# JAYPEE INSTITUTE OF INFORMATION AND TECHNOLOGY

## INTEGRATED M. TECH BIOTECHNOLOGY

**9th Semester**
**(Summer Semester)**

**PLANT DISEASE AND BIOTECHNOLOGY**

**Detailed Syllabus**

**Lecture-wise Breakup**

| | | | |
|---|---|---|---|
| **Course Code** | 15B1NBT833 | **Semester : Summer** | **Semester** Summer **(IX) AY 2022-23** |
| **Course Name** | Plants Diseases & Biotechnology | | |
| **Credits** | 3 | **Contact Hours** | 3 |

| | | |
|---|---|---|
| **Faculty (Names)** | **Coordinator(s)** | Dr Sonam Chawla |
| | **Teacher(s) (Alphabetically)** | Dr Sonam Chawla |
| 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** |

**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: Students prepare a writeup on biotechnological applications that have improved the crop productivity in various global scenarios. Assessment is done via viva and report content

**AQUACULTURE**
**Detailed Syllabus**
**Lecture-wise Breakup**

| | | | |
|---|---|---|---|
| **Course Code** | 15B1NBT834 | **Semester Summer** | **Semester Summer Session** 2016-17 **Month from May- July** |
| **Course Name** | Aquaculture | | |
| **Credits** | **4** | **Contact Hours** | **9** |

| | | |
|---|---|---|
| **Faculty (Names)** | **Coordinator(s)** | Dr. Ashwani Mathur |
| | **Teacher(s) (Alphabetically)** | Prof Neeraj Wadhwa<br>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, Basabhanda, 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 *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** |

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. |

## Detailed Syllabus
### Lab-wise Breakup

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|---|---|---|---|
| **Course Code** | **17M15BT112** | **Semester ODD (specify Odd/Even)** | **Semester IX Session** 2022 -2023 |
| **Course Name** | **Biotechniques Lab-II** | | |
| **Credits** | 3 | **Contact Hours** | 6 |

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|---|---|---|
| **Faculty (Names)** | **Coordinator(s)** | Dr Ashwani Mathur |
| | **Teacher(s) (Alphabetically)** | Dr Ashwani Mathur, Prof Neeraj Wadhwa, Dr. Sonam Chawla, Dr. Vibha Gupta |

| **COURSE OUTCOMES** | |
|---|---|
| **C170.1** | Experiment with high end analytical techniques in biotechnology |
| **C170.2** | Develop basic and applied skills in cell culture |
| **C170.3** | Examine and analyse disease-specific drug targets |
| **C170.4** | Analyse bioactive compounds from plant and microbial systems |

| **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 *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** |

**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.** | 5. 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 | 18M11GE111 | Semester SUMMER | Semester IX Session 2022-23 |
|---|---|---|---|
| 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** | **30** |
| (Course delivery method: open ended discussion, guided self-study, lectures) | | | |

**Evaluation Criteria**

| Components | Maximum Marks |
|---|---|
| Mid Term Examination | 30 |
| End Semester Examination | 40 |
| Assignments | 30 (Quiz, Assignments) |
| **Total** | **100** |

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| **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. |