

**JAYPEE INSTITUTE OF  
INFORMATION AND TECHNOLOGY**

**INTEGRATED M. TECH  
BIOTECHNOLOGY**

**10<sup>th</sup> Semester**

<b>Subject Code</b>	<b>12M12BT119</b>	<b>Semester: ODD</b>	<b>Semester: X</b> <b>Session: 2023-2024</b> <b>Month from: July - Dec</b>
<b>Subject Name</b>	<b>PHYTOTHERAPEUTICS AND PHARMACOLOGY</b>		
<b>Credits</b>	<b>3</b>	<b>Contact Hours</b>	<b>3+1</b>

<b>Faculty (Names)</b>	<b>Coordinator(s)</b>	1. Professor. Vibha Rani
	<b>Teacher(s) (Alphabetically)</b>	1. Professor. Vibha Rani

<b>COURSE OUTCOMES</b>		<b>COGNITIVE LEVELS</b>
<b>CO130.1</b>	Analyze the existing biotechnological techniques to develop plant-based therapeutics	<b>Analyzing (C4)</b>
<b>CO130.2</b>	Evaluate the classes, synthesis and structure functional relationship of Phyto molecules	<b>Evaluating (C5)</b>
<b>CO130.3</b>	Explain the therapeutic applications of phytochemicals	<b>Understanding (C2)</b>
<b>CO130.4</b>	Identify the current aspects of phytomedicines on toxicity and clinical trials	<b>Applying (C3)</b>
<b>CO130.5</b>	Case studies to analyze Ayurpharmaco-epidemiology	<b>Analyzing (C4)</b>
<b>CO130.6</b>	Use of bioinformatics tools and approaches to predict the molecular function of novel bioactive molecules	<b>Creating (C6)</b>

<b>Module No.</b>	<b>Subtitle of the Module</b>	<b>Topics in the module</b>	<b>No. of Lectures for the module</b>
<b>1</b>	<b>Introduction</b>	Concepts of Phototherapeutics, Trend and market analysis, Global herbal medicine market, Herbal Sector in India	3
<b>2</b>	<b>Medicinal Plants Metabolites</b>	Introduction to metabolites, Secondary metabolites, properties and beneficial aspects.	3

3	<b>Isolation technique extraction procedure</b>	Pharmacology Approaches in Phototherapeutics, Bioactive guided discovery process Isolation from medicinal plants. Isolation from aromatic plants. Recent advancements in extraction	4
4	<b>Characterization technique</b>	Qualitative and quantitative Analysis Gas Chromatography High Performance Liquid Chromatography: (HPLC) High Performance Thin Layer Chromatography: (HPTLC)	4
5	<b>Structure functional relationship</b>	Bioinformatics approach in predicting structure functional relationship Mechanism of Action Unidentified Therapeutic Intakes Factors that Affect Metabolism	4
6	<b>Therapeutic Application</b>	Free radicals and antioxidants Plants used in Metabolic disorder Plants used in respiratory system Plants used in COVID Pandemic Plants used with antimicrobial activity. Plants used with neurodegenerative disorders Plants used in cardiovascular system.	8
7	<b>Toxicity Issue and Clinical Trials</b>	Current aspects of phytomedicine on toxicity and clinical trials	6
8	<b>Case studies</b>	Success stories, research-based case studies related to phototherapeutics	8
9	<b>Potential risks associated and future aspects</b>	Discussion	2
<b>Total number of Lectures</b>			<b>42</b>

#### Evaluation Criteria

Components	Maximum Marks
T1	20
T2	20
End Semester Examination	35
TA	25 (Class Test-1, Assignment-1&2, PBL, Case studies 1, 2& 3)
<b>Total</b>	<b>100</b>

**Project based learning:** Each student will opt a human health issues and diseases. To make subject application based, the students will analyze uncharacterized Indian medicinal herbs and will explore their therapeutic potential and also perform market research. Various phototherapeutics concepts will be discussed by students. Students would explain the critical disease targets and mechanism of actions

of selected herbs by *in silico* methods. Understanding the concepts would enhance the student's knowledge and motivation for herbal drug discovery and its continuously growing market which will help their employability into various biotechnology and health sectors.

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

- |    |   |
|----|---|
| 1. | Plant Bioactive and Drug Discovery: Principles, Practice, and Perspectives. Valdir Cechinel-Filho (Ed.). 2012 John Wiley & Sons, Inc. |
| 2. | Phototherapeutics (Recent Progress in Medicinal Plants). S. K. Sharma, J. N. Govil, V. K. Sing. 2005. Studium Press.                  |
| 3. | Phytotherapies: Efficacy, Safety, and Regulation. Iqbal Ramzan (Ed.) 2015 John Wiley & Sons, Inc.                                     |
| 4. | Recent research articles and reviews related to each module.  |

## PRODUCT DEVELOPMENT IN BIOTECHNOLOGY

<b>Course Code</b>	<b>17M12BT118</b>	<b>Semester Odd</b>	<b>Semester: X Session 2023-2024 Month from July – Dec</b>
<b>Course Name</b>	<b>Product Development in Biotechnology</b>		
<b>Credits</b>	<b>3</b>	<b>Contact Hours</b>	<b>3</b>

