JAYPEE INSTITUTE OF INFORMATION TECHNOLOGY

M.Sc. ENVIRONMENTAL BIOTECHNOLOGY (IVSEMESTER)

2023-2024

Detailed Syllabus

Programme Name: M.Sc. Microbiology

Course Code	**19M27BT211**	**Semester -EVEN**	**Semester** -IV **Session:** 2023-2024 **Month from:** Jan - June
Course Name	**Dissertation**		
Coordinator	**Dr. Ankisha Vijay**		
Credits	10	**Contact Hours**	20

COURSE OUTCOMES: Upon completion of this course, students will be able to		**COGNITIVE LEVELS**
	Define a research problem relevant to health, environment, industry, and society	Understanding Level Level II
C250.2	Interpret and organize the existing literature on the chosen topic to formulate a hypothesis	Applying Level Level III
C250.3	Analyze experimental methodologies for the chosen research problem	Analyze level Level IV
C250.4	Analyze experimental findings	Analyze level Level IV
C250.5	Communicate research findings both orally and in written form	Create Level Level VI

PBL Component: The students will define a research problem relevant to health, environment, industry, and society after literature mining. They will design a methodology for obtaining solution to the defined problem and execute it. The students will develop skills to analyze their findings and communicate them to the scientific community both orally and in written form.

Market Research and Data Analysis

M.Sc (IV Sem)

Detailed Syllabus

Lecture-wise Breakup

Course Code	22M22BT211	**Semester Summer**	**Semester Summer Even Sem** **Session** 2023-24 **Month from Jan - July**
Course Name	Market Research and Data Analysis		
Credits	**3**	**Contact Hours**	**42**

Faculty (Names)	**Coordinator(s)**		Dr. Ashwani Mathur
	Teacher(s) (Alphabetically)		Dr. Ashwani Mathur
COURSE OUTCOMES			**COGNITIVE LEVELS**
CO1	Understand Market Research, its application in entrepreneurial and start-up initiatives		**Understand level (C2)**
CO2	Interpret Segmentation and market sizing and their role in Market Research design		**Apply Level (C3)**
CO3	Utilize software and tools for data collection and analysis		**Apply Level (C3)**
CO4	Analyze market research reports of collected or available segmented data		**Analyze level (C4)**
Module No.	**Title of the Module**	**Topics in the Module**	**No. of Lectures for the module**
1.	Introduction	Introduction of Market Research, Market Research Industry size and potential, future prospects of Market Research sector	**3**
2.	Entrepreneurship in Market Research	Understand independent market research strategy, knowledge of market potential	**3**
3.	Market research – Categorization and strategic approach	Types of Market research based on problem statements (Ambiguous, somewhat defined and well defined problem), Market Research based on data source (Primary and Secondary data), Based on strategic approach (Exploratory and Descriptive Research)	**4**
4.	Data collection strategy	Identifying and formulating the problem, Methods of Data collection, Nature of Data: primary data, secondary data, big data. Familiarize with data sources and approach to collect data for market sizing, company profiling	**5**

5.	Company profiling	Knowledge of competitor analysis based on Market Share, Understanding company revenue and market share, demographic analysis of competitor	**5**
6.	Product analysis	Categorization of products, analysis of market share of biological / therapeutic products based on available databases, data collection and analysis.	**4**
7.	Customer and Market segmentation	Diffusion of innovation theory, knowledge of Anstoff's matrix for exploring potential market, Knowledge of different attributes of market segmentation.	**4**
8.	Data collection and analysis	Familiarization with different databases used for collection of data for market research report, data collection through LinkedIn scouting, sample size estimation, Questionnaire designing and familiarizing with classification, open ended and close ended questions	**6**
9.	Statistical tools and Data analysis softwares	Inferential statistical approaches for data analysis (hypothesis testing using student T-test, F- test) for data collected for the assigned PBL project, Use of MS Excel, SPSS and Tableau software. Understanding of ODK tool for primary survey (data collection).	**4**
10.	Preparation of Report	Report preparation template, components of Market Research report, Data presentation layout	**4**
		Total number of Lectures	**42**

Evaluation Criteria

Components	**Maximum Marks**
T1	20
T2	20
End Semester Examination	35
TA	25 (Market Research Report preparation /Assignment)
Total	**100**

Project Based Learning: Students will understand the importance of Market Research in start-up ecosystem and entrepreneurial initiatives. They will learn different strategies of segmentation, data collection databases, primary data collection strategies and prepare a segmented market research 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.	A concise guide to market research by Marko Sarstedt and Erik Mooi, Springer Publication, 2020
2.	The market research tool box by Edward F McQuarrie, Sage Publication, 2015
3.	Entrepreneurship in Independent Market Research & Strategic Digital Marketing by Mirdul Amin Sarkar, Evincepub Publishing, 2020
4.	Recent Market Research reports (available online)

Agriculture Biotechnology

Integrated M.Tech, M.Tech, MSc (Microbio), MSc (Environment)
(Elective Course)

