLANT DISEASE AND BIOTECHNOLOGY

Detailed Syllabus

Lecture-wise Breakup

Course Code	15B1NBT833	Semester: Summer (specify Odd/Even/summer)	Session 2023-24
Course Name	Plants Diseases & Biotechnology		
Credits	3	Contact Hours	3
Faculty (Names)	Coordinator(s)	Dr. Sonam Chawla	
	Teacher(s) (Alphabetically)		

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 systemic acquired resistance (SAR)	5
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	

PBL: Students will be asked to identify a biotic stressor negatively impacting crop production and present a current biotechnological approach (research paper) proposing a solution to the stressor/pathogen. The student will prepare a report and will be evaluated based on a viva and report.

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, 2 nd edition, published by American society of plant biologists & ASPB foundation.
2.	Molecular Biotechnology: principles and Applications, Bernard Glick, Jack J Pasternack, Cheryl Patten, 4 th edition, ASM press

AQUACULTURE
Detailed Syllabus
Lecture-wise Breakup

Course Code	15B1NBT834	Semester Summer	Semester Summer Session 2023-24 Month from May- July
Course Name	Aquaculture		
Credits	4	Contact Hours	9

Faculty (Names)	Coordinator(s)	Dr. Ashwani Mathur
	Teacher(s) (Alphabetically)	Dr. Ashwani 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, Basabhandra, kharlands – Different organisms in Mariculture – mussel, edible oyster, pearl oyster and sea weeds. Scope of open sea farming in India. Important fin fishes cultured in the open seas and the culture systems. Present status and recent developments in mariculture.	4

5.	Culture of Prawns, Molluscs and Frog	Cultivable species of freshwater prawns and their biology – culture of <i>Macrobrachium rosenbergii</i> , 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 management	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 (Assignment1, Assignment2)
Total	100

Project Based Learning: students will understand the importance of aquaculture in economic growth and as potential entrepreneurial opportunity by understanding the types of aquacultures, pond and farm design, life cycles of fishes, crustaceans, molluscs and other aquatic flora and fauna, the economic attributes of sustainable fish farming and recent techniques of aquaculture. Students are encouraged to analyze the importance of aquaculture in India and its contribution to the economic growth of the nation

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: Principles & 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.