<b>Faculty (Names)</b>	<b>Coordinator(s)</b>	Prof. Neeraj Wadhwa
	<b>Teacher(s) (Alphabetically)</b>	Prof. Neeraj Wadhwa

<b>COURSE OUTCOMES</b>		<b>COGNITIVE LEVELS</b>
<b>CO1</b>	Outline various processes relevant for Bio business	<b>Understand Level (C2)</b>
<b>CO2</b>	Compare marketing techniques and related ethics	<b>Apply Level (C2)</b>
<b>CO3</b>	Select appropriate technology for the production of biological products	<b>Understand Level (C3)</b>
<b>CO4</b>	Explain financial, regulatory, health policy aspects for biobased industries	<b>Understand Level (C2)</b>

<b>Module No.</b>	<b>Title of the Module</b>	<b>Topics in the Module</b>	<b>No. of Lectures for the module</b>
<b>1.</b>	<b>Biotechnology Industries overview</b>	Biotech industries in India and abroad, Biotechnology as a function of science and business, Company structures versus other non-biotech companies, Functional units Company structure and functions Emerging technology and technical convergences issues	<b>5</b>
<b>2.</b>	<b>Business in the context of biotechnology</b>	Science/development, the idea and its development, Plant tissue culture lab-equipment- glassware's chemical requirement-- construction, techniques in	<b>14</b>

	<b>Entrepreneurship-</b>	culturing and export abroad, Vermitechnology, Mushroom cultivation, single cell protein, Biofertilizer technology-production, Textile processing, leather treatment, leather industry set up Detergent industry, bakery, diary, Technology product development Other biotech product development, such as biofuels, bioengineered foods, etc.-commercialization of Bakery and dairy products relevant case studies	
<b>3.</b>	<b>Product development</b>	a. Production of commercially important primary metabolites like organic acids, amino acids and alcohol & Production processes for various classes of secondary metabolites: Antibiotics, Vitamins and Steroids. production of Industrial Enzymes, Biopesticides, Biofertilizers, Bio preservatives, Biopolymers, Pulp and Paper, SINGLE CELL PROTEIN & Mushroom culture, Bioremediation. Bioprocess strategies in Plant Cell organ culture and Animal Cell culture.	<b>12</b>
<b>4.</b>	<b>Bio business plans</b>	Concerns and opportunities, Environmental clearances requirement from government, Quality checks and validation certificates, Branding, Marketing and Packaging concerns Bank loan and finance strategy, Budget planning, Policy and regulatory concerns,	<b>6</b>
<b>5.</b>	<b>Bioremediation Bioethics and legal issues</b>	Business Development public perception in product development, Sustainability, Environmental concerns of product and their waste as well of genetically modified products and organism-	<b>5</b>
<b>Total number of Lectures</b>			<b>42</b>
<b>Evaluation Criteria</b>			
<b>Components</b>		<b>Maximum Marks</b>	
T1		20	
T2		20	
End Semester Examination		35	
TA		25 (Assignment)	
<b>Total</b>		<b>100</b>	

Project Based Learning (PBL): Students will be skilled, prepared and oriented towards understanding the insight of various bio-based business development ideas. They will be made aware of various planning and policy systems existing in the global market to start and run a business. Students will also be trained to develop entrepreneurial skills.

<b>Recommended Reading material:</b> Author(s), Title, Edition, Publisher, Year of Publication etc. (Text books, Reference Books, Journals, Reports, Websites etc. in the IEEE format)	
1.	Satyanarayana, U. "Biotechnology" Books & Allied (P) Ltd., 2005.
2.	Kumar, H.D. "A Textbook on Biotechnology" 2nd Edition. Affiliated East West Press Pvt. Ltd., 1998.
3.	Balasubramanian, D. et al., "Concepts in Biotechnology" Universities Press Pvt. Ltd., 2004.
4.	Ratledge, Colin and Bjorn Kristiansen "Basic Biotechnology" 2nd Edition Cambridge University Press, 2001
5.	Faber K, Biotransformation's in Organic Chemistry, IV edition, Springer
6.	Dubey, R.C. "A Textbook of Biotechnology" S. Chand & Co. Ltd., 2006. Trevor Palmer, Enzymes II ed Horwood Publishing Ltd
7.	Cruger, Wulf and Anneliese Crueger, "Biotechnology: A Textbook of Industrial Microbiology", 2 <sup>nd</sup> Edition, Panima Publishing, 2000
8.	Moo-Young, Murrey, "Comprehensive Biotechnology", 4 Vols. Pergamon Press, (An Imprint of Elsevier) 2004.
9.	Richard Oliver "The coming Biotech Age; the business of Biomaterials "Mc Graw Hill Publication, New York USA2000
10.	Karthikeyan, S and Arthur Ruf." Bio business" MJP Publication Chennai India 2009
11.	Cynthia Robins," The business of Biotechnology". UK Harper Collins 2001

## BIOSENSORS

<b>Subject Code</b>	<b>17M12BT111</b>	<b>Semester: Odd (specify Odd/Even)</b>	<b>Semester: X Session: 2023-24 July to Dec.</b>
<b>Subject Name</b>	Biosensors		
<b>Credits</b>	<b>3</b>	<b>Contact Hours</b>	<b>3</b>

