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BSc_PCM

Title of the Course	English-I
Course Code	AEC0201[T]

Part A								
Year	1st	Semester	2nd	Credits	L	T	P	C
					2	0	0	2
Course Type	Theory only							
Course Category	Ability Enhancement Courses							
Pre-Requisite/s	The students have a basic knowledge and understanding of the English language and communication.			Co-Requisite/s	Communication skills, Leadership development etc.			
Course Outcomes & Bloom's Level	CO1- Determine interpersonal skills and be an effective goal-oriented team player(BL1-Remember) CO2- Elaborate creativity and lateral thinking(BL2-Understand) CO3- Examine attitudes, emotional intelligence and understand its influence on behavior(BL3-Apply) CO4- Justify approaches to conflict resolution.(BL4-Analyze) CO5- Evaluate goal setting, management, decision-making skills.(BL5-Evaluate)							
Coures Elements	Skill Development ✓ Entrepreneurship ✗ Employability ✓ Professional Ethics ✓ Gender ✗ Human Values ✓ Environment ✗		SDG (Goals)	SDG4(Quality education)				

Part B			
Modules	Contents	Pedagogy	Hours
Module 1	Where the Mind is Without Fear, The Tryst with Destiny The Hero, Indian Weavers The Portrait of a Lady The Solitary Reaper	Classroom Lecture, PPTs, Videos	10
Module 2	Basic Language Skills Synonyms, Antonyms, Homonyms, Word Formation, Prefix, Suffix	Classroom Lecture, PPTs,	6
Module 3	Uncountable Noun, Verb, Tense, Adverb	Classroom Lecture, PPTs,	6
Module 4	Trading Comprehension, Unseen Passage	Classroom Lecture, PPTs, Videos	4
Module 5	Introduction to Report Writing, Major Objectives of Writing Reports, Significance of Business/Technical, Types and Forms of Reports, Styles of Writing Reports – Printed format, Memo Format, Letter Format, Book/Letter Text Format, Layout and Structure of Reports, Components of Report Writing.	Classroom Lecture, PPTs, Videos	5

Part D(Marks Distribution)					
Theory					
Total Marks	Minimum Passing Marks	External Evaluation	Min. External Evaluation	Internal Evaluation	Min. Internal Evaluation
100	40	40	12	60	
Practical					
Total Marks	Minimum Passing Marks	External Evaluation	Min. External Evaluation	Internal Evaluation	Min. Internal Evaluation

Part E	
Books	C. Muralikrishna and S. Mishra (2011) Communication Skills for Engineers, Pearson education. ISBN: 9788131733844
Articles	Carnegie Dale, How to win Friends and Influence People, New York: Simon & Schuster, 1998.
References Books	Technical Communication – Principles and Practices by Meenakshi Raman & Sangeeta Sharma, Oxford Univ. Press, 2007, New Delhi.
MOOC Courses	https://nptel.ac.in/courses/109103020
Videos	https://nptel.ac.in/courses/109103020

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Syllabus-2023-2024

BSc_Biotechnology

Title of the Course	Genetic Engineering
Course Code	BSBT 401 (T)

Part A								
Year	2nd	Semester	4th	Credits	L	T	P	C
					3	0	1	4
Course Type	Embedded theory and lab							
Course Category	Disciplinary Major							
Pre-Requisite/s	Student must have the detailed knowledge of Gene expression and hereditary information			Co-Requisite/s	Detailed study of genomics, proteomics and metabolomics tool			
Course Outcomes & Bloom's Level	CO1- To remember the role of all the enzymes used in the DNA editing (BL1-Remember) CO2- To understand the method of creating new molecules such as DNA & RNA(BL2-Understand) CO3- To understand the importance Nucleic acid editing tools(BL2-Understand) CO4- To evaluate the applications of in various fields such as research, Agriculture, Pharmaceutical industries(BL5-Evaluate) CO5- To apply the understanding of creation of new DNA , RNA & Protein and its use in different Fields.(BL3-Apply)							
Coures Elements	Skill Development ✓ Entrepreneurship ✓ Employability ✓ Professional Ethics ✓ Gender ✗ Human Values ✓ Environment ✓		SDG (Goals)	SDG4(Quality education)				

Part B			
Modules	Contents	Pedagogy	Hours
1	Introduction to gene cloning and its necessity: DNA modifying enzymes: Restriction enzymes (RE)- structure function and types, polymerase, kinases, ligase, alkaline phosphatase, exonuclease etc.. Cloning methods. linkers and adaptors.	Tutorials, Collaborative, Demonstrations, Project methods Experiments,	8
2	Methods of introduction of DNA into living cells, E.coli, plant and animal cells, Genetic transformation in plants:Agrobacterium mediated transformation in plants,structure and features of Ti and Ri plasmids.Genomic libraries and cDNA libraries.	Tutorials, Collaborative, Demonstrations, Project methods Experiments,	8
3	Cloning vectors: Plasmids and Bacteriophages, Phagemids, Cosmids, Artificial chromosomes (BAC and YAC) for E.coli, yeast. Strategies for identification of recombinant clones containing cloned genes: Nucleic acid hybridization, immune screening etc. Expression vectors for E.coli andYeast.	Tutorials, Collaborative, Demonstrations, Project methods Experiments,	8
4	Tools for RDT: Restriction mapping, Southern and northern blotting, Forensic application of biotechnology: DNA fingerprinting and its applications, forensic medicine Molecular Pharming: Application	Tutorials, Collaborative, Demonstrations, Project methods Experiments,	8
5	Applications of RDT, Production of recombinant protein (Insulin, Growth hormone), production of Recombinant vaccine. Golden rice, Artificial seed production, biofertilizers and biopesticide production GM crops and GM food	Tutorials, Collaborative, Demonstrations, Project methods Experiments,	8

Part C				
Modules	Title	Indicative-ABCA/PBL/ Experiments/Field work/ Internships	Bloom's Level	Hours
1	Preparation of stock and buffer solutions for DNA isolation	Experiments	BL3-Apply	2
2	Isolation of DNA from yeast cells.	Experiments	BL3-Apply	2
3	Isolation of DNA from Plant cell.	Experiments	BL3-Apply	2
4	Isolation of plasmid DNA	Experiments	BL3-Apply	2
5	Agarose gel electrophoresis of Genomic DNA	Experiments	BL4-Analyze	2
6	Isolation of RNA	Experiments	BL4-Analyze	2
7	Quantification of DNA by spectrophotometer(260/280nm)	Experiments	BL4-Analyze	2
8	To isolate the Auxotrophic mutants from the mixed culture sample of Microorganism	PBL	BL5-Evaluate	3 days

Part D(Marks Distribution)

Theory					
Total Marks	Minimum Passing Marks	External Evaluation	Min. External Evaluation	Internal Evaluation	Min. Internal Evaluation
100	40	60	18	40	
Practical					
Total Marks	Minimum Passing Marks	External Evaluation	Min. External Evaluation	Internal Evaluation	Min. Internal Evaluation
100	50	60	30	40	

Part E

Books	TA Brown, Gene cloning 4 edition
Articles	https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3078015/
References Books	James D watson.Molecular Biology Of gene, 4 edition
MOOC Courses	https://nptel.ac.in/courses/102103074
Videos	https://nptel.ac.in/courses/102103074

Course Articulation Matrix

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Syllabus-2023-2024

BSc_Biotechnology

Title of the Course	Animal Tissue Culture
Course Code	BSBT 601 (T)

Part A								
Year	3rd	Semester	6th	Credits	L	T	P	C
					3	0	1	4
Course Type	Embedded theory and lab							
Course Category	Disciplinary Major							
Pre-Requisite/s	Student must be aware of cell,tissues, culture media for the in vitro regeneration of cell organs.			Co-Requisite/s				
Course Outcomes & Bloom's Level	CO1- To understand the Animal tissue culture: and how does it interact with living and non-living molecules(BL2-Understand) CO2- To Understand media constituents and media formulation strategies for mamalian cell culture.(BL2-Understand) CO3- Develop basic aseptic skills for mammalian cell culture and their applications.(BL3-Apply) CO4- To Develop proficiency in mammalian cell culture and the maintenance of cell lines.(BL3-Apply) CO5- To Apply cell and molecular techniques to in vitro situations.(BL3-Apply)							
Coures Elements	Skill Development ✓ Entrepreneurship ✓ Employability ✓ Professional Ethics ✓ Gender X Human Values ✓ Environment ✓		SDG (Goals)	SDG3(Good health and well-being) SDG4(Quality education)				

Part B			
Modules	Contents	Pedagogy	Hours
I	Introducción: History Cell culture enchiques, Equipment, and sterilization methodology. Introduction to animal cell cultures: Nutritional and physiological: Growth factors and growth parameters	Lecture methods, demonstrations, experiments, field visit, Activity based learning	8
II	Primary cell cultures, Establishment and maintenance of primary cell cultures of adherent and non-adherent cell lines, fibroblasts, endothelial cells, embryonic cell lines and stem cells. Organ culture: Methods, behavior of organ explants and utility of organ culture, whole embryo culture.	Lecture methods, demonstrations, experiments, field visit, Activity based learning, Project based learning	9
III	Secondary cell cultures, □Establishment and maintenance of secondary mammalian and insect cell lines, Characterization of cell lines, □Karyotyping, biochemical and genetic characterization of cell lines	Lecture methods, demonstrations, experiments, field visit, Activity based learning, Project based learning	8
IV	Production of the vaccine in animal cells: □Use of Hybridoma for production of monoclonal antibodies.Cell cloning and selection. Transfection & transformation of cell. Commercial scale production of animal cells, stem and their application. Application of animal cell culture for in vitro testing of drugs; Testing of toxicity of environmental pollutants in cell.	Lecture methods, demonstrations, experiments, field visit, Activity based learning, Project based learning	9
V	Scale-up: Scale-up in suspension: Rotating chambers; Perfused suspension cultures; Fluidized bed reactors for suspension culture,Scale-up in monolayers: Multisurface propagators; Multiarray disks, spirals, and tubes; Roller culture; Microcarriers; Perfused monolayer cultures; Membrane perfusion; Hollow fiber perfusion; Matrix perfusion; Microencapsulation; Growth monitoring	Lecture methods, demonstrations, experiments, field visit, Activity based learning, Project based learning	9

Part C				
Modules	Title	Indicative-ABCA/PBL/ Experiments/Field work/ Internships	Bloom's Level	Hours
I	Introdction to animal tissue culture lab.	Experiments	BL2-Understand	2
II	Prerparation of Hank's Balanace salt solution	Experiments	BL3-Apply	2
III	To culture the animal tissue in the prepared media	Experiments	BL3-Apply	3
IV	To check the viability of the cell and count the cell number	Experiments	BL4-Analyze	3
V	Observation of polymorpho nuclear monocytes	Experiments	BL4-Analyze	2
VI	To perform skin grafting	Internships	BL6-Create	1 month
VII	To observed the various cell lines and tissues under culture media for its growth and development	PBL	BL4-Analyze	1 week

Part D(Marks Distribution)					
Theory					
Total Marks	Minimum Passing Marks	External Evaluation	Min. External Evaluation	Internal Evaluation	Min. Internal Evaluation
100	40	60	18	40	
Practical					
Total Marks	Minimum Passing Marks	External Evaluation	Min. External Evaluation	Internal Evaluation	Min. Internal Evaluation
100	50	60	30	40	

Part E	
Books	Freshney, Wiley-Liss,Culture of Animal Cells,5th Edition-2005
Articles	https://www.ncbi.nlm.nih.gov/pmc/articles/PMC732584/
References Books	Culture of Animal Cells: A Manual of Basic Technique (6th Edition) R. Ian Freshney. REQUIRED. It is in your best interest to bring this book or the required chapters to class.
MOOC Courses	https://nptel.ac.in/courses/102106081
Videos	https://nptel.ac.in/courses/102106081