Detailed Syllabus

Lecture-Wise Breakup

Course Code	**22M12BT111**	**Semester:**	**Semester: II, IV, Session: Even 2024** Month from: Jan to June	
Course Name	**Agriculture Biotechnology**			
Credits	3-0-3		**Contact Hours**	**3**

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

COURSE OUTCOMES: Upon completion of the course, students will be able to		**COGNITIVE LEVELS**
CO.1	Infer applications of agriculture biotechnology for improved quality and productivity.	Understand Level, C2
CO.2	Relate Physiological & Molecular mechanisms of plant, its genome and extra chromosomal genetic information.	Apply Level, C3
CO.3	Apply different agricultural & biotechnological methods to meet National food security goals.	Apply Level, C3
CO.4	Connect advances in agriculture biotechnology to quality control, transgenics, regulations & agriculture policies.	Analyze Level, C4

Module No.	**Subtitle of the Module**	**Topics in the module**	**No. of Lectures for the module**
1.	Overview of agriculture biotechnology & NAP	Introduction and significance of biotechnology in agriculture, Climate change and its impact on agriculture, National agriculture Policy, food security, SDG & agriculture, quality control in agriculture & GAP	6
2.	Plant growth & Physiology	Fundamentals of Plant growth, Photosynthesis and genes involved, symbiotic and non-symbiotic nitrogen fixation, Role of lectins,	6

		nod genes, nif genes, Structure, function and regulation of nitrogenase, Leg-haemoglobin, Nodulins, Molecular aspects of regulation and enhancement of nitrogen fixation, Synthesis and metabolism of hormones and plant signaling	
3.	Plant Genome & Plant Genetic resources	Genome size and sequence components, Nuclear, cytoplasmic/organelle genomes and significance, conservation of plant genetic resources, seedbanks, germplasm conservation and cryopreservation	4
4.	Agriculture Biotechnology & methods for improved production	Concept of plasticity in plant development, Tissue culture, hybridization, Marker Assisted Breeding, Molecular markers for plant genotyping and germplasm analysis commercial application of plant tissue culture	8
5.	Plant genetic engineering & applications	Agrobacterium-plant interaction; Virulence; Ti and Ri plasmids; Opines and their significance; T-DNA transfer; Disarming the Ti plasmid, Agrobacterium-mediated gene delivery, Cointegrate and binary vectors and their utility, Chloroplast transformation: advantages, vectors systems of plant genetic engineering, Enhancing crop yield and crop quality improvement through Genetic Engineering for quality improvement: Seed storage proteins; essential amino acids, Vitamins and minerals, heterologous protein production in transgenic plants for agriculture, industry and pharmaceuticals uses, biodegradable plastics	12
6.	Agriculture policies & Regulations for GM and non-GM crops	Provisions on crop genetic resources in Indian Biodiversity Act, CBD and Cartagena protocol, Agricultural biodiversity; International Treaty on Plant Genetic Resources for Food and Agriculture (PGRFA), Global efforts for management of crop genetic resources; Strategies on PVFR and Biodiversity Acts; Impact of GE crops on Biodiversity	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.	Genetics, Agriculture, and Biotechnology, Walter Suza, Iowa State University Donald Lee, Published by University of Nebraska-Lincoln, Copyright Year: 2021
2.	Textbook of Agriculture Biotechnology, Nag Ahindra, Second Edition, PHI publications, 2018
3	Plant Biotechnology and Agriculture-Prospects for the 21st Century, Eds. Arie Altman, Paul Hasegawa, Elsevier publications, 2nd Edition, 2020.
4.	Research articles from refereed journals.

Detailed Syllabus
Lecture-wise Breakup

Subject Code	20M32BT213	**Semester** Even	**Semester IV**
Subject Name	**Bioenterpreneurship**		
Credits	**3**	**Contact Hours**	**3**

Faculty (Names)	**Coordinator(s)**	1. Dr. Neeraj Wadhwa
	Teacher(s) (Alphabetically)	Dr. Neeraj Wadhwa

	COURSE OUTCOMES	**COGNITIVE LEVELS**
CO1	**Explain Bioentrepreneur ship and describe its components and forms**	**Understand (C2)**
CO2	**Understand business opportunities and operation of business**	**Understand (C2)**
CO3	**Identify business feasibility and break-even analysis in a bio venture**	**Apply(C3)**
CO4	**Analyze underlying challenges faced in ethical technology management**	**Analyzing(C4)**