<b>Faculty (Names)</b>	<b>Coordinator(s)</b>	1. Prof. Sudha Srivastava
	<b>Teacher(s) (Alphabetically)</b>	1. Prof. Sudha Srivastava

<b>COs</b>	<b>Cos description</b>	<b>Level</b>
<b>CO111.1</b>	Understand biosensor, its performance characteristics and types of biosensors and advancement thereof	Understand Level 2
<b>CO111.2</b>	Analyze different immobilization methods and their effect on biosensor performance	Analyze level 3
<b>CO111.3</b>	Evaluate performance of a given biosensor, for disease diagnosis, drug screening, pathogen and pollutant detection	Evaluate level 5
<b>CO111.4</b>	Design methods to improve sensitivity of the biosensor	Create Level 6

<b>Module No.</b>	<b>Subtitle of the Module</b>	<b>Topics in the module</b>	<b>No. of Lectures</b>
<b>1.</b>	<b>Introduction:</b>	Sensors and biosensors, definitions, types of sensors, markets, target analytes, glucose and other medical sensors	<b>2</b>
<b>2.</b>	<b>Biosensor Advancements and nanotechnology</b>	First-, second-, third generation biosensors, Nanotechnology and present day biosensors	<b>3</b>
<b>3.</b>	<b>Basic Design Considerations</b>	Calibration, dynamic Range, signal to noise, sensitivity, selectivity, interference.	<b>3</b>

4.	<b>The biological component</b>	Whole cell sensors, enzymes – sensing substrates or inhibitors, antibodies (Mab, Fab). And other binding proteins, oligonucleotides and aptamers.	3
5.	<b>Types of biosensors</b>	Optical biosensors, Electrochemical biosensors, Piezoelectric biosensor, Calorimetric biosensors	8
6.	<b>Immobilization method</b>	Non-covalent immobilization - entrapment and multipoint electrostatic attachment. Covalent attachment via thiol, amino and hydroxyl groups. Affinity interactions - avidin/biotin, complementary oligonucleotides.	4
7.	<b>Techniques for sensing: Physical and chemical</b>	Absorbance, fluorescence, chemi/bioluminescence and phosphorescence, Surface Plasmon Resonance (SPR), quartz crystal microbalance, cyclic voltammetry	8
8.	<b>Sensor stabilization</b>	Storage and operational stability. Polyols, polymers and low Mw compounds as stabilizing agents for drying and long term storage. Stabilization mechanisms.	3
9.	<b>Applications</b>	Pharmaceutical, agricultural, food safety, biomedical applications, food processing: state of the field, market potential, unique design criteria and needs, current sensors in use.	8
<b>Total number of Lectures</b>			<b>42</b>
<b>PBL:</b> Students form group or as individual and present a report on biosensor designing and performance for various applications like agriculture, environment and healthcare			

<b>Recommended Reading material:</b> Author(s), Title, Edition, Publisher, Year of Publication etc. (Text books, Reference Books, Journals, Reports, Websites etc. in the IEEE format)	
1.	Ligler, F.S. and Rowe Taitt, C.A. 2002. Optical Biosensors: Present & Future. Elsevier, The Netherlands. ISBN: 0-444-50974-7.

2.	Yang, V.C. and T.T. Ngo. 2000. Biosensors and Their Applications. Kluwer Academic/Plenum Publishers, New York, NY. ISBN: 0-306-46087-4.
3.	Recent research articles

## **BIOTECHNIQUES LAB-I**

<b>Course Code</b>	<b>17M15BT111</b>	<b>Semester Odd (Specify Odd/Even)</b>	<b>Semester X Session 2023-2024 Month from <b>July- December</b></b>
<b>Course Name</b>	<b>Biotechniques Lab-I</b>		
<b>Credits</b>	<b>3</b>	<b>Contact Hours</b>	<b>6</b>

<b>Faculty (Names)</b>	<b>Coordinator(s)</b>	Prof Vibha Rani
	<b>Teacher(s) (Alphabetically)</b>	Prof Sujata Mohanty, Prof Vibha Rani, Dr. Pooja Tyagi

<b>COURSE OUTCOMES</b>		<b>COGNITIVE LEVELS</b>
<b>C111.1</b>	Apply basic analytical techniques in biotechnology	Apply Level (C3)
<b>C111.2</b>	Develop skills in molecular biology techniques	Apply Level (C3)
<b>C111.3</b>	Examine and analyse gene expression	Analyze (Level C4)
<b>C111.4</b>	Make use of purification techniques for natural products	Apply Level (C3)

<b>Module No.</b>	<b>Title of the Module</b>	<b>List of Experiments</b>	<b>CO</b>
<b>1.</b>	Analytical techniques	To explore drug-protein interactions	2
<b>2.</b>	Molecular biology techniques	Cloning strategy: Screening of recombinants: isolate recombinant plasmid DNA from bacterial cells; Restriction enzyme digestion, separate and visualize DNA bands by agarose gel electrophoresis	4
<b>3.</b>	Gene expression techniques	Designing primers for amplification of gene of interest by PCR, PCR amplification, analyze PCR products; Analysis of a recombinant protein by polyacrylamide gel electrophoresis	3