Part APart B

Part C

Part D(Marks Distribution)Part E

Course Articulation Matrix

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Syllabus-2023-2024

BSc_Biotechnology

Title of the Course	Disaster Management
Course Code	BSBT VAC III

Part A								
Year	2nd	Semester	3rd	Credits	L	T	P	C
					2	0	0	2
Course Type	Theory only							
Course Category	Community Enganement and Service							
Pre-Requisite/s	To be familiar with the basics of natural disasters as well as anthropogenic factors and various approaches for disaster managements.			Co-Requisite/s				
Course Outcomes & Bloom's Level	CO1- To learn types of disasters and its profile in India(BL1-Remember) CO2- To understand the causes and impacts of disasters on environment and related case studies of Global and National disasters.(BL2-Understand) CO3- To learn about risk reduction approaches of disasters with safety issues in mitigating industrial disasters.(BL3-Apply) CO4- To understand the concept of Disaster Management Cycle and its Risk Reduction Measures(BL4-Analyze) CO5- To apply the National Acts and policies for mitigating disasters, Role of Army, Police, Community, Corporate, Media etc. for post Disaster Management.(BL5-Evaluate)							
Coures Elements	Skill Development ✓ Entrepreneurship ✗ Employability ✓ Professional Ethics ✓ Gender ✗ Human Values ✗ Environment ✓	SDG (Goals)		SDG1(No poverty) SDG3(Good health and well-being) SDG4(Quality education) SDG6(Clean water and sanitation) SDG8(Decent work and economic growth) SDG10(Reduced inequalities) SDG11(Sustainable cities and economies) SDG12(Responsible consuption and production) SDG13(Climate action) SDG15(Life on land) SDG17(Partnerships for the goals)				

Part B			
Modules	Contents	Pedagogy	Hours
1	Concepts and definitions (Disaster, Hazard, Vulnerability, Resilience, Risks, Capacity buildings) Factors of disasters, Global trends in disaster: urban disasters, pandemics, complex emergencies, Climate change	lecture method, collaborative learning, group dicussions, field visit,	8
2	Classification of disaster: geophysical, hydrological, climatological, meteorological, biological and technological or man-made hazards. Causes, impacts including social, economic, political, environmental, health, psychosocial, etc. Differential impacts- in terms of caste, class, gender, age, location, disability.	lecture method, collaborative learning, group dicussions, field visit,case studies	8
3	Disaster management cycle – Phases, Culture of safety, prevention, mitigation and preparedness community based DRR, Structural- nonstructural measures, Roles and responsibilities of community, Panchayati Raj Institutions/Urban Local Bodies (PRIs/ULBs), States, Centre, and other stakeholders- Institutional Processes and Framework at State and Central Level- State Disaster Management Authority(SDMA).	lecture method, collaborative learning, group dicussions, field visit,case studies	8
4	Factors affecting Vulnerabilities, differential impacts, impact of Development projects such as dams, embankments, changes in Land-use etc. Climate Change Adaptation. Relevance of indigenous knowledge, appropriate technology and local resources	lecture method, collaborative learning, group dicussions, field visit,case studies	8
5	Disaster Management Indian scenario, India's vulnerability profile, Disaster Management Act 2005 and Policy guidelines, Environmental Legislation for Disaster Risk Management in India. Role of information technology in protecting environment and health. Role of NGOs Cases Studies: Bhopal Gas Disaster, Gujarat Earth Quake, Orissa Super-cyclone, South India Tsunami, Bihar floods, Plague Surat, COVID-19 pandemic	lecture method, collaborative learning, group dicussions, field visit,case studies	8

Part C				
Modules	Title	Indicative-ABCA/PBL/ Experiments/Field work/ Internships	Bloom's Level	Hours
1	Contemporary Disaster Issues in India & World	Case Study	BL4-Analyze	4
2	Disaster Mitigation Methods & Involvement of Technologies	Seminar	BL3-Apply	4

Part D(Marks Distribution)

Theory					
Total Marks	Minimum Passing Marks	External Evaluation	Min. External Evaluation	Internal Evaluation	Min. Internal Evaluation
100	40	60	18	40	
Practical					
Total Marks	Minimum Passing Marks	External Evaluation	Min. External Evaluation	Internal Evaluation	Min. Internal Evaluation
0	0	0	0	0	0

Part E

Books	• Singhal J.P. "Disaster Management", Laxmi Publications, 2010. ISBN-10: 9380386427 ISBN-13: 978-9380386423 • Tushar Bhattacharya, "Disaster Science and Management", McGraw Hill India Education Pvt. Ltd., 2012. ISBN-10: 1259007367, ISBN-13: 978-1259007361 • Gupta Anil K, Sreeja S. Nair. Environmental Knowledge for Disaster Risk Management, NIDM, New Delhi, 2011 • Kapur Anu Vulnerable India: A Geographical Study of Disasters, IAS and Sage Publishers, New Delhi, 2010. • Kapur, Anu & others, 2005: Disasters in India Studies of grim reality, Rawat Publishers, Jaipur
Articles	https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3105552/
References Books	• Coppola P Damon, 2007. Introduction to International Disaster Management, Carter, Nick 1991. Disaster Management: A Disaster Manager's Handbook. • Cury, F. 1983. Development and Disasters, Oxford University Press. Document on World Summit on Sustainable Development 2002. • Govt. of India: Disaster Management Act 2005, Government of India, New Delhi. Government of India, 2009. National Disaster Management Policy. • Disaster Management Guidelines. GOI-UNDP Disaster Risk Reduction Programme (2009-2012. • Disaster Medical Systems Guidelines. Emergency Medical Services Authority, State of California, EMSA no.214, June 2003 • National Institute of Disaster Management • National Disaster Management Authority • http://nidm.gov.in , http://cwc.gov.in , http://ekdrn.net , http://www.emdat.be , http://www.nws.noaa.gov , http://pubs.usgs.gov , http://nidm.gov.in http://www.imd.gov.in
MOOC Courses	https://nptel.ac.in/courses/124107010
Videos	https://nptel.ac.in/courses/124107010

BSc_PCM

Part A

Part BPart D(Marks Distribution)Part E

Course Articulation Matrix

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Part APart BPart D(Marks Distribution)Part E

Course Articulation Matrix

[illegible]

Part A

Part BPart CPart D(Marks Distribution)Part E

Course Articulation Matrix

[illegible]

Part A

Part B

Part D(Marks Distribution)Part F

Course Articulation Matrix

[illegible]

[illegible]

Part APart BPart D(Marks Distribution)Part E

Course Articulation Matrix

[illegible]

Syllabus-2023-2024

BSc_FoodTechnology

Title of the Course	Functional Foods and Nutraceuticals [T]
Course Code	BSFT-0801 [T]

Part A

Year	4th	Semester	8th	Credits	L	T	P	C
					3	0	1	4
Course Type	Embedded theory and lab							
Course Category	Disciplinary Major							
Pre-Requisite/s	students to pass 10+2 with a minimum aggregate of 50% from the science stream with mandatory subjects like PCMB (Physics, Chemistry, Maths, Biology).			Co-Requisite/s	Students should have basic knowledge of bio-active compounds present in various plants and animal products , processing methods.			
Course Outcomes & Bloom's Level	CO1: Recognize the importance and link between nutrition and diseases(BL1-Remember) CO2: Identify major types of health foods and nutraceutical products in the market(BL2-Understand) CO3: To understand the molecular basis of using micronutrients and phytochemicals in prevention of chronic diseases(BL2-Understand) CO4: Design and develop foods having health promoting properties(BL6-Create) CO5: Critically evaluate the safety and efficacy of using health foods and nutraceutical products. (BL4-Analyze)							
Coures Elements	Skill Development ✓ Entrepreneurship ✓ Employability ✗ Professional Ethics ✓ Gender ✗ Human Values ✗ Environment ✗		SDG (Goals)	SDG3(Good health and well-being) SDG9(Industry Innovation and Infrastructure) SDG12(Responsible consumption and production)				

Part B

Modules	Contents	Pedagogy	Hours
1	Nutraceuticals and Functional Food: An Introduction, Definition; the link between nutrition and medicine; classical nutrients; phytochemicals and other dietary health factors for disease prevention. Applied aspects of the Nutraceutical Science	Lecture methods, ppt	6
2	Nutraceuticals: Types of nutraceutical compounds – Phytochemicals, phytosterols and other bioactive compounds, peptides and proteins, dietary fibers, oligosaccharides and resistant starch, prebiotics, probiotics and synbiotics, Conjugated Linoleic Acid, omega-3 fatty acids, fat replacers; their sources and role in promoting human health	Lecture methods, Quiz, Illustrate with analogies	10
3	Functional Foods: Types of functional foods- Cereal and cereal products, Milk and milk products, egg, oils, meat and products, sea foods, nuts and oilseeds, functional fruits and vegetables, herbs and spices, beverages (tea, wine etc), Fermented foods – their health benefits and role in promoting health.	Lecture methods, PPT, Expert Lecture	11
4	Future prospects:Research development and trends in processing of functional foods. Formulation and fabrication of functional foods. Legal Aspects: Stability of nutraceuticals. Safety, Consumer acceptance and assessment of health claims, labeling, marketing, and regulatory issues related to nutraceuticals and functional foods.	Lecture methods, Audio/Video clips, group discussion, quiz	10
5	Anti-nutritional Factors present in Foods: Types of inhibitors present in various foods and how they can be inactivated. General idea about role of Probiotics and Prebiotics as nutraceuticals. Recent advances in techniques & feeding of substrates. Assessment of nutritional status and Recommended Daily allowances	Lecture methods, Group discussion, quiz	8

Part C

Modules	Title	Indicative-ABCA/PBL/ Experiments/Field work/ Internships	Bloom's Level	Hours
1	Estimation of ascorbic acid from lemon & amla juice by titration method	Experiments	BL4-Analyze	2
2	To determine the antioxidant potential of functional foods	Experiments	BL5-Evaluate	2
3	TLC separation of Plant pigments – Curcumin and carotene	Experiments	BL3-Apply	2
4	Estimation of crude fiber/pectic substances from plant material	Experiments	BL4-Analyze	2
5	Estimation of total phenols and chlorogenic acid (Phenolic compound) in plant materials and animal foods	Experiments	BL4-Analyze	2
6	To estimate cholesterol content in given sample by Lievermann-Burchard method	Experiments	BL4-Analyze	2
7	Qualitative test for tannins, phenolics and alkaloids using TLC	Experiments	BL5-Evaluate	2
8	To prepare functional foods from plant foods	PBL	BL6-Create	2

Part D(Marks Distribution)

Theory					
Total Marks	Minimum Passing Marks	External Evaluation	Min. External Evaluation	Internal Evaluation	Min. Internal Evaluation
100	40	60	18	40	12
Practical					
Total Marks	Minimum Passing Marks	External Evaluation	Min. External Evaluation	Internal Evaluation	Min. Internal Evaluation
100	50	60	30	40	20

Part E

Books	
Articles	https://citeseerx.ist.psu.edu/document?repid=rep1&type=pdf&doi=f9c23dd60eea111659bd43b58ff763a70ff78824
References Books	Handbook of Nutraceutical and Functional Foods-Wildman REC Innovations in Healthy and Functional Foods-Ghosh D Handbook of nutraceuticals Volume 2-Pathak YV
MOOC Courses	https://onlinecourses.swayam2.ac.in/ugc19_hs33/preview#:~:text=The%20online%20course%20on%20Functional,implications%20and%20mechanisms%20of%20action.
Videos	https://www.youtube.com/watch?v=R7BonXAIOE4&t=1s

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Syllabus-2023-2024

Bsc_Microbiology

Title of the Course	Disaster Management
Course Code	BSMB VACIII (T)

Part A								
Year	2nd	Semester	3rd	Credits	L	T	P	C
					2	0	0	2
Course Type	Theory only							
Course Category	Foundation core							
Pre-Requisite/s	To be familiar with the basics of natural disasters as well as anthropogenic factors and various approaches for disaster managements.			Co-Requisite/s				
Course Outcomes & Bloom's Level	CO1- To learn types of disasters and its profile in India(BL1-Remember) CO2- To understand the causes and impacts of disasters on environment and related case studies of Global and National disasters.(BL2-Understand) CO3- To learn about risk reduction approaches of disasters with safety issues in mitigating industrial disasters. (BL3-Apply) CO4- To understand the concept of Disaster Management Cycle and its Risk Reduction Measures(BL4-Analyze) CO5- To apply the National Acts and policies for mitigating disasters, Role of Army, Police, Community, Corporate, Media etc. for post Disaster Management.(BL5-Evaluate)							
Coures Elements	Skill Development ✕ Entrepreneurship ✕ Employability ✓ Professional Ethics ✓ Gender ✓ Human Values ✕ Environment ✓		SDG (Goals)	SDG1(No poverty) SDG3(Good health and well-being) SDG4(Quality education) SDG6(Clean water and sanitation) SDG8(Decent work and economic growth) SDG10(Reduced inequalities) SDG11(Sustainable cities and economies) SDG12(Responsible consumption and production) SDG13(Climate action) SDG15(Life on land) SDG17(Partnerships for the goals)				