Module No.	**Subtitle of the Module**	**Topics in the module**	**No. of Lectures for the module**
1.	Innovation and entrepreneurship in bio-business	Introduction and scope in Bio-entrepreneurship, Types of bio-industries and competitive dynamics between the sub-industries of the bio-sector (e.g. pharmaceuticals vs. Industrial biotech), Strategy and operations of bio-sector firms: Factors shaping opportunities for innovation and entrepreneurship in bio-sectors, and the business implications of those opportunities, Alternatives faced by emerging bio-firms and the relevant tools for strategic decision, Entrepreneurship development programs of public and private agencies (MSME, DBT, BIRAC, Make In India), strategic dimensions of patenting & commercialization strategies.	8
2.	Bio markets: business strategy and marketing	Negotiating the road from lab to the market (strategies and processes of negotiation with financers, government and regulatory authorities), Pricing strategy, Challenges in marketing in bio business (market conditions & segments; developing distribution channels, the nature, analysis and management of customer needs), Basic contract principles, different types of agreement and contract terms typically found in joint venture and development agreements, Dispute resolution skills.	8
3.	Finance and accounting	Business plan preparation including statutory and legal requirements, Business feasibility study, financial management	8

		issues of procurement of capital and management of costs, Collaborations & partnership, Information technologytechniquessuch as enzyme detection, hybridization, PCR, Gene probe technology etc.	
4.	Technology management	Technology – assessment, development & upgradation, Managing technology transfer, Quality control & transfer of foreign technologies, Knowledge centers and Technology transfer agencies, Understanding of regulatory compliances and procedures (CDSCO, NBA, GCP, GLA, GMP).	8
Total number of Lectures			**42**

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.	Adams, D. J., & Sparrow, J. C. (2008). Enterprise for Life Scientists: Developing Innovation and Entrepreneurship in the Biosciences. Bloxham: Scion.
2.	Shimasaki, C. D. (2014). Biotechnology Entrepreneurship: Starting, Managing, and Leading Biotech Companies. Amsterdam: Elsevier. Academic Press is an imprint of Elsevier. 3
3.	Onetti, A., & Zucchella, A. (n.d.). Business Modeling for Life Science and Biotech Companies: Creating Value and Competitive Advantage with the Milestone Bridge. Routledge.
4.	Jordan, J. F. (2014). Innovation, Commercialization, and Start-Ups in Life Sciences. London: CRC Press.
5.	Desai, V. (2009). The Dynamics of Entrepreneurial Development and Management. New Delhi: Himalaya Pub. House.

PUBLIC HEALTH (19M22BT214)

Detailed Syllabus

Lecture-wise Breakup

Course Code	**19M22BT214**	**Semester** ODD **(specify Odd/Even)**	**Semester** X **Session** 2021 - 2022 **Month from** JULY - DECEMBER
Course Name	**PUBLIC HEALTH**		
Credits	3	**Contact Hours**	3

Faculty (Names)	**Coordinator(s)**	DR. ASHWANI MATHUR
	Teacher(s) (Alphabetically)	DR. ASHWANI MATHUR

COURSE OUTCOMES		**COGNITIVE LEVELS**
CO1	Understanding Government policies , socio-economic conditions and their role in Public Health	Understanding (Level 2)
CO2	Explain fundamentals of disease epidemiology and pathogenesis	Understanding (Level 2)
CO3	Using health indicators and other secondary data in ethical public health research	Applying (Level 3)
CO4	Analysis of the role of health care in policy making	Analyzing (Level 4)

Module No.	Title of the Module	Topics in the Module	No. of Lectures for the module
1.	Importance of Public Health	Introduction to Public Health, Health Promotion and Disease Prevention, Relevance of policy response in public health, Public health research methods – qualitative and quantitative methods, Role of ethics in research	**8**
2.	Basic Epidemiology	Introduction to Fundamentals of Epidemiology; Disease- History, prevention and intervention; measurement of occurrence, effect and impact; cohort studies	**7**
3.	Microbial pathogenesis	Introduction to Pathogenesis, microbial pathogens from water, soil and air. Viral pathogenesis, Impact of pathogenic organisms on public health, discussion of case study of Covid-19	**7**
4.	Health indicators and their role in data analysis	Understanding of Universal indicators, HDI, LE, Mortality and Morbidity; Use of indicators for understanding epidemiology of disease	**7**
5.	Public Health medicines	Introduction to social medicine, community medicine and , prospective and retrospective research design for epidemiological studies	**4**
6.	Public Health ethics and Laws	The ethics and legal aspects of public health, Health Insurance Portability and Accountability Act in Public Health	
6.	Health Policy Analysis	Policy analysis process; health care and health policy; Role of government in policy making; Policy analysis process- identification, evaluation (technology assessment; economic viability)	**5**
		Total number of Lectures	42

Evaluation Criteria	
Components	**Maximum Marks**
T1	20
T2	20
End Semester Examination	35
TA	25 (Assignment / Class Test-1 & 2)
Total	**100**

Project Based Learning: Students will understand the importance of Public Health Indicators and their use in analysis of disease epidemiology and pathogenesis. The students will be using these indicators to learn preparing life tables and also use it to analyze the role of indicators in policy making. Students will learn the facets of government policy in the health of public health and hygiene.

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.	**Schneider, M-J. Introduction to Public Health. Jones and Bartlett Publishers, USA**
2.	**Bhattacharya, J., Hyde, T., Tu, P. Health Economics. Palgrave Macmillan**
3.	**Drummond M., et al. Methods for the Economic Evaluation of health care programmes. Oxford University Press**
4.	**Johannesson, Magnus. Theory and Methods of Economic Evaluation of Healthcare. Springer Science Business Media**