4.	Purification techniques	To obtain antimicrobial compound from bacterial culture; to purify the antimicrobial compound by column chromatography; use of bioactivity-guided fractionation to analyze and quantify the compounds	3
		<b>Total</b>	<b>12</b>
<b>Evaluation Criteria</b>			
<b>Components</b>		<b>Maximum Marks</b>	
Mid-Term Viva		20	
Day-to-Day (Lab record, attendance, performance)		60	
Final Viva		20	
<b>Total</b>		<b>100</b>	
<b>Project Based Learning:</b> The students learn column chromatography, molecular biology, and analytical techniques and analyze gene expression which is required for the Biotech industry.			

<b>Recommended Reading material:</b> Author(s), Title, Edition, Publisher, Year of Publication, etc. Textbooks, Reference Books, Journals, Reports, Websites, etc. in the IEEE format)	
1	Introduction to Biotechnology, Laboratory Manual: <a href="http://www.austincc.edu/awheeler/Files/BIOL%201414%20Fall%202011/BIOL1414_Lab%20Manual_Fall%202011.pdf">http://www.austincc.edu/awheeler/Files/BIOL%201414%20Fall%202011/BIOL1414_Lab%20Manual_Fall%202011.pdf</a>
2	Frederick M. Ausubo, Roger Brent, Robert E. Kingston, David D. Moore, J.G. Seidman, John A. Smith, Kevin Struhl (eds.) Current Protocols in Molecular Biology. John Wiley & Sons Inc; ringbou edition (December 4, 2003)
3	Molecular Biology web book- <a href="http://www.web-books.com/MoBio/">http://www.web-books.com/MoBio/</a>
4	S. V. S. Rana, Biotechniques Theory and Practice. Rastogi Publications 2008.
5	Methods standardized in lab

## REGULATORY AFFAIRS

<b>Course Code</b>	17M12BT116	<b>Semester Odd</b>	<b>Semester X</b> Session 2023-2024
<b>Course Name</b>	Regulatory Affairs		
<b>Credits</b>	3	<b>Contact Hours</b>	3

<b>Faculty (Names)</b>	<b>Coordinator(s)</b>	Prof Shweta Dang
	<b>Teacher(s) (Alphabetically)</b>	Prof Shweta Dang

<b>COURSE OUTCOMES</b>		<b>COGNITIVE LEVELS</b>
<b>C120.1</b>	Explain regulatory markets and agencies; preclinical and clinical trials	Understanding (Level 2)
<b>C120.2</b>	Analyze the guidelines for approvals of new drugs/biologics	Analyzing (Level 4)
<b>C120.3</b>	Compare innovator and generic pharmaceutical industry with Patent and Non patent exclusivity	Evaluating (Level 5)
<b>C120.4</b>	Interpret ICH guidelines applicable to drugs and biotechnology based therapeutic products.	Understanding (Level 2)
<b>C120.5</b>	Assess regulatory approvals via related case studies	Evaluating (Level 5)

<b>Module No.</b>	<b>Title of the Module</b>	<b>Topics in the Module</b>	<b>No. of Lectures for the module</b>
<b>1.</b>	Introduction To Regulatory agencies	CDSCO, India USFDA, USA EMA, European Union TGA, Australia	<b>2</b>
<b>2.</b>	Introduction To Pharmacopoeias and Monographs	Indian Pharmacopoeia (IP) British Pharmacopoeia (BP) United States Pharmacopoeia (USP) International Pharmacopoeia (Int. Ph.) European Pharmacopoeia (Eur. Ph.)	<b>2</b>

3.	Safety and efficacy of drugs/biologics, preclinical studies, Clinical phases	Case studies of safety issues in history, Preclinical requirements, acute and chronic toxicity, dose determination, NOAEL, phases of clinical trials (I, II III)	4		
4.	Approval pathways for Drugs/ biologic/ biopharmaceuticals in USFDA	FDA, CDER, CBER, IND, NDA, BLA, recalls, Phase IV, filing procedures	7		
5.	Approval pathways for Drugs/ biologic/ biopharmaceuticals in Europe	EMA, market authorization application. Centralized, Decentralized, National, Mutual recognition procedure. CTD, eCTD, Nees Submissions, ICH M4	4		
6.	Approval pathways for Drugs/ biologic/ biopharmaceuticals in India and Japan	Central Drug Standard Control Organization, INDIA, Pharmaceutical and Medical Devices Agency of Japan	3		
7.	Generics and Biosimilars	Hatch Wax man Act (Para I, II, III and IV filings), BPCI act USA, CDSCO guidelines, EMA guidelines, Status of guidelines	6		
8.	Non-Patent Exclusivities	Orphan Drug law, Market exclusivity, Pediatrics exclusivity, first to file exclusivity	5		
9.	ICH Guidelines for Biologics and Good Clinical Practices	Overview of ICH guidelines, ICH Q5E, ICH Q5C, ICH Q5D, ICH Q5E, ICH Q5F, ICH Q5G, ICH Q5H, ICH Q5I, ICH Q5J, ICH Q5K, ICH Q5L, ICH Q5M, ICH Q5N, ICH Q5O, ICH Q5P, ICH Q5Q, ICH Q5R, ICH Q5S, ICH Q5T, ICH Q5U, ICH Q5V, ICH Q5W, ICH Q5X, ICH Q5Y, ICH Q5Z, ICH Q6, ICH Q7, ICH Q8, ICH Q9, ICH Q10	5		
11.	Case Studies	Relevant Case studies	4		
<b>Total number of Lectures</b>			<b>42</b>		
<b>Evaluation Criteria</b>					
<b>Components</b>		<b>Maximum Marks</b>			
T1		20			
T2		20			
End Semester Examination		35			
TA		25 (Class Test, Assignment I and II) PBL (5 Marks)			
<b>Total</b>		<b>100</b>			