Part B			
Modules	Contents	Pedagogy	Hours
1	Concepts and definitions (Disaster, Hazard, Vulnerability, Resilience, Risks, Capacity buildings) Factors of disasters, Global trends in disaster: urban disasters, pandemics, complex emergencies, Climate change	lecture method, collaborative learning, group discussions, field visit,	8
2	Classification of disaster: geophysical, hydrological, climatological, meteorological, biological and technological or man-made hazards. Causes, Impacts including social, economic, political, environmental, health, psychosocial, etc. Differential impacts- in terms of caste, class, gender, age, location, disability.	lecture method, collaborative learning, group discussions, field visit,case studies	8
3	Disaster management cycle – Phases, Culture of safety, prevention, mitigation and preparedness community based DRR, Structural- nonstructural measures, Roles and responsibilities of community, Panchayati Raj Institutions/Urban Local Bodies (PRIs/ULBs), States, Centre, and other stakeholders- Institutional Processes and Framework at State and Central Level- State Disaster Management Authority(SDMA).	lecture method, collaborative learning, group discussions, field visit,case studies	8
4	Factors affecting Vulnerabilities, differential impacts, impact of Development projects such as dams, embankments, changes in Land-use etc. Climate Change Adaptation. Relevance of indigenous knowledge, appropriate technology and local resources	lecture method, collaborative learning, group discussions, field visit,case studies	8
5	Disaster Management Indian scenario, India's vulnerability profile, Disaster Management Act 2005 and Policy guidelines, Environmental Legislation for Disaster Risk Management in India. Role of information technology in protecting environment and health. Role of NGOs Cases Studies: Bhopal Gas Disaster, Gujarat Earth Quake, Orissa Super-cyclone, South India Tsunami, Bihar floods, Plague Surat, COVID-19 pandemic	lecture method, collaborative learning, group discussions, field visit,case studies	8

Part D(Marks Distribution)

Theory					
Total Marks	Minimum Passing Marks	External Evaluation	Min. External Evaluation	Internal Evaluation	Min. Internal Evaluation
100	40	40	12	60	
Practical					
Total Marks	Minimum Passing Marks	External Evaluation	Min. External Evaluation	Internal Evaluation	Min. Internal Evaluation
0	0	0	0	0	0

Part E

Books	• Singhal J.P. "Disaster Management", Laxmi Publications, 2010. ISBN-10: 9380386427 ISBN-13: 978-9380386423 • Tushar Bhattacharya, "Disaster Science and Management", McGraw Hill India Education Pvt. Ltd., 2012. ISBN-10: 1259007367, ISBN-13: 978-1259007361] • Gupta Anil K, Sreeja S. Nair, Environmental Knowledge for Disaster Risk Management, NIDM, New Delhi, 2011 • Kapur Anu Vulnerable India: A Geographical Study of Disasters, IAS and Sage Publishers, New Delhi, 2010. • Kapur, Anu & others, 2005: Disasters in India Studies of grim reality, Rawat Publishers, Jaipur
Articles	https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3105552/
References Books	• Coppola P Damon, 2007. Introduction to International Disaster Management, Carter, Nick 1991. Disaster Management: A Disaster Manager's Handbook. • Cuny, F. 1983. Development and Disasters, Oxford University Press. Document on World Summit on Sustainable Development 2002. • Govt. of India: Disaster Management Act 2005, Government of India, New Delhi. Government of India, 2009. National Disaster Management Policy. • Disaster Management Guidelines. GOI-UNDP Disaster Risk Reduction Programme (2009-2012. • Disaster Medical Systems Guidelines. Emergency Medical Services Authority, State of California, EMSA no.214, June 2003 • National Institute of Disaster Management • National Disaster Management Authority • http://nidm.gov.in , http://cwc.gov.in , http://ekdrn.net , http://www.emdat.be , http://www.nws.noaa.gov , http://pubs.usgs.gov , http://www.imd.gov.in
MOOC Courses	https://nptel.ac.in/courses/124107010
Videos	https://nptel.ac.in/courses/124107010

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	2	-	-	-	-	1	2	-	-	-	-	1	-	-
CO2	1	2	-	-	-	-	1	2	-	-	-	-	1	-	-
CO3	1	2	-	-	-	-	1	2	-	-	-	-	-	-	-
CO4	1	2	-	-	-	-	1	2	-	-	-	-	-	2	-
CO5	1	2	-	-	-	-	1	2	-	-	-	-	-	-	3
CO6	1	2	-	-	-	-	1	2	-	-	-	-	-	-	3

Syllabus-2023-2024

Bsc_Microbiology

Title of the Course	Plant Tissue Culture
Course Code	BSMB302(T)

Part A

Year	2nd	Semester	3rd	Credits	L	T	P	C
					3	0	1	4
Course Type	Embedded theory and lab							
Course Category	Disciplinary Major							
Pre-Requisite/s	Should be acquainted with the basic knowledge of plants, cell biology, botany and genetics.			Co-Requisite/s				
Course Outcomes & Bloom's Level	CO1- To understand and recall the basic terms, techniques, historical landmarks of plant tissue culture.(BL1-Remember) CO2- To prepare the plant tissue culture media using sterilization techniques for inoculation.(BL2-Understand) CO3- To observe and differentiate the behavior of various explants towards the different types of nutrient media.(BL4-Analyze) CO4- To standardize the techniques and nutrient media for the growth and development of in vitro cultures.(BL3-Apply) CO5- To develop in vitro regenerated and transgenic plantlets using various tools and techniques of plant tissue culture.(BL6-Create)							
Coures Elements	Skill Development ✓ Entrepreneurship ✓ Employability ✓ Professional Ethics ✓ Gender ✗ Human Values ✗ Environment ✗		SDG (Goals)	SDG4(Quality education)				

Part B

Modules	Contents	Pedagogy	Hours
I	History: Important events and landmarks in the history of plant tissue culture. Introduction to cell and tissue culture, terms and definitions. Cellular Totipotency: Introduction cytodifferentiation, organ genic differentiation. Laboratory requirements and general techniques.	Tutorials, Collaborative, Demonstrations, Project methods Experiments,	8
II	Tissue culture media: Introduction, media constituents, types, selection, media preparation. Callus culture and its maintenance. Plant growth regulators. Cell and Suspension cultures, Somatic embryogenesis :Technique and application	Tutorials, Collaborative, Demonstrations, Project methods Experiments,	8
III	Micropropagation in Plants, Acclimatization : Process and challenges. Haploid production.: Anther culture and embryo culture: Introduction, techniques, culture requirements and applications. Protoplast Culture: Protoplast isolation, culture and regeneration. Soma clonal Variation	Tutorials, Collaborative, Demonstrations, Project methods Experiments,	8
IV	Somatic hybridization: technique and application.. Elicitors, Secondary metabolites and their production. Cryopreservation: technique and application	Tutorials, Collaborative, Demonstrations, Project methods Experiments,	8
V	Plant cloning vectors and their applications. Agrobacterium mediated transformation in plants. Transgenic plants: technique and application. Application of plant tissue culture in agriculture and forestry. Concept of Intellectual property right (IPR)	Tutorials, Collaborative, Demonstrations, Project methods Experiments,	9

Part C

Modules	Title	Indicative-ABCA/PBL/ Experiments/Field work/ Internships	Bloom's Level	Hours
I	Plant tissue culture: Applications and commercial importance	Experiments	BL2-Understand	2
II	Laboratory design and set up of plant tissue culture unit.	Experiments	BL2-Understand	2
III	Preparation of culture media.	Experiments	BL3-Apply	2
IV	Surface sterilization, sealing of culture, sources of contamination and their check measures	Experiments	BL3-Apply	3
V	Sterilization of media and apparatus.	Experiments	BL3-Apply	2
VI	Collection and preparation of explants	Experiments	BL4-Analyze	2
VII	Preparation of MS media for the inoculation of seeds.	Experiments	BL3-Apply	2
VIII	To establish seeds cultures	PBL	BL6-Create	2

Part D(Marks Distribution)

Theory					
Total Marks	Minimum Passing Marks	External Evaluation	Min. External Evaluation	Internal Evaluation	Min. Internal Evaluation
100	40	60	18	40	
Practical					
Total Marks	Minimum Passing Marks	External Evaluation	Min. External Evaluation	Internal Evaluation	Min. Internal Evaluation
100	50	60	30	40	

Part E

Books	Razdan M.K.;An Introduction to Plant Tissue Culture;3rd Edition Smith.R, Plant Tissue Culture: Techniques and Experiments. Academic Press, 2012
Articles	https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7356144/ https://link.springer.com/article/10.1007/s11627-022-10301-9
References Books	Bhojwani S.S & Razdan M.K;Plant Tissue Culture; 5th Edition Kole, C., Michler, C., Abbott, A.G., Hall, T.C. (Eds.) Transgenic Crop Plants: Volume 1: Principles and Development. Springer. 2010. Kole, C., Michler, C., Abbott, A.G., Hall, T.C. (Eds.) Transgenic Crop Plants: Volume 2: Utilization and Biosafety. Springer. 2010.
MOOC Courses	https://nptel.ac.in/courses/102103016
Videos	https://nptel.ac.in/courses/102103016

Syllabus-2023-2024

Bsc_Microbiology

Title of the Course	Genetic Engineering, Tools and applications
Course Code	BSMB401(T)

Part A								
Year	2nd	Semester	4th	Credits	L	T	P	C
					3	0	1	4
Course Type	Embedded theory and lab							
Course Category	Discipline Core							
Pre-Requisite/s	Student must have the detailed knowledge of Gene expression and hereditary information			Co-Requisite/s	Detailed study of genomics, proteomics and metabolomics tool			
Course Outcomes & Bloom's Level	CO1- To remember the role of all the enzymes used in the DNA editing(BL1-Remember) CO2- To understand the method of creating new molecules such as DNA & RNA(BL2-Understand) CO3- To understand the importance Nucleic acid editing tools(BL2-Understand) CO4- To evaluate the applications of in various fields such as research, Agriculture, Pharmaceutical industries(BL5-Evaluate) CO5- To apply the understanding of creation of new DNA , RNA & Protein and its use in different Fields.(BL3-Apply)							
Coures Elements	Skill Development ✓ Entrepreneurship ✓ Employability ✓ Professional Ethics ✓ Gender ✓ Human Values ✗ Environment ✗		SDG (Goals)	SDG4(Quality education)				

Part B			
Modules	Contents	Pedagogy	Hours
1	Introduction to gene cloning and its necessity: DNA modifying enzymes: Restriction enzymes (RE)- structure function and types, polymerase, kinases, ligase, alkaline phosphatase, exonuclease etc.. Cloning methods. linkers and adaptors.	Tutorials, Collaborative, Demonstrations, Project methods Experiments,	8
2	Methods of introduction of DNA into living cells, E.coli, plant and animal cells, Genetic transformation in plants:Agrobacterium mediated transformation in plants,structure and features of Ti and Ri plasmids.Genomic libraries and cDNA libraries.	Tutorials, Collaborative, Demonstrations, Project methods Experiments,	8
3	Cloning vectors: Plasmids and Bacteriophages, Phagemids, Cosmids, Artificial chromosomes (BAC and YAC) for E.coli, yeast. Strategies for identification of recombinant clones containing cloned genes: Nucleic acid hybridization, immune screening etc. Expression vectors for E.coli andYeast.	Tutorials, Collaborative, Demonstrations, Project methods Experiments,	8
4	Tools for RDT: Restriction mapping, Southern and northern blotting, Forensic application of biotechnology: DNA fingerprinting and its applications, forensic medicine Molecular Pharming: Application	Tutorials, Collaborative, Demonstrations, Project methods Experiments,	8
5	Applications of RDT, Production of recombinant protein (Insulin, Growth hormone), production of Recombinant vaccine. Golden rice, Artificial seed production, biofertilizers and biopesticide production GM crops and GM food	Tutorials, Collaborative, Demonstrations, Project methods Experiments,	8

Part C				
Modules	Title	Indicative-ABCA/PBL/ Experiments/Field work/ Internships	Bloom's Level	Hours
1	Preparation of stock and buffer solutions for DNA isolation	Experiments	BL3-Apply	2
2	Isolation of DNA from yeast cells.	Experiments	BL3-Apply	2
3	Isolation of DNA from Plant cell.	Experiments	BL3-Apply	2
4	Isolation of plasmid DNA	Experiments	BL3-Apply	2
5	Agarose gel electrophoresis of Genomic DNA	Experiments	BL4-Analyze	2
6	Isolation of RNA	Experiments	BL4-Analyze	2
7	Quantification of DNA by spectrophotometer(260/280nm)	Experiments	BL4-Analyze	2
8	To isolate the Auxotrophic mutants from the mixed culture sample of Microorganism	PBL	BL5-Evaluate	3 days