PBL: Students will be given a project to search orange book database of USFDA and prepare a patent and non-patent exclusivity status of drugs		
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<b>Recommended Reading material:</b> Author(s), Title, Edition, Publisher, Year of Publication etc. ( Text books, Reference Books, Journals, Reports, Websites etc. in the IEEE format)
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|----|---|
| 1. | Sandy Weinberg, GUIDEBOOK FOR DRUG REGULATORY SUBMISSIONS, 2009 (first edition), John Wiley & Sons, Inc.  |
| 2. | The Common Technical Document (CTD), Internet:<br><a href="http://www.ich.org/">http://www.ich.org/</a>   |
| 3. | Guideline for submitting supporting documentation in drug applications for the manufacture of drug substances, February 1987, Internet:<br><a href="http://www.fda.gov/cder/guidance/drugsub.pdf">http://www.fda.gov/cder/guidance/drugsub.pdf</a>  |
| 4. | ICH Guideline: The Common Technical Document for the Registration of Pharmaceuticals for Human Use: Quality - M4Q; Quality Overall Summary of Module 2, Module 3: Quality, Internet:<br><a href="http://www.ich.org/MediaServer.jserv?@_ID=556&amp;@_MODE=GLB">http://www.ich.org/MediaServer.jserv?@_ID=556&amp;@_MODE=GLB</a> |

### Sustainable Agriculture

<b>Course Code</b>	19M12BT113	<b>Semester: Odd</b>	<b>Semester: X Session 2023-24</b>
<b>Course Name</b>	<b>Sustainable Agriculture</b>		
<b>Credits</b>	3	<b>Contact Hours</b>	3

<b>Faculty (Names)</b>	<b>Coordinator(s)</b>	Prof. S Krishna Sundari
	<b>Teacher(s) (Alphabetically)</b>	Prof. S Krishna Sundari

<b>COURSE OUTCOMES</b>		<b>COGNITIVE LEVELS</b>
CO131.1	<ul style="list-style-type: none"><li>Interpret various practices in sustainable agriculture and sustainable food systems</li></ul>	Understanding Level Level II
CO131.2	<ul style="list-style-type: none"><li>Examine methods to promote soil health, minimize water use, and decrease pollution in farm soils</li></ul>	Analysis Level Level IV
CO131.3	Outline appropriate certification guidelines and Economic Rules that apply for organic farming and biotechnological farm inputs	Understanding Level Level II
CO131.4	<ul style="list-style-type: none"><li>Recommend strategies to avoid degradation of soils on a farm through implementation of sustainable management practices in agriculture</li></ul>	Evaluate Level Level V

<b>Module No.</b>	<b>Title of the Module</b>	<b>Topics in the Module</b>	<b>No. of Lectures for the module</b>
1.	Soil health	Major types of soil, Soil structure and composition, problems in soils & Soil life	4

2.	Soil degradation	Soil structural decline, factors contributing to soil degradation, mechanisms of soil degradation	4
3.	Plant nutrition	Essential requirements for plant growth, micro and macro nutrients, principles of fertilization	4
4.	Synthetic crop chemicals	Types of chemical inputs in modern agriculture, fertilizers, pesticides, insecticides, weedicides, role and mechanism	2
5.	Phytotoxicity	Factors contributing to phyto toxicity, chemical toxicity, soil pollutants, soil antagonists	4
6.	Pest and diseases in Plants	Major categories of plant diseases and associated crop issues, Pest control & Preventative measures, integrated pest management	4
7.	Sustainable ways of farming	Different methods for Sustainable ways of farming, processes involved, advantages, strategy for implementation, Introduction to Land Management programs	6
8.	Organic farming	Natural farming, Safe Cultivation techniques, Cover crops, biofertilizers, biopesticides, bioinoculants, zero chemical input agriculture	5
9.	Tools for Sustainable farming	Irrigation systems & sustainability, Weed Management, cropping seasonal variations, plantation times, crop rotation, energy farming, restoring marginal lands and brown field	3
10	Agriculture economics	Economic principles of agriculture, Financial sustainability & planning, Integrated farmer community dynamics	3
11	Agriculture regulatory matters	Certification & guidelines for crop inputs (organic, biological inputs, hormones and	3

		others), IPR in agriculture, Role of Regulatory bodies	
<b>Total number of Lectures</b>			<b>42</b>
<b>Evaluation Criteria</b>			
<b>Components</b>		<b>Maximum Marks</b>	
T1		20	
T2		20	
End Semester Examination		35	
TA		25 (...)	
<b>Total</b>		<b>100</b>	

**PBL:** Study published literature concerning technological research advances in the field of agriculture, understand the significance of incorporating research driven solutions in current agriculture practice and identify successful agriculture management practices implemented to ensure agriculture sustainability

<b>Recommended Reading material:</b> Author(s), Title, Edition, Publisher, Year of Publication etc. ( Text books, Reference Books, Journals, Reports, Websites etc. in the IEEE format)	
<b>1.</b>	Organic Agriculture - A Global Perspective, Editors: Paul Kristiansen, Acram Taji and John Reganold, CSIRO PUBLISHING, Australia
<b>2.</b>	Sustainable Agriculture– Beyond Organic Farming, editor: Sean Clark, MDPI, Basel, Switzerland,
<b>3.</b>	Sustainable Agriculture, From Common Principles to Common Practice, Edited by Fritz J. Häni, László Pintér and Hans R. Herren, Published by the International Institute for Sustainable Development, ISBN 978-1-894784-05-4
<b>4.</b>	Technical reports of USDA, UNDP, ICAR
<b>5.</b>	Articles from Journals such as: Journal of Sustainable Agriculture; Agriculture, ecosystem & Environment; Agroecology and Sustainable Food Systems

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

Course Code	<b>19M12HS211</b>	Semester: Odd (specify Odd/Even)	Semester: X Session: 2023 -2024 Month from: July-December
Course Name	<b>Cost Accounting for Engineering Projects</b>		
Credits	03	Contact Hours	3-0-0

Faculty (Names)	Coordinator(s)	Dr. Praveen Kumar Sharma
	Teacher(s) (Alphabetically)	Dr. Praveen Kumar Sharma

COURSE OUTCOMES		COGNITIVE LEVELS
<b>C201.1</b>	Understand basic concepts of Cost Accounting	Understand (C2)
<b>C201.2</b>	Apply concepts of cost in project management	Apply (C3)
<b>C201.3</b>	Analyze cost behavior for decision making	Analyze (C4)
<b>C201.4</b>	Evaluate different budgets for controlling the cost	Evaluate (C5)

Module No.	Title of the Module	Topics in the Module	No. of Lectures for the module
1.	Introduction	Introduction & Overview of <b>Strategic</b> Cost Management Process	2
2.	Cost Concepts	Relevant Cost, Differential Cost, Incremental Cost, Opportunity Cost, Objectives of a costing system, Inventory Valuation, Provision of data for decision making	4
3.	Project execution	Meaning, Different types, why to manage, cost overruns centres, various stages of project execution: conception to commissioning. Project execution as conglomeration of technical and nontechnical activities. Detailed Engineering activities.	5
4.	Project Execution & Quantitative techniques for cost management	Pre project execution main clearances and documents Project team: Role of each member. Importance Project site Data required with significance, Project contracts, Types and contents, Project execution, Project cost control, bar charts, Project commissioning, <b>Linear Programming, PERT/CPM,</b>	7

		Transportation problems, Assignment problems, Simulation, Learning Curve Theory	
5.	Cost Behavior	Distinction between Marginal Costing and Absorption Costing; Break-even Analysis, Cost-Volume-Profit Analysis. Various decision-making problems.	6
6.	Profit Planning Marginal Costing	Standard Costing and Variance Analysis. Pricing strategies: Pareto Analysis. Target costing, Life Cycle Costing. Costing of service sector. Just-in-time approach,	6
7.	Material Planning	Material Requirement Planning, Enterprise Resource Planning, Total Quality Management and Theory of constraints. Activity-Based Cost Management, Bench Marking; Balanced Score Card & value chain analysis.	6
8.	Budgetary Control	Flexible budgets, Performance budgets, zero based budgets, Measurements of divisional profitability pricing decisions including transfer pricing.	6
<b>Total number of Lectures</b>			<b>42</b>

<b>Evaluation Criteria</b>	
<b>Components</b>	<b>Maximum Marks</b>
T1	20
T2	20
End Semester Examination	35
TA	25 (Quiz+ project)
<b>Total</b>	<b>100</b>

Project based learning: student will form the group of four to five students. To make subject application based, student will apply various concepts such as Cost management and various types of Costing, project execution & quantitative technique for cost management, cost behaviour and profit planning. Student will apply these concept on organization, or in any ongoing project or interdisciplinary base research project or any innovative idea in any particular industry along with feasibility.