Part D(Marks Distribution)

Theory					
Total Marks	Minimum Passing Marks	External Evaluation	Min. External Evaluation	Internal Evaluation	Min. Internal Evaluation
100	40	60	18	40	
Practical					
Total Marks	Minimum Passing Marks	External Evaluation	Min. External Evaluation	Internal Evaluation	Min. Internal Evaluation
100	50	60	30	40	20

Part E

Books	TA Brown, Gene cloning 4 edition
Articles	https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3078015/
References Books	James D watson.Molecular Biology Of gene, 4 edition
MOOC Courses	https://nptel.ac.in/courses/102103074
Videos	https://nptel.ac.in/courses/102103074

Course Articulation Matrix

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Syllabus-2023-2024

MSc_Biotechnology

Title of the Course	Genetic Engineering
Course Code	BT 301 (T)

Part A								
Year	2nd	Semester	3rd	Credits	L	T	P	C
					4	0	0	4
Course Type	Embedded theory and lab							
Course Category	Discipline Core							
Pre-Requisite/s	knowledge of DNA RNA structure and mutation types in DNA			Co-Requisite/s	Effects of Changes in DNA on cell and Protein formation and use of different proteins in Health and Medicine Industry			
Course Outcomes & Bloom's Level	CO1- To remember the role of all the enzymes used in the DNA editing(BL1-Remember) CO2- To understand the method of creating new molecules such as DNA & RNA(BL2-Understand) CO3- To understand the importance Nucleic acid editing tools (BL2-Understand) CO4- To apply the understanding of creation of new DNA, RNA & Protein and its use in different Fields.(BL3-Apply) CO5- To evaluate the applications of in various fields such as research, Agriculture, Pharmaceutical industries(BL5-Evaluate)							
Coures Elements	Skill Development ✓ Entrepreneurship ✗ Employability ✓ Professional Ethics ✓ Gender ✗ Human Values ✗ Environment ✓		SDG (Goals)	SDG4(Quality education) SDG8(Decent work and economic growth)				

Part B				
Modules	Contents	Pedagogy	Hours	
1	Essential enzymes used in r-DNA technology. Types of Restriction enzymes and their mechanism, Restriction modification system. Cloning vectors- Plasmids, Cosmids, Phagmids, Plasmids, Artificial hromosomes (YAC and BAC), Shuttle vectors, Expression vectors, for E.coli, Hybrid Plasmid and phage vectors. Host organism used for expression system	Tutorials, Collaborative, Demonstrations, Project methods, Hands on experience, Experiments,	8	
2	Genetic transformation in plants:Agrobacterium mediated transformation in plants, crown gall and hairy root producing strains, structure and features of Ti and Ri plasmids, mechanisms of DNA transfer. Recalcitrance of monocot for Agrobacterium mediated transformation.Ti and Ri plasmid based vectors, Binary vectors, use of 35SCaMV and other promoters, selectable marker, Reporter genes. Methods of direct DNA transfer, particle bombardment, electroporation, Microinjection. Transfection, Alternative DNA transfer methods	Tutorials, Collaborative, Demonstrations, Project methods, Hands on experience, Experiments,	8	
3	Strategies for development of Tolerant/Resistant plants and their utility for productivity and performance: Herbicide resistance (Glyphosate, phosphinothricin, Sulfonylurea, Atrazine), Insect resistance: Bt Genes, Non-Bt like protease inhibitors, Alpha amylase inhibitor, Trypsin inhibitor; Genetically modifies plants: Examples, Advantages and disadvantages	Tutorials, Collaborative, Demonstrations, Project methods, Hands on experience, Experiments, Video lectures	8	
4	Gene therapy: types of gene therapy, Strategies of gene delivery, Gene replacement/augmentation, gene therapy for cancer cells, Gene silencing. RNA interference; Si RNA and mi RNA. DNA fingerprinting and its applications.Human genome project: Objective and goals. Protein engineering : examples and application	Tutorials, Collaborative, Demonstrations, Project methods, Hands on experience, Experiments, Video lectures	8	
5	Applications of r-DNA technology in health, agriculture, industrial sectors and pharmaceuticals. Molecular Farming: Pharming in animals and plants, Nutritional quality: golden rice,protein, vitamins. Archeogenetics: Introduction and application	Tutorials, Collaborative, Demonstrations, Project methods, Hands on experience, Experiments,	8	

Part C				
Modules	Title	Indicative-ABCA/PBL/ Experiments/Field work/ Internships	Bloom's Level	Hours
1	Preparation of stock and buffer solutions for DNA isolation	Experiments	BL2-Understand	3
2	Isolation of DNA from yeast cells.	Experiments	BL3-Apply	3
3	Isolation of DNA from Plant cell.	Experiments	BL3-Apply	3
4	Isolation of plasmid DNA	Experiments	BL3-Apply	3
5	Agarose gel electrophoresis of Genomic DNA	Experiments	BL5-Evaluate	3
6	Quantification of DNA by spectrophotometer(260/280nm)	PBL	BL2-Understand	6
7	Isolation of RNA from Yeast cell	PBL	BL3-Apply	3

Part D(Marks Distribution)

Theory					
Total Marks	Minimum Passing Marks	External Evaluation	Min. External Evaluation	Internal Evaluation	Min. Internal Evaluation
100	40	60	18	40	
Practical					
Total Marks	Minimum Passing Marks	External Evaluation	Min. External Evaluation	Internal Evaluation	Min. Internal Evaluation
100	0	40	20	60	30

Part E

Books	TA Brown Gene cloning 4th Edition
Articles	https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3078015/
References Books	Waston J.D. Molecular Biology of the Gene: 4th Edition Primrose andTwyman Principles of Gene Manipulation and Genomics 8th Edition
MOOC Courses	https://nptel.ac.in/courses/102103074
Videos	https://nptel.ac.in/courses/102103074

Syllabus-2023-2024

MSc_Biotechnology

Title of the Course	Agriculture Biotechnology and IPR
Course Code	BT 305 (T)

Part A								
Year	2nd	Semester	3rd	Credits	L	T	P	C
					4	0	0	4
Course Type	Theory only							
Course Category	Discipline Core							
Pre-Requisite/s	Student should have basic knowledge of botany and genetic engineering			Co-Requisite/s				
Course Outcomes & Bloom's Level	CO1- To define and contrast the terms agriculture and agricultural biotechnology(BL1-Remember) CO2- To understand the techniques, skills, and modern engineering tools necessary for engineering practice in agriculture biotechnology(BL2-Understand) CO3- To define the concept of utilizing plants for production of vaccines and production of biofertilizers(BL2-Understand) CO4- To apply the knowledge of engineering principles of agriculture biotechnology to living entities for societal welfare(BL3-Apply) CO5- The students will be able to develop the relationship between science and society and will be able to give justification for biotechnological manipulation of plants for human use(BL4-Analyze)							
Coures Elements	Skill Development ✓ Entrepreneurship ✓ Employability ✓ Professional Ethics ✓ Gender ✗ Human Values ✓ Environment ✓		SDG (Goals)	SDG3(Good health and well-being) SDG4(Quality education)				

Part B			
Modules	Contents	Pedagogy	Hours
I	Introduction To Agricultural Biotechnology: Origin of cultivated plants and plant indication, Introduction to Indian Agriculture heritage; Soil management and its relevance in Pre-modern India. Review of plant cell structure and function; Review of water uptake Introduction to plant nutrition; Mineral availability- uptake of minerals	Lecture method, demonstrations, field visit, ABL, Case studies, ABL.	8
II	Methods of breeding self-pollinated and vegetatively propagated plants; Seed Germination and Seedling Growth; Photoperiodism and its significance; Vernalization and hormonal control. Heterosis-Genetic and Molecular basis, Apomixis -Mechanism and significance in crop improvement	Lecture method, demonstrations, field visit, ABL, Case studies, ABL.	9
III	Post Harvest Biotechnology: Importance of post harvest physiology; Stages of growth; Maturity indices; Fruit ripening- changes during ripening; Post harvest losses-types; Technologies to control post harvest losses; Respiration and transpiration loss, methods to measure respiration and transpiration losses; Spoilage of fruit and vegetable, Microbial contaminants and post-harvest pathology	Lecture method, demonstrations, field visit, ABL, Case studies, ABL.	8
IV	Biotechnology In Organic Farming: Organic farming, principles and its scope in India; Role of Biotechnology in organic nutrient resources and its fortification; Restrictions to nutrient use in organic farming; Choice of crops and varieties in organic farming; Molecular Farming And Nitrogen Fixation: Molecular farming for the production of industrial enzymes, biodegradable plastics, polyhydroxybutyrate, antibodies, edible vaccines; Metabolic engineering of plants for the production of fatty acids, industrial oils, flavonoids etc.,	Lecture method, demonstrations, field visit, ABL, Case studies, ABL.	9
V	Introduction to Intellectual Property Rights Concept and Theories Kinds of Intellectual Property Rights Economic analysis of Intellectual Property Rights Need for Private Rights versus Public Interests Advantages and Disadvantages of IPR, International Regime Relating to IPR TRIPS and other Treaties (WIPO,WTO, GATTS)		8

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Part C				
Modules	Title	Indicative-ABCA/PBL/ Experiments/Field work/ Internships	Bloom's Level	Hours
I	To analyze the soil samples of various locations to check its fertility.	PBL	BL4-Analyze	1 week
II	To study the mechanism and significance in crop improvement.	Industrial Visit	BL4-Analyze	8 hrs
III	To apply for the patent for a specific product, product development process or any idea	PBL	BL6-Create	15 days

Part D(Marks Distribution)

Theory					
Total Marks	Minimum Passing Marks	External Evaluation	Min. External Evaluation	Internal Evaluation	Min. Internal Evaluation
100	40	60	18	40	
Practical					
Total Marks	Minimum Passing Marks	External Evaluation	Min. External Evaluation	Internal Evaluation	Min. Internal Evaluation

Part E	
Books	MS Swamynathan, Biotechnology in Agriculture, a Dialogue, 1981 Arun K. Sharma, Hand book of organic farming Agrobios, 2002
Articles	https://www.ncbi.nlm.nih.gov/pmc/articles/PMC8751662/
References Books	Arie Altman Paul Hasegawa, Plant Biotechnology and Agriculture, 2011 K. Lindsey and M.G.K. Jones, Plant biotechnology in Agriculture, 1989
MOOC Courses	https://nptel.ac.in/courses/126105014 https://nptel.ac.in/courses/126105337 https://nptel.ac.in/courses/109106128
Videos	https://nptel.ac.in/courses/126105014 https://nptel.ac.in/courses/126105337 https://nptel.ac.in/courses/109106128

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Syllabus-2023-2024

MSc_Biotechnology

Title of the Course	Bioprocess Engineering
Course Code	BT304 (T)

Part A

Year	2nd	Semester	3rd	Credits	L	T	P	C
					3	0	1	4
Course Type	Theory only							
Course Category	Discipline Core							
Pre-Requisite/s	Should be familiar with the basics of Bioprocess Engineering, techniques used for the production, purification and transport of metabolites, production of different metabolites with the help of microbes and their kinetics.			Co-Requisite/s	Should have the different fermentation processes, transport phenomenon and production of some important industrial metabolites			
Course Outcomes & Bloom's Level	CO1- The course prepares the student to understand the basic concepts of Bioprocess Engineering, its applications and future prospects. (BL1-Remember) CO2- The subject Bioprocess Engineering is designed for post graduate students of biotechnology for understanding of basic concepts of each and every division of the subject along with its applications in other fields. (BL2-Understand) CO3- The course aims to provide experimental basis, and to enable students to acquire a specialized knowledge and understanding. (BL3-Apply) CO4- The course aims to provide basis of analyzing the applications of Bioprocess Engineering in various fields of research and industries.(BL3-Apply) CO5- The course aims to provide basis of design, production and purification of bioproducts produced through research and in industries.(BL3-Apply)							
Coures Elements	Skill Development ✓ Entrepreneurship ✓ Employability ✓ Professional Ethics ✓ Gender ✗ Human Values ✗ Environment ✗		SDG (Goals)	SDG2(Zero hunger) SDG3(Good health and well-being) SDG4(Quality education) SDG8(Decent work and economic growth)				