<b>Recommended Reading material:</b> Author(s), Title, Edition, Publisher, Year of Publication etc. ( Text books, Reference Books, Journals, Reports, Websites etc. in the IEEE format)	
1.	S. M. Datar and M. Rajan, <i>Horngren's Cost Accounting: A Managerial Emphasis. 16th ed.</i> Pearson Education, 2018.
2.	B. M. L. Nigam and I. C. Jain, <i>Cost Accounting: Principles And Practice</i> , PHI Learning Pvt. Ltd. PHI Learning Pvt. Ltd., 2010.
3.	R. S. Kaplan and A. A. Atkinson, <i>Advanced management accounting</i> . PHI Learning, 2015.
4.	A. K. Bhattacharyya, <i>Principles and practice of cost accounting</i> . PHI Learning Pvt. Ltd., 2004.
5.	N. D. Vohra, <i>Quantitative Techniques in Management, 3e.</i> Tata McGraw-Hill Education, 2006.
6.	C. Drury, <i>Management and Cost Accounting ,10th edition, Cengage Learning. 2017.</i>

7.	P. Chandra, <i>Projects-Planning Analysis, Selection, Implementation &amp; Review 9e</i> , Tata McGraw Hill, New Delhi. 2019.
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## Seminar & Term paper (17M17BT211)

### Integrated M.Tech X sem

#### Course Outcomes:

At the completion of the course, students will be able to,

Sl. No.	DESCRIPTION	COGNITIVE LEVEL
CO212.1	Understand the problem statement and its societal impact	Understand Level (C2)
CO212.2	Make use of existing literature to define a research problem.	Apply Level(C3)
CO212.3	Survey the available scientific resources & databases to address the problem	Analyze Level (C4)
CO212.4	Conclude through oral and written scientific presentations	Evaluate Level (C5)

#### Assessment Tools for CO Attainments

Seminar & Term paper (17M17BT211)			
	Course Outcome: Upon completion of the course students should be able to	Direct Assessment Tools (80%)	In-Direct Assessment Tools (20%)
CO1	Make use of existing literature to define a research problem.	Midterm and End Term Seminars, Day to Day assessment by the supervisor/teacher assigned to the student	Course Exit Survey
CO2	Survey the available scientific resources & databases to address the problem.	Midterm and End Term Seminars, Day to Day assessment	Course Exit Survey
CO3	Evaluate and critique acquired knowledge	Midterm and End Term Seminars	Course Exit Survey
CO4	Conclude through oral and written scientific presentations	Midterm and End Term Seminars, Midterm report and End Term "Term paper"	Course Exit Survey

## COURSE DESCRIPTION

### PROJECT BASED LEARNING-II (17M17BT112 / 17M17BT212)

END TERM VIVA MARKS: 52

DAY TO DAY MARKS: 48

<b>Project Based Learning -II (17M17BT112) – Integrated M.tech (X Sem)</b>				
	<b>COURSE OUTCOMES</b>	<b>Cognitive level</b>	<b>Assessment tool Direct (80%)</b>	<b>Assessment tool Indirect (20%)</b>
CO1	Discuss the problem statement, its impact on society and approaches to circumvent, based on the literature survey	Understanding Level 2	<b>Viva-I</b> (Defining and Interpreting the research problem; Summarise and evaluate the current knowledge of the topic based on Literature reviewed), <b>Day to Day Marks from Supervisors</b> ((Defining and Interpreting the research problem; Summarise and evaluate the current knowledge of the topic based on Literature reviewed)	Exit Survey
CO2	Identify relevant theory and concepts, and relate these to appropriate methodologies and evidence	Understanding Level 2	<b>Viva-I</b> (Rational of the study & Objectives), <b>Day to Day Marks by Supervisor</b> (Rational of the study & Objectives),  <b>Viva-II</b> (Strategic approach proposed for exploring answers to the research problem and attained); <b>Day to Day Marks by Supervisor</b> (Strategic approach proposed for exploring answers to the problem statement and attained)	Exit Survey
CO3	Implement the proposed research strategy and relate	Apply Level 3	<b>Viva-I</b> (Designing the research strategy / work plan) <b>Day to Day Marks</b>	Exit Survey

	methodologies to expected outcomes		<b>by Supervisor</b> (Understanding of the proposed research strategy/ work plan)	
CO4	Apply qualitative and/or quantitative evaluation processes to the experimental data	Apply Level 3	<b>Viva-II</b> (Research strategy followed and outcomes of the study), <b>Day to Day Marks by Supervisor</b> ( Research strategy followed the outcomes of the study) <b>Viva-II</b> (Conclusion / Learning Outcome, Viva and Report), <b>Day to Day marks from Supervisor</b> (Conclusion / Learning Outcome, Report )	Exit Survey
CO5	Demonstrate research concept, context clarity and experimental finding, through presentation skills and report writing	Apply Level 3	<b>Viva-II</b> (Presentation skills, Viva and Report), <b>Day to Day marks from Supervisor</b> (Presentation skills and Report)	Exit Survey

**Project based learning:** The students learn the importance of secondary data collection using databased, journals, periodicals and databases. They perform wet lab and in-silico, experimental studies, systematic review or survey based analysis to define the problem statement and learn biotechnological and allied approaches to answer the problem statements. Such knowledge help student to develop independent thinking and inculcate the practice of following good laboratory, scientific and ethical practices in their career

## Detailed Syllabus

### Lecture-wise Breakup

Course Code	<b>19M13HS211</b>	Semester: Odd	Semester: M.Tech III and M.Tech Integrated X Session: 2023 -2024 Month from: August-December 2023
Course Name	<b>Constitution of India</b>		
Credits	2	Contact Hours	2-0-0

Faculty (Names)	Coordinator(s)	Dr. Namreeta Kumari
	Teacher(s) (Alphabetically)	Dr. Namreeta Kumari

<b>COURSE OUTCOMES</b>		<b>COGNITIVE LEVELS</b>
<b>C20 2.1</b>	Demonstrate an understanding of the historical inheritances and institutional legacies of Indian Constitution	Understand (C2)
<b>C20 2.2</b>	Demonstrate an understanding of the powers and functions of the Indian executive, legislature and judiciary	Understand (C2)

<b>C20 2.3</b>	Assess the devolution of powers and authority of governance of the Union government and the local government	Evaluate (C5)
<b>C20 2.4</b>	Assess the nature of the Indian constitution and its applicability in the study of politics in India	Evaluate (C5)

<b>Module No.</b>	<b>Title of the Module</b>	<b>Topics in the Module</b>	<b>No. of Lectures for the module</b>
<b>1.</b>	History of Making of the Indian Constitution	<ul style="list-style-type: none"> <li>· History</li> <li>· Drafting Committee-Composition &amp; Working</li> </ul>	2
<b>2.</b>	Philosophy of the India Constitution	<ul style="list-style-type: none"> <li>· Preamble</li> <li>· Salient Features</li> <li>· Federalism</li> </ul>	2
<b>3.</b>	Fundamental Rights and Directive Principles	<ul style="list-style-type: none"> <li>· Right to Equality</li> <li>· Right to Freedom</li> <li>· Right against Exploitation</li> <li>· Right to Freedom of Religion</li> <li>· Cultural and Educational Rights</li> <li>· Right to Constitutional Remedies</li> <li>· Directive Principles of State Policy</li> <li>· Conflict between DPSP and FR</li> </ul>	5

		<ul style="list-style-type: none"> <li>· Fundamental Duties</li> </ul>	
4.	Organs of Governance	<ul style="list-style-type: none"> <li>· Parliament-Composition, Qualifications &amp; and Disqualification, Powers and Functions</li> <li>· Executive- President, Governor Council of Ministers</li> <li>· Judiciary-Appointment and Transfer of Judges, Qualifications, Power and Functions</li> </ul>	8

5.	Local Administration	<ul style="list-style-type: none"> <li>· District's Administration head: Role and Importance</li> <li>· Municipalities: Introduction, Mayor and role of Elected Representative, CEO of Municipal Corporation</li> <li>· Panchayati raj: Introduction, PRI: Zila Panchayat.</li> <li>· Elected officials and their roles, CEO Zila Panchayat: Position and role</li> <li>· Block level: Organizational Hierarchy (Different departments)</li> <li>· Village level: Role of Elected and Appointed officials</li> <li>· Importance of Grass root democracy</li> </ul>	8										
6.	Election Commission	<ul style="list-style-type: none"> <li>· Election Commission: Role and Functioning</li> </ul>	3										
<b>Total number of Lectures</b>			<b>28</b>										
<p><b>Evaluation Criteria</b></p> <table border="0" style="width: 100%;"> <thead> <tr> <th style="text-align: left;"><b>Components</b></th> <th style="text-align: right;"><b>Maximum Marks</b></th> </tr> </thead> <tbody> <tr> <td>Mid Term:</td> <td style="text-align: right;">30</td> </tr> <tr> <td>End Semester Examination</td> <td style="text-align: right;">40</td> </tr> <tr> <td>TA</td> <td style="text-align: right;">30 (Attendance, Quiz, Project)</td> </tr> <tr> <td><b>Total</b></td> <td style="text-align: right;"><b>100</b></td> </tr> </tbody> </table>				<b>Components</b>	<b>Maximum Marks</b>	Mid Term:	30	End Semester Examination	40	TA	30 (Attendance, Quiz, Project)	<b>Total</b>	<b>100</b>
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<b>Total</b>	<b>100</b>												

<b>Recommended Reading material:</b> Author(s), Title, Edition, Publisher, Year of Publication etc. ( Text books, Reference Books, Journals, Reports, Websites etc. in the IEEE format)	
1.	Austin, G. (1996). <i>The Indian Constitution: Corner Stone of a Nation</i> . Oxford: Oxford University Press
2.	Bakshi, P.M.(2015). <i>The Constitution of India</i> . Delhi: Universal Law Pub. Co. Pvt. Ltd
3.	Bhuyan, D. (2016). <i>Constitutional Government and Democracy in India</i> . Cuttack:Kitab Mahal..
4.	Busi, S.N. (2016). <i>Dr. B. R. Ambedkar framing of Indian Constitution</i> . Hyderabad:Ava Publishers
5.	Basu, D.D. (2018). <i>Introduction to the Constitution of India</i> . Nagpur: Lexis Nexis
6.	Jayal, N.G. & Mehta, P.B. (eds.)(2010). <i>The Oxford Companion to Politics in India</i> . New Delhi: Oxford University Press.
7.	Constitution series by Rajya Sabha Television and discussion on Indian Constitution by Rajya Sabha Television

**Project:** Projects based on the different aspects of the Indian Constitution have to be submitted by the students as a part of the project-based learning. This would help the students learn about the nitty gritty of the Constitution, their rights and duties which would later on help them not only in their work place but in their general life.