Part B

Modules	Contents	Pedagogy	Hours
1	Units and dimensions: dimensional analysis, stiochiometric and composition relationship, Newton's law of viscosity and its measurement. Introduction to bioprocess technology Isolation and screening of Industrial microorganisms, Preservation and maintenance of industrial microorganisms	Tutorials, Collaborative, Demonstrations, Project methods Experiments,	8
2	Kinetics of microbial growth, death and product synthesis; Air and media sterilization, Construction, design and types of bioreactor. Kinetics of batch, fed batch and continuous reactor. Automation for monitoring and control	Tutorials, Collaborative, Demonstrations, Project methods Experiments,	8
3	Transport phenomenon in biochemical engineering: Mass transfer, heat transfer, rheology, Aeration and agitation. Product recovery processes, centrifugation, chromatography, extraction process, crystallization, drying and packaging. Quality assurance and safety consideration in DSP, Bioprocess Economics.	Tutorials, Collaborative, Demonstrations, Project methods Experiments,	8
4	Microbial production of Antibiotics (Penicillin and Streptomycin) and Enzymes (Amylase, Protease) with applications. Microbial Production of Vitamin (Vitamin B12), amino acids (Glutamic acid).	Tutorials, Collaborative, Demonstrations, Project methods, Hands on experience, Experiments, Video lecture	8
5	Microbial production of Organic acids (Citric acid and Acetic Acid), solvents (Ethanol and acetone). Microbial production of food-SCP.	Tutorials, Collaborative, Demonstrations, Project methods, Hands on experience, Experiments,	8

Part C

Modules	Title	Indicative-ABCA/PBL/ Experiments/Field work/ Internships	Bloom's Level	Hours
1	Isolation of industrially important microbes from soil by serial dilution method	Experiments	BL3-Apply	3
2	Isolation of industrially important microbes from water	Experiments	BL3-Apply	3
3	Isolation of industrially important microbes from air	Experiments	BL3-Apply	3
4	Microbial production of ethanol from orange juice using S. Cereviseae	Experiments	BL4-Analyze	3
5	Microbial production of ethanol from pineapple juice using S. Cereviseae	Experiments	BL3-Apply	3
6	Microbial production of ethanol from grape juice using S. Cereviseae	Experiments	BL3-Apply	3
7	Microbial production of citric acid using Aspergillus niger	Experiments	BL3-Apply	3
8	Microbial production of acetic acid	Experiments	BL3-Apply	3

Part D(Marks Distribution)

Theory					
Total Marks	Minimum Passing Marks	External Evaluation	Min. External Evaluation	Internal Evaluation	Min. Internal Evaluation
100	40	60	18	40	20
Practical					
Total Marks	Minimum Passing Marks	External Evaluation	Min. External Evaluation	Internal Evaluation	Min. Internal Evaluation
100	40	40	12	60	30

Part E

Books	Bioprocess Engg. Principles, P.M. Doran, Elsevier.
Articles	https://www.researchgate.net/topic/Bioprocess-Engineering
References Books	Bioprocess Engg., Schular, Kargi
MOOC Courses	https://nptel.ac.in/courses/102106022
Videos	https://nptel.ac.in/courses/102106022

Course Articulation Matrix

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Syllabus-2023-2024

Bsc_Microbiology

Title of the Course	Agriculture Biotechnology and Intellectual property rights
Course Code	DSE II (T)

Part A								
Year	3rd	Semester	6th	Credits	L	T	P	C
					3	0	0	3
Course Type	Theory only							
Course Category	Discipline Specific Elective							
Pre-Requisite/s	Student should have basic knowledge of botany and genetic engineering			Co-Requisite/s				
Course Outcomes & Bloom's Level	CO1- To define and contrast the terms agriculture and agricultural biotechnology(BL1-Remember) CO2- To understand the techniques, skills, and modern engineering tools necessary for engineering practice in agriculture biotechnology(BL2-Understand) CO3- To define the concept of utilizing plants for production of vaccines and production of biofertilizers(BL2-Understand) CO4- To apply the knowledge of engineering principles of agriculture biotechnology to living entities for societal welfare(BL3-Apply) CO5- The students will be able to develop the relationship between science and society and will be able to give justification for biotechnological manipulation of plants for human use(BL4-Analyze)							
Coures Elements	Skill Development ✓ Entrepreneurship ✓ Employability ✓ Professional Ethics ✓ Gender ✕ Human Values ✓ Environment ✓		SDG (Goals)	SDG3(Good health and well-being) SDG4(Quality education)				

Part B			
Modules	Contents	Pedagogy	Hours
I	Introduction To Agricultural Biotechnology: Origin of cultivated plants and plant indication, Introduction to Indian Agriculture heritage; Soil managemnet and its relevance in Pre-modern India. Review of plant cell structure and function; Review of water uptake Introduction to plant nutrition; Mineral availability- uptake of minerals	Lecture method, demonstrations, field visit, ABL, Case studies, ABL.	8
II	Methods of breeding self-pollinated and vegetatively propagated plants; Seed Germination and Seedling Growth; Photoperiodism and its significance; Vernalization and hormonal control. Heterosis-Genetic and Molecular basis, Apomixis -Mechanism and significance in crop improvement	Lecture method, demonstrations, field visit, ABL, Case studies, ABL.	9
III	Post Harvest Biotechnology: Importance of post harvest physiology; Stages of growth; Maturity indices; Fruit ripening- changes during ripening; Post harvest losses-types; Technologies to control post harvest losses; Respiration and transpiration loss, methods to measure respiration and transpiration losses; Spoilage of fruit and vegetable, Microbial contaminants and post-harvest pathology	Lecture method, demonstrations, field visit, ABL, Case studies, ABL.	8
IV	Biotechnology In Organic Farming: Organic farming, principles and its scope in India; Role of Biotechnology in organic nutrient resources and its fortification; Restrictions to nutrient use in organic farming; Choice of crops and varieties in organic farming; Molecular Farming And Nitrogen Fixation: Molecular farming for the production of industrial enzymes, biodegradable plastics, polyhydroxybutyrate, antibodies, edible vaccines; Metabolic engineering of plants for the production of fatty acids, industrial oils, flavonoids etc.,	Lecture method, demonstrations, field visit, ABL, Case studies, ABL.	9
V	Introduction to Intellectual Property Rights Concept and Theories Kinds of Intellectual Property Rights Economic analysis of Intellectual Property Rights Need for Private Rights versus Public Interests Advantages and Disadvantages of IPR, International Regime Relating to IPR TRIPS and other Treaties (WIPO,WTO, GATTS)		8

Part C				
Modules	Title	Indicative-ABCA/PBL/ Experiments/Field work/ Internships	Bloom's Level	Hours
I	To analyze the soil samples of various locations to check its fertility.	PBL	BL4-Analyze	1 week
II	To study the mechanism and significance in crop improvement.	Industrial Visit	BL4-Analyze	8 hrs
III	To apply for the patent for a specific product, product development process or any idea	PBL	BL6-Create	15 days

Part D(Marks Distribution)

Theory					
Total Marks	Minimum Passing Marks	External Evaluation	Min. External Evaluation	Internal Evaluation	Min. Internal Evaluation
100	40	60	18	40	
Practical					
Total Marks	Minimum Passing Marks	External Evaluation	Min. External Evaluation	Internal Evaluation	Min. Internal Evaluation
100	50	60	30	40	

Part E

Books	MS Swamynathan,Biotechnology in Agriculture, a Dialogue,1981 Arun K. Sharma,Hand book of organic farming Agrobios,2002
Articles	https://www.ncbi.nlm.nih.gov/pmc/articles/PMC8751662/
References Books	Arie Altman Paul Hasegawa,Plant Biotechnology and Agriculture,2011 K. Lindsey and M.G.K. Jones,Plant biotechnology in Agriculture, 1989
MOOC Courses	https://nptel.ac.in/courses/126105014 https://nptel.ac.in/courses/126105337 https://nptel.ac.in/courses/109106128
Videos	https://nptel.ac.in/courses/126105014 https://nptel.ac.in/courses/126105337 https://nptel.ac.in/courses/109106128

Syllabus-2023-2024

BSc_Biotechnology

Title of the Course	Agriculture Biotechnology and Intellectual property rights
Course Code	DSE II (T)

Part A								
Year	3rd	Semester	6th	Credits	L	T	P	C
					3	0	0	3
Course Type	Theory only							
Course Category	Discipline Core							
Pre-Requisite/s	Student should have basic knowledge of botany and genetic engineering			Co-Requisite/s				
Course Outcomes & Bloom's Level	CO1: To define and contrast the terms agriculture and agricultural biotechnology(BL1-Remember) CO2: To understand the techniques, skills, and modern engineering tools necessary for engineering practice in agriculture biotechnology(BL2-Understand) CO3- To define the concept of utilizing plants for production of vaccines and production of biofertilizers(BL2-Understand) CO4: To apply the knowledge of engineering principles of agriculture biotechnology to living entities for societal welfare(BL3-Apply) CO5: The students will be able to develop the relationship between science and society and will be able to give justification for biotechnological manipulation of plants for human use(BL4-Analyze)							
Coures Elements	Skill Development ✓ Entrepreneurship ✓ Employability ✓ Professional Ethics ✓ Gender ✗ Human Values ✓ Environment ✓		SDG (Goals)	SDG3(Good health and well-being) SDG4(Quality education)				

Part B			
Modules	Contents	Pedagogy	Hours
I	Introduction To Agricultural Biotechnology: Origin of cultivated plants and plant indication, Introduction to Indian Agriculture heritage; Soil management and its relevance in Pre-modern India. Review of plant cell structure and function; Review of water uptake Introduction to plant nutrition; Mineral availability- uptake of minerals	Lecture method, demonstrations, field visit, ABL, Case studies, ABL.	8
II	Methods of breeding self-pollinated and vegetatively propagated plants; Seed Germination and Seedling Growth; Photoperiodism and its significance; Vernalization and hormonal control. Heterosis-Genetic and Molecular basis, Apomixis -Mechanism and significance in crop improvement	Lecture method, demonstrations, field visit, ABL, Case studies, ABL.	9
III	Post Harvest Biotechnology: Importance of post harvest physiology; Stages of growth; Maturity indices; Fruit ripening- changes during ripening; Post harvest losses-types; Technologies to control post harvest losses; Respiration and transpiration loss, methods to measure respiration and transpiration losses; Spoilage of fruit and vegetable, Microbial contaminants and post-harvest pathology	Lecture method, demonstrations, field visit, ABL, Case studies, ABL.	8
IV	Biotechnology In Organic Farming: Organic farming, principles and its scope in India; Role of Biotechnology in organic nutrient resources and its fortification; Restrictions to nutrient use in organic farming; Choice of crops and varieties in organic farming; Molecular Farming And Nitrogen Fixation: Molecular farming for the production of industrial enzymes, biodegradable plastics, polyhydroxybutyrate, antibodies, edible vaccines; Metabolic engineering of plants for the production of fatty acids, industrial oils, flavonoids etc.,	Lecture method, demonstrations, field visit, ABL, Case studies, ABL.	9
V	Introduction to Intellectual Property Rights Concept and Theories Kinds of Intellectual Property Rights Economic analysis of Intellectual Property Rights Need for Private Rights versus Public Interests Advantages and Disadvantages of IPR, International Regime Relating to IPR TRIPS and other Treaties (WIPO,WTO, GATTS)		8

Part C				
Modules	Title	Indicative-ABCA/PBL/ Experiments/Field work/ Internships	Bloom's Level	Hours
I	To analyze the soil samples of various locations to check its fertility.	PBL	BL4-Analyze	1 week
II	To study the mechanism and significance in crop improvement.	Industrial Visit	BL4-Analyze	8 hrs
III	To apply for the patent for a specific product, product development process or any idea	PBL	BL6-Create	15 days

Part D(Marks Distribution)

Theory					
Total Marks	Minimum Passing Marks	External Evaluation	Min. External Evaluation	Internal Evaluation	Min. Internal Evaluation
100	40	60	18	40	
Practical					
Total Marks	Minimum Passing Marks	External Evaluation	Min. External Evaluation	Internal Evaluation	Min. Internal Evaluation

Part E	
Books	MS Swamynathan,Biotechnology in Agriculture, a Dialogue,1981 Arun K. Sharma,Hand book of organic farming Agrobios,2002
Articles	https://www.ncbi.nlm.nih.gov/pmc/articles/PMC8751662/
References Books	Arie Altman Paul Hasegawa,Plant Biotechnology and Agriculture,2011 K. Lindsey and M.G.K. Jones,Plant biotechnology in Agriculture, 1989
MOOC Courses	https://nptel.ac.in/courses/126105014 https://nptel.ac.in/courses/126105337 https://nptel.ac.in/courses/109106128
Videos	https://nptel.ac.in/courses/126105014 https://nptel.ac.in/courses/126105337 https://nptel.ac.in/courses/109106128

Syllabus-2023-2024

Bsc_Microbiology

Title of the Course	Agriculture Microbiology
Course Code	DSE II (T)

Part A

Year	3rd	Semester	6th	Credits	L	T	P	C
					3	0	0	3
Course Type	Embedded theory and lab							
Course Category	Discipline Core							
Pre-Requisite/s	Basic knowledge of microscope and other microbiological techniques			Co-Requisite/s				
Course Outcomes & Bloom's Level	CO1- TO Understand and accurately apply terminology used in the field of microbiology, and understand the fundamental differences between different types of microorganisms including bacteria, viruses, fungi, prions and protozoa(BL1-Remember) CO2- Describe the structure and biology of bacterial cells, including the arrangement and replication of genetic material, and understand the concept of virulence and virulence factors(BL2-Understand) CO3- To analyse how microorganisms may be detected within various environments, including how they may be cultivated within the laboratory setting, and molecular methods of detection(BL3-Apply) CO4- To identify specific microorganisms important to animals, plants and soil ecosystems, and explain why these microorganisms are significant(BL4-Analyze) CO5- Review and evaluate readings relating to microbiology and agricultural production(BL5-Evaluate)							
Coures Elements	Skill Development ✓ Entrepreneurship ✓ Employability ✓ Professional Ethics ✓ Gender X Human Values ✓ Environment ✓		SDG (Goals)	SDG4(Quality education)				

Part B

Modules	Contents	Pedagogy	Hours
1	Introduction – Soil as an environment for microorganisms. Classification of soil, physical and chemical properties of soil, structure of soil. Microbial interactions - mutualism, commensalism, amensalism, synergism, parasitism, predation and competition. Microbial interactions between plants–phylosphere, mycorrhizae, rhizosphere and symbiotic association in root nodules. Biofertilizer – VAM, Rhizobium, Frankia, Azospirillum, Azotobacter, cyanobacteria and Azolla.	Tutorials, Collaborative, Demonstrations, Project methods, Hands on experience, ABL Experiments,	8
2	Soil microbes and fertility of soil. Roles of microbes in biogeochemical cycles, Microorganisms in soil processes, carbon cycle, organic matter decomposition, humus formation, nitrogen cycle, nitrogen fixation, symbiotic, non-symbiotic, associative organisms, ammonification, nitrification, denitrification, reactions, organisms involved.	Tutorials, Collaborative, Demonstrations, Project methods, Hands on experience, ABL Experiments,	8
3	Plant protection – phenolics – phytoalexins and related compounds. Bio insecticides – viral, bacterial and fungal, Chemical Pesticide and their adverse effect on agriculture (soil and crop).	Tutorials, Collaborative, Demonstrations, Project methods, Hands on experience, ABL Experiments,	8
4	Plant pathogenic Microorganisms :- Historical Background, Disease symptoms, Mode of Entry of pathogens, Plant Disease Resistance, Physiology of Parasitism, Factors effecting disease Incidence, Algal, Fungal, Viral, Bacterial disease, Bacterial diseases of agricultural crops -pathogens, symptoms and control measures with reference to paddy, cotton, maize, tomato, citrus, mango and potato. Mycoplasma Disease, Nematode Disease.	Tutorials, Collaborative, Demonstrations, Project methods, Hands on experience, ABL Experiments,	8
5	Microorganisms Harmful to Man and Animal: - Resentence of animal to pathogens, Group of organisms causing disease, Foot mouth disease, John's disease, Control of John's disease (JD) in cattle, poisoning of livestock by blue-green algae	Tutorials, Collaborative, Demonstrations, Project methods, Hands on experience, ABL Experiments,	8

Part C

Modules	Title	Indicative-ABCA/PBL/ Experiments/Field work/ Internships	Bloom's Level	Hours
1	Enumeration of microbial population in soil; qualitative and quantitative distribution;	PBL	BL3-Apply	1 month
2	isolation of symbiotic nitrogen fixing bacteria –non symbiotic and associative symbiotic bacteria;	Experiments	BL3-Apply	2
3	soil algae ; nitrification	Experiments	BL4-Analyze	4
4	isolation of sulphur and iron bacteria;	Experiments	BL5-Evaluate	2
5	Isolation and study of phosphobacteria and phosphorus solubility	Experiments	BL5-Evaluate	2

Part D(Marks Distribution)

Theory					
Total Marks	Minimum Passing Marks	External Evaluation	Min. External Evaluation	Internal Evaluation	Min. Internal Evaluation
100	40	60	18	40	
Practical					
Total Marks	Minimum Passing Marks	External Evaluation	Min. External Evaluation	Internal Evaluation	Min. Internal Evaluation
100	40	40	20	60	

Part E

Books	Martin Alexander 1976. Introduction to soil microbiology Willy Eastern Ltd. New Delhi. Robert LTate III. 1995. Soil Microbiology. John Wiley & Sons, New York, pp 398.
Articles	https://www.ncbi.nlm.nih.gov/pmc/articles/PMC8313292/
References Books	Subbarao, N.S. 1977. Soil microorganisms and plant growth, Oxford & IBH Publishing Co., New Delhi. Walker, N. 1975. Soil Microbiology. Butterworths, London AGRICULTURAL MICROBIOLOGY By D. J. BAGYARAJ, G. RANGASWAMI Alexander M. 1997. Introduction to soil microbiology, John Wiley & Sons, Inc, New York. EcEldowney S., Hardman, D.J. and Waite, S. 1993. Pollution Ecology and Biotreatment-Longman Scientific Technical.
MOOC Courses	https://nptel.ac.in/courses/105107173
Videos	https://nptel.ac.in/courses/105107173

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
C01	1	2	2	-	-	2	-	-	-	2	2	-	2	2	3
C02	2	1	2	-	-	3	-	-	-	2	1	-	1	2	2
C03	2	2	2	-	-	1	-	-	-	1	1	-	1	1	2
C04	1	2	1	-	-	2	-	-	-	1	2	-	3	1	1
C05	2	2	1	-	-	1	-	-	-	1	-	-	3	2	1
C06	2	2	3	-	-	3	-	-	-	-	2	-	2	1	1

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Syllabus-2023-2024

Bsc_Microbiology

Title of the Course	Molecular Diagnostics
Course Code	DSE IV (T)

Part A

Year	3rd	Semester	6th	Credits	L	T	P	C
					3	0	0	3
Course Type	Embedded theory and lab							
Course Category	Discipline Specific Elective							
Pre-Requisite/s	Student must be aware of basic immunity and immunological assays.			Co-Requisite/s				
Course Outcomes & Bloom's Level	CO1- understanding of the basic principles and clinical significance of laboratory testing in the field of molecular diagnostics.(BL1-Remember) CO2- Demonstrate an understanding of basic molecular diagnostic techniques(BL2-Understand) CO3- Demonstrate an understanding of electrophoresis in the separation of DNA fragments() CO4- Apply molecular diagnostic techniques to the identification and diagnosis of diseases(BL3-Apply) CO5- Understand the basics in quality control and quality assurance(BL2-Understand)							
Coures Elements	Skill Development ✓ Entrepreneurship ✗ Employability ✓ Professional Ethics ✓ Gender ✗ Human Values ✓ Environment ✗		SDG (Goals)	SDG3(Good health and well-being) SDG4(Quality education) SDG8(Decent work and economic growth)				

Part B

Modules	Contents	Pedagogy	Hours
I	Enzyme immunoassays: Comparison of enzymes available for enzyme immunoassays, conjugation of enzymes. Solid phases used in enzyme immunoassays. Homogeneous and heterogeneous enzyme immunoassays. Enzyme immunoassays after immuno blotting.	lecture method, Demonstrations, experiments, ABL, PBL, case studies	6
II	Enzyme immuno histochemical techniques: Use of polyclonal or monoclonal antibodies in enzymes immuno assays. Applications of enzyme immunoassays in diagnostic microbiology; Molecular methods in clinical microbiology: Applications of PCR, RFLP, Nuclear hybridization methods, Single nucleotide polymorphism and plasmid finger printing in clinical microbiology	lecture method, Demonstrations, experiments, ABL, PBL, case studies	7
III	Laboratory tests in chemotherapy: Susceptibility tests: Micro-dilution and macro-dilution broth procedures. Susceptibility tests: Diffusion test procedures. Susceptibility tests: Tests for bactericidal activity. Automated procedures for antimicrobial susceptibility tests.	lecture method, Demonstrations, experiments, ABL, PBL, case studies	8
IV	Automation and rapid diagnostic approach: Automation in microbial diagnosis, rapid diagnostic approach including technical purification and standardization of antigen and specific antibodies.	lecture method, Demonstrations, experiments, ABL, PBL, case studies	8
V	Idiotypes and immunodiagnostic: Concepts and methods in idiotypes. Immunodiagnostic tests- Immuno florescence. Radioimmunoassay. Diagnostic tools: HPLC, Electron microscopy, flow cytometry and cell sorting.	lecture method, Demonstrations, experiments, ABL, PBL, case studies	8

Part C

Modules	Title	Indicative-ABCA/PBL/ Experiments/Field work/ Internships	Bloom's Level	Hours
I	To isolate genomic DNA from the animal sample	Experiments	BL3-Apply	6
II	To anlyse immunological activity using various assays	PBL	BL3-Apply	7
III	To perform ELISA test	PBL	BL5-Evaluate	6
IV	To preform radial immunodiffsn	Experiments	BL3-Apply	5
V	To analyse the AIDS patients through immunological assays and moelcular markers	Case Study	BL5-Evaluate	1 week
VI	Detection and identification of microorganisms using molecular techniques	PBL	BL3-Apply	1 week

Part D(Marks Distribution)

Theory					
Total Marks	Minimum Passing Marks	External Evaluation	Min. External Evaluation	Internal Evaluation	Min. Internal Evaluation
100	40	60	18	40	
Practical					
Total Marks	Minimum Passing Marks	External Evaluation	Min. External Evaluation	Internal Evaluation	Min. Internal Evaluation
100	50	60	30	40	

Part E

Books	Williams, Bethany Jill, Chloe Knowles, and Darren Treanor. "Maintaining quality diagnosis with digital pathology: a practical guide to ISO 15189 accreditation." Journal of clinical pathology 72.10 (2019): 663-668. Modern Approaches to Quality Control. Croatia, IntechOpen, 2011.
Articles	https://www.ncbi.nlm.nih.gov/pmc/articles/PMC1214554/
References Books	Moumtzoglou, Anastasius, ed. Laboratory Management Information Systems: Current Requirements and Future Perspectives: Current Requirements and Future Perspectives. IGI Global, 2014. Burnett, David. A Practical Guide to ISO 15189 in Laboratory Medicine. United Kingdom, ACB Venture Publications, 2013.
MOOC Courses	https://nptel.ac.in/courses/127105391
Videos	https://nptel.ac.in/courses/127105391

Syllabus-2023-2024

BSc_Biotechnology

Title of the Course	Medical Biotechnology
Course Code	DSE V (T)

Part A

Year	4th	Semester	7th	Credits	L	T	P	C
					2	0	0	2
Course Type	Embedded theory and lab							
Course Category	Discipline Specific Elective							
Pre-Requisite/s	Students acquainted with the fundamental concepts of nanotechnology and develop an understanding to employ its principles in modern biotechnology applications.				Co-Requirement/s			
Course Outcomes & Bloom's Level	CO1- The students are introduced to the biological revolutions in this field.(BL1-Remember) CO2- To understand the role of biotechnology in the world wide market(BL2-Understand) CO3- To learn about biosensors, vaccine production, monoclonal antibodies, nanotechnology and its applications.(BL2-Understand) CO4- The students will be able to demonstrate the use of biotechnology in solving various medical problems(BL3-Apply)							
Coures Elements	Skill Development ✓ Entrepreneurship ✗ Employability ✓ Professional Ethics ✓ Gender ✗ Human Values ✓ Environment ✗		SDG (Goals)		SDG3(Good health and well-being) SDG4(Quality education)			

Part B

Modules	Contents	Pedagogy	Hours
I	Introduction – Origin, significance & worldwide market of Medical Biotechnology. Revolution in clinical diagnosis, Antibody and Nucleic Acid Hybridization techniques, Imaging techniques (Nanodiagnosis).	Lecture methods, demonstrations, experiments, ABL, PBL, Field visits	8
II	Genetic & Metabolic Disorders – Introduction, Classification, Impact of genetic diseases on human health - Chromosome errors - Down syndrome, Klinefelter's and Turner's syndrome. Metabolic disorders – Phenylketonuria, Homocystinuria, Mucopolysaccharidosis, Gangliosidosis, Gaucher's disease, Diabetes, Hemophilia and sickle cell anemia. Treatment of Genetic diseases - prenatal diagnosis, Genetic Counseling - Ethical, Legal and Social Issues	Lecture methods, demonstrations, experiments, ABL, PBL, Field visits	8
III	Revolution in treatment – Recombinant DNA technology for human insulin, Hepatitis B vaccine. Tissue plasminogen activator, clotting factor VIII. Antibody Engineering and Therapeutic Antibodies. Phage therapy.	Lecture methods, demonstrations, experiments, ABL, PBL, Field visits	8
IV	Cancer - Molecular, cellular and genetic basis of cancer, tumor virus and oncogenes, tumor suppressor genes and mechanism of action of p53 proteins. Stem Cells - Sources and types of stem cells, Stem cell transplant and its types, Potential targets for stem cell treatment, Therapeutic applications of stem cells, Regenerative medicine and Stem cell ethics. Skin Grafting	Lecture methods, demonstrations, experiments, ABL, PBL, Field visits	8
V	Gene therapy- basic approaches and types of gene therapy, vectors used in gene therapy, application of gene therapy in medicine. Nanobiotechnology - Introduction, types and structures of nanoparticles, biosynthesis of nanoparticles, application of nanoparticles in treatment.	Lecture methods, demonstrations, experiments, ABL, PBL, Field visits	8

Part C

Modules	Title	Indicative-ABCA/PBL/ Experiments/Field work/ Internships	Bloom's Level	Hours
I	Biochemical test for identification of bacteria	Experiments	BL4-Analyze	3
II	Extraction and separation of Antigen proteins from Bacteria & protozoa	Experiments	BL4-Analyze	3
III	Estimation of blood glucose.	Experiments	BL4-Analyze	2
IV	Estimation of cholesterol in blood.	Experiments	BL4-Analyze	2
V	Estimation of iron in blood.	Experiments	BL5-Evaluate	3
VI	Biological synthesis of nanoparticles	Experiments	BL6-Create	2
VII	Widal test	PBL	BL4-Analyze	5

Part D(Marks Distribution)

Theory					
Total Marks	Minimum Passing Marks	External Evaluation	Min. External Evaluation	Internal Evaluation	Min. Internal Evaluation
100	40	60	18	40	
Practical					
Total Marks	Minimum Passing Marks	External Evaluation	Min. External Evaluation	Internal Evaluation	Min. Internal Evaluation

Part E

Books	Glick B.R. and Pasurank..Molecular biotechnology – Principle and Applications of Recombinant DNA- J.I.(4th edition), ASM Press. 2010. Anthony D. Ho, Hoffman. R, and Esmail D. Zanjani, Stem Cell Transplantation (4th edition), Wiley – liss publishers, 2006. Hornyak. G.L , Moore. J.J. Tibbals H.F., Dutta. J. Fundamentals of Nanotechnology (1st edition), CRC press, 2008.
Articles	https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6153617/
References Books	Jogdand. S. N. Medical Biotechnology –, (4th edition), Himalayan publishing house, 2004. Freshney.I, Stacey. G. N, Auerbach.J.M, Culture of Human Stem Cells (1st edition) , Wiley – Liss publishers, 2007.
MOOC Courses	NA
Videos	https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6153617/

Syllabus-2023-2024

Bsc_Microbiology

Title of the Course	Medical Biotechnology
Course Code	DSE V (T)

Part A

Year	4th	Semester	7th	Credits	L	T	P	C
					3	0	0	3
Course Type	Embedded theory and lab							
Course Category	Discipline Specific Elective							
Pre-Requisite/s	Students acquainted with the fundamental concepts of nanotechnology and develop an understanding to employ its principles in modern biotechnology applications.				Co-Requisite/s			
Course Outcomes & Bloom's Level	CO1- The students are introduced to the biological revolutions in this field.(BL1-Remember) CO2- To understand the role of biotechnology in the world wide market(BL2-Understand) CO3- To learn about biosensors, vaccine production, monoclonal antibodies, nanotechnology and its applications.(BL2-Understand) CO4- The students will be able to demonstrate the use of biotechnology in solving various medical problems(BL3-Apply)							
Coures Elements	Skill Development ✓ Entrepreneurship ✗ Employability ✓ Professional Ethics ✓ Gender ✗ Human Values ✓ Environment ✗		SDG (Goals)		SDG3(Good health and well-being) SDG4(Quality education)			

Part B

Modules	Contents	Pedagogy	Hours
I	Introduction – Origin, significance & worldwide market of Medical Biotechnology. Revolution in clinical diagnosis, Antibody and Nucleic Acid Hybridization techniques, Imaging techniques (Nanodiagnosis).	Lectue methods, demonstrations, experiments, ABL, PBL, Field visits	8
II	Genetic & Metabolic Disorders – Introduction, Classification, Impact of genetic diseases on human health - Chromosome errors - Down syndrome, Klinefelter's and Turner's syndrome. Metabolic disorders – Phenylketonuria, Homocystinuria, Mucopolysaccharidosis, Gangliosidosis, Gaucher's disease, Diabetes, Hemophilia and sickle cell anemia. Treatment of Genetic diseases - prenatal diagnosis, Genetic Counseling - Ethical, Legal and Social Issues	Lectue methods, demonstrations, experiments, ABL, PBL, Field visits	8
III	Revolution in treatment – Recombinant DNA technology for human insulin, Hepatitis B vaccine. Tissue plasminogen activator, clotting factor VIII. Antibody Engineering and Therapeutic Antibodies. Phage therapy.	Lectue methods, demonstrations, experiments, ABL, PBL, Field visits	8
IV	Cancer - Molecular, cellular and genetic basis of cancer, tumor virus and oncogenes, tumor suppressor genes and mechanism of action of p53 proteins. Stem Cells - Sources and types of stem cells, Stem cell transplant and its types, Potential targets for stem cell treatment, Therapeutic applications of stem cells, Regenerative medicine and Stem cell ethics. Skin Grafting	Lectue methods, demonstrations, experiments, ABL, PBL, Field visits	8
V	Gene therapy- basic approaches and types of gene therapy, vectors used in gene therapy, application of gene therapy in medicine. Nanobiotechnology - Introduction, types and structures of nanoparticles, biosynthesis of nanoparticles, application of nanoparticles in treatment.	Lectue methods, demonstrations, experiments, ABL, PBL, Field visits	8

Part C

Modules	Title	Indicative-ABCA/PBL/ Experiments/Field work/ Internships	Bloom's Level	Hours
I	Biochemical test for identification of bacteria	Experiments	BL4-Analyze	3
II	Extraction and separation of Antigen proteins from Bacteria & protozoa	Experiments	BL4-Analyze	3
III	Estimation of blood glucose.	Experiments	BL4-Analyze	2
IV	Estimation of cholesterol in blood.	Experiments	BL4-Analyze	2
V	Estimation of iron in blood.	Experiments	BL5-Evaluate	3
VI	Biological synthesis of nanoparticles	Experiments	BL6-Create	2
VII	Widal test	PBL	BL4-Analyze	5

Part D(Marks Distribution)

Theory					
Total Marks	Minimum Passing Marks	External Evaluation	Min. External Evaluation	Internal Evaluation	Min. Internal Evaluation
100	40	60	18	40	
Practical					
Total Marks	Minimum Passing Marks	External Evaluation	Min. External Evaluation	Internal Evaluation	Min. Internal Evaluation

Part E

Books	Glick B.R. and Pasurank..Molecular biotechnology – Principle and Applications of Recombinant DNA- J.I.(4th edition), ASM Press. 2010. Anthony D. Ho, Hoffman. R, and Esmail D. Zanjani, Stem Cell Transplantation (4th edition), Wiley – liss publishers, 2006. Hornyak. G.L , Moore. J.J. Tibbals H.F., Dutta. J. Fundamentals of Nanotechnology (1st edition), CRC press, 2008.
Articles	https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6153617/
References Books	Jogdand. S. N. Medical Biotechnology –, (4th edition), Himalayan publishing house, 2004. Freshney.I, Stacey. G. N, Auerbach.J.M, Culture of Human Stem Cells (1st edition) , Wiley – Liss publishers, 2007.
MOOC Courses	NA
Videos	https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6153617/

Syllabus-2023-2024

BSc_Biotechnology

Title of the Course	Industrial Microbiology
Course Code	DSE VI (T)

Part A

Year	4th	Semester	7th	Credits	L	T	P	C
					3	0	1	4
Course Type	Embedded theory and lab							
Course Category	Discipline Core							
Pre-Requisite/s	Explain the various fermentation strategies and the growth kinetics of industrial microorganisms			Co-Requsite/s	the environmental and nutritional factors affecting the production of various metabolites, the best conditions and optimization protocol needed for various microbial products			
Course Outcomes & Bloom's Level	CO1- To identify the different types of fermenters(BL1-Remember) CO2- Explain the various fermentation strategies and the growth kinetics of industrial microorganisms (BL2-Understand) CO3- Discuss the methods for the production of certain products (metabolites) using different microorganisms (BL2-Understand) CO4- Describe the environmental and nutritional factors affecting the production of various metabolites(BL3-Apply) CO5- Select the best conditions and optimization protocol needed for various microbial products(BL4-Analyze)							
Coures Elements	Skill Development ✓ Entrepreneurship ✓ Employability ✓ Professional Ethics ✓ Gender X Human Values ✓ Environment ✓		SDG (Goals)	SDG4(Quality education) SDG8(Decent work and economic growth)				

Part B

Modules	Contents	Pedagogy	Hours
1	Bioreactor / Fermenter – types & operation of Bioreactors, physico-chemical standards used in bioreactors, limitations of bioreactors, stages of fermentation processes, Media design for fermentation processes, Solid substrate fermentation, Fermenters (Stirred tank, bubble columns, airlift, Bioreactors, Static, Submerged and agitated fermentation), advantages & disadvantages of solid substrate & liquid fermentation	Tutorials, Collaborative, Demonstrations, Project methods, Hands on experience, Experiments,	8
2	Technology of Microbial cell maintenance – steps to maintain microbial culture in an aseptic & sterile environment (how to inoculate, preserve & maintain), Strain preservation, maintenance and strain improvement by mutation of gene transfer processes.	Tutorials, Collaborative, Demonstrations, Project methods, Hands on experience, Experiments, industrial visits	8
3	Downstream processing – extraction, separation, concentration, recovery & purification, operations (Insulin, Vitamins, Metabolites), Industrial production of Ethyl alcohol, Acetic Acid (Vinegar), Citric acid, lactic acid, α-amylase, protease penicillin, tetracycline and vitamin B12, with reference to easily available raw materials, Production of herbal drugs.	Tutorials, Collaborative, Demonstrations, Project methods, Hands on experience, Experiments, industrial visits	8
4	Enzyme technology – nature of enzymes, application of enzymes, limitations of microbial cells used as catalysts in fermentation, multi-enzyme reactors, genetic engineering & protein engineering of enzymes, cloning strategy for enzymes, technology of enzyme production, use of immobilized cells and enzymes (Ca-alginate beads, polyacrylamide), industrial applications of immobilized enzymes.	Tutorials, Collaborative, Demonstrations, Project methods, Hands on experience, Experiments,	8
5	Biotechnology in specific medical & industrial applications - Retting of jute, microbial process for immunization (Production of monoclonal antibodies), Deterioration of paper, textiles, painted surfaces and their prevention, Biofilms, microbial biopolymers, bio-surfactants, Microbial culture selection with high yield potential.	Tutorials, Collaborative, Demonstrations, Project methods, Hands on experience, Experiments, industrial visits	8

Part C

Modules	Title	Indicative-ABCA/PBL/ Experiments/Field work/ Internships	Bloom's Level	Hours
1	Study different parts of fermenter	Experiments	BL2-Understand	2
1	To check the antimicrobial properties of Asoca sarca	PBL	BL4-Analyze	2 months
4	Solid state fermentation – Mushroom production	Experiments	BL3-Apply	2
5	Production of Wine from Grapes	Experiments	BL3-Apply	2
6	Cell separation of yeast and LAB by Centrifugal and Filtration	Experiments	BL3-Apply	2

Part D(Marks Distribution)

Theory					
Total Marks	Minimum Passing Marks	External Evaluation	Min. External Evaluation	Internal Evaluation	Min. Internal Evaluation
100	40	40	12	60	
Practical					
Total Marks	Minimum Passing Marks	External Evaluation	Min. External Evaluation	Internal Evaluation	Min. Internal Evaluation
100	50	40	20	60	

Part E

Books	L. E. Casida Industrial Microbiology (1st Edition)
Articles	strainimprovement-130430125756-phpapp02.pdf
References Books	Nduka Okafor Modern Industrial Microbiology and Biotechnology-1st Edition
MOOC Courses	https://nptel.ac.in/courses/102106053 https://nptel.ac.in/courses/102106022
Videos	https://nptel.ac.in/courses/102106053 https://nptel.ac.in/courses/102106022

Syllabus-2023-2024

Bsc_Microbiology

Title of the Course	Industrial Microbiology
Course Code	DSE VI (T)

Part A

Year	4th	Semester	7th	Credits	L	T	P	C
					3	0	1	4
Course Type	Embedded theory and lab							
Course Category	Discipline Core							
Pre-Requisite/s	Explain the various fermentation strategies and the growth kinetics of industrial microorganisms			Co-Requsite/s	the environmental and nutritional factors affecting the production of various metabolites, the best conditions and optimization protocol needed for various microbial products			
Course Outcomes & Bloom's Level	CO1- To identify the different types of fermenters(BL1-Remember) CO2- Explain the various fermentation strategies and the growth kinetics of industrial microorganisms (BL2-Understand) CO3- Discuss the methods for the production of certain products (metabolites) using different microorganisms (BL2-Understand) CO4- Describe the environmental and nutritional factors affecting the production of various metabolites(BL3-Apply) CO5- Select the best conditions and optimization protocol needed for various microbial products(BL4-Analyze)							
Coures Elements	Skill Development ✓ Entrepreneurship ✓ Employability ✓ Professional Ethics ✓ Gender ✗ Human Values ✓ Environment ✓		SDG (Goals)	SDG4(Quality education) SDG8(Decent work and economic growth)				

Part B

Modules	Contents	Pedagogy	Hours
1	Bioreactor / Fermenter – types & operation of Bioreactors, physico-chemical standards used in bioreactors, limitations of bioreactors, stages of fermentation processes, Media design for fermentation processes, Solid substrate fermentation, Fermenters (Stirred tank, bubble columns, airlift, Bioreactors, Static, Submerged and agitated fermentation), advantages & disadvantages of solid substrate & liquid fermentation	Tutorials, Collaborative, Demonstrations, Project methods, Hands on experience, Experiments,	8
2	Technology of Microbial cell maintenance – steps to maintain microbial culture in an aseptic & sterile environment (how to inoculate, preserve & maintain), Strain preservation, maintenance and strain improvement by mutation of gene transfer processes.	Tutorials, Collaborative, Demonstrations, Project methods, Hands on experience, Experiments, industrial visits	8
3	Downstream processing – extraction, separation, concentration, recovery & purification, operations (Insulin, Vitamins, Metabolites), Industrial production of Ethyl alcohol, Acetic Acid (Vinegar), Citric acid, lactic acid, α-amylase, protease penicillin, tetracycline and vitamin B12, with reference to easily available raw materials, Production of herbal drugs.	Tutorials, Collaborative, Demonstrations, Project methods, Hands on experience, Experiments, industrial visits	8
4	Enzyme technology – nature of enzymes, application of enzymes, limitations of microbial cells used as catalysts in fermentation, multi-enzyme reactors, genetic engineering & protein engineering of enzymes, cloning strategy for enzymes, technology of enzyme production, use of immobilized cells and enzymes (Ca-alginate beads, polyacrylamide), industrial applications of immobilized enzymes.	Tutorials, Collaborative, Demonstrations, Project methods, Hands on experience, Experiments,	8
5	Biotechnology in specific medical & industrial applications - Retting of jute, microbial process for immunization (Production of monoclonal antibodies), Deterioration of paper, textiles, painted surfaces and their prevention, Biofilms, microbial biopolymers, bio-surfactants, Microbial culture selection with high yield potential.	Tutorials, Collaborative, Demonstrations, Project methods, Hands on experience, Experiments, industrial visits	8

Part C

Modules	Title	Indicative-ABCA/PBL/ Experiments/Field work/ Internships	Bloom's Level	Hours
1	Study different parts of fermenter	Experiments	BL2-Understand	2
1	To check the antimicrobial properties of Asoca sarca	PBL	BL4-Analyze	2 months
4	Solid state fermentation – Mushroom production	Experiments	BL3-Apply	2
5	Production of Wine from Grapes	Experiments	BL3-Apply	2
6	Cell separation of yeast and LAB by Centrifugal and Filtration	Experiments	BL3-Apply	2

Part D(Marks Distribution)

Theory					
Total Marks	Minimum Passing Marks	External Evaluation	Min. External Evaluation	Internal Evaluation	Min. Internal Evaluation
100	40	40	12	60	
Practical					
Total Marks	Minimum Passing Marks	External Evaluation	Min. External Evaluation	Internal Evaluation	Min. Internal Evaluation
100	50	40	20	60	

Part E

Books	L. E. Casida Industrial Microbiology (1st Edition)
Articles	strainimprovement-130430125756-phpapp02.pdf
References Books	Nduka Okafor Modern Industrial Microbiology and Biotechnology-1st Edition
MOOC Courses	https://nptel.ac.in/courses/102106053 https://nptel.ac.in/courses/102106022
Videos	https://nptel.ac.in/courses/102106053 https://nptel.ac.in/courses/102106022

Syllabus-2023-2024

Bsc_Microbiology

Title of the Course	Food and Dairy Microbiology
Course Code	DSE VII (T)

Part A

Year	4th	Semester	8th	Credits	L	T	P	C
					3	0	1	4
Course Type	Embedded theory and lab							
Course Category	Discipline Core							
Pre-Requisite/s	Explain the interactions between microorganisms and the food environment, and factors influencing their growth and survival.			Co-Requisite/s	Describe the characteristics of foodborne, waterborne, and spoilage microorganisms, and methods for their isolation, detection, and identification.			
Course Outcomes & Bloom's Level	CO1- Explain the interactions between microorganisms and the food environment, and factors influencing their growth and survival.(BL1-Remember) CO2- Explain the significance and activities of microorganisms in food.(BL2-Understand) CO3- Describe the characteristics of foodborne, waterborne and spoilage microorganisms, and methods for their isolation, detection and identification.(BL3-Apply) CO4- Explain why microbiological quality control programmes are necessary in food production.(BL3-Apply) CO5- Explain the effects of fermentation in food production and how it influences the microbiological quality and status of the food product.(BL4-Analyze)							
Coures Elements	Skill Development ✓ Entrepreneurship ✓ Employability ✓ Professional Ethics ✓ Gender ✗ Human Values ✓ Environment ✓		SDG (Goals)	SDG4(Quality education)				

Part B

Modules	Contents	Pedagogy	Hours
1	Introduction to microbiology: Microbiology in daily life, Characteristics and morphology of bacteria, fungi, virus, protozoa and algae. Control of micro-organisms- Growth curve; Influence of environmental factors on growth- PH, Water activity, O2 availability, Temperature, Pressure, and Radiation.	Tutorials, Collaborative, Demonstrations, Project methods, Hands on experience, Experiments,	8
2	Principles, physical methods of food preservation: temperature (low, high, canning, drying), irradiation, hydrostatic pressure, high voltage pulse, microwave processing, and aseptic packaging, chemical methods of food preservation: salt, sugar, organic acids, SO ₂ , nitrite and nitrates, ethylene oxide, antibiotics, and bacteriocins.	Tutorials, Collaborative, Demonstrations, Project methods, Hands on experience, Experiments,	8
3	Contamination and spoilage of different foods: Cereals, sugar and their products, Milk and milk products, Fruits and vegetables, canned foods, Meat, fish, egg, and poultry.	Tutorials, Collaborative, Demonstrations, Project methods, Hands on experience, Experiments, industrial visit	8
4	Foodborne illness: Food intoxication- Staphylococcal intoxication, botulism. Food infection- Salmonellosis, Clostridium perfringens, Bacillus cereus gastroenteritis, E. coli infection, Yersinia enterocolitica, Listeria monocytogenes, Campylobacter jejuni, and others. Pre-biotic and pro-biotic	utorials, Collaborative, Demonstrations, Project methods, Hands on experience, Experiments, industrial visit	8
5	SCP- Microorganisms used, raw materials used as substrate, condition for growth and production, nutritive value and use of SCP; Fat from microorganisms- Microorganisms used raw materials, production of fat; Production of amino acids; Production of other substances added to foods. Production of enzymes- amylases, invertase, pectolytic enzymes, proteolytic enzymes, and other enzymes	utorials, Collaborative, Demonstrations, Project methods, Hands on experience, Experiments, industrial visit	8

Part C

Modules	Title	Indicative-ABCA/PBU/ Experiments/Field work/ Internships	Bloom's Level	Hours
1	Staining of microorganisms	Experiments	BL3-Apply	2
2	Composition, preparation and sterilization of media	Experiments	BL3-Apply	2
3	Demonstration of techniques for pure culture of microorganisms	Experiments	BL4-Analyze	2
4	Streak plate method	Experiments	BL3-Apply	2
5	Pour plate method.	Experiments	BL3-Apply	2
6	Serial dilution agar plate method	Experiments	BL4-Analyze	2
7	Microbiology testing of milk	PBL	BL4-Analyze	2
8	Serial dilution agar plate method	Experiments	BL4-Analyze	2
9	To visit the various food industries in order to learn the basic methodologies	Industrial Visit	BL2-Understand	5
10	To visualize the effect of antibiotics on the expression and growth of fungi and Bacterial cell.	PBL	BL3-Apply	4
11	To determine the production of primary and secondary metabolites by Endophytic Microorganism.	PBL	BL3-Apply	4

Part D(Marks Distribution)

Theory					
Total Marks	Minimum Passing Marks	External Evaluation	Min. External Evaluation	Internal Evaluation	Min. Internal Evaluation
100	50	40	12	60	
Practical					
Total Marks	Minimum Passing Marks	External Evaluation	Min. External Evaluation	Internal Evaluation	Min. Internal Evaluation
100	50	40	20	60	

Part E

Books	Virendra Kumar Pande Textbook of Food Microbiology 1st Edition
Articles	https://academic.oup.com/jimb
References Books	John C. Ayres Microbiology of Foods 2nd Edition Frazier, W.C. Food Microbiology 4th edition Pelzar, H.J. and Rober, D. Microbiology 5th edition
MOOC Courses	https://onlinecourses.nptel.ac.in/noc24_ag03/preview https://onlinecourses.nptel.ac.in/noc23_ag02/preview https://nptel.ac.in/courses/126105015 https://onlinecourses.nptel.ac.in/noc24_ag07/preview
Videos	https://nptel.ac.in/courses/102105058

Course Articulation Matrix

[illegible]

Syllabus-2023-2024

BSc_Biotechnology

Title of the Course	Food and Dairy Microbiology
Course Code	DSE VII (T)

Part A

Year	4th	Semester	8th	Credits	L	T	P	C
					3	0	1	4
Course Type	Embedded theory and lab							
Course Category	Discipline Core							
Pre-Requisite/s	Explain the interactions between microorganisms and the food environment, and factors influencing their growth and survival.			Co-Requisite/s	Describe the characteristics of foodborne, waterborne, and spoilage microorganisms, and methods for their isolation, detection, and identification.			
Course Outcomes & Bloom's Level	CO1- Explain the interactions between microorganisms and the food environment, and factors influencing their growth and survival.(BL1-Remember) CO2- Explain the significance and activities of microorganisms in food.(BL2-Understand) CO3- Describe the characteristics of foodborne, waterborne and spoilage microorganisms, and methods for their isolation, detection and identification.(BL3-Apply) CO4- Explain why microbiological quality control programmes are necessary in food production.(BL3-Apply) CO5- Explain the effects of fermentation in food production and how it influences the microbiological quality and status of the food product.(BL4-Analyze)							
Coures Elements	Skill Development ✓ Entrepreneurship ✓ Employability ✓ Professional Ethics ✓ Gender ✗ Human Values ✓ Environment ✓		SDG (Goals)	SDG4(Quality education)				

Part B

Modules	Contents	Pedagogy	Hours
1	Introduction to microbiology: Microbiology in daily life, Characteristics and morphology of bacteria, fungi, virus, protozoa and algae. Control of micro-organisms- Growth curve; Influence of environmental factors on growth- PH, Water activity, O2 availability, Temperature, Pressure, and Radiation.	Tutorials, Collaborative, Demonstrations, Project methods, Hands on experience, Experiments,	8
2	Principles, physical methods of food preservation: temperature (low, high, canning, drying), irradiation, hydrostatic pressure, high voltage pulse, microwave processing, and aseptic packaging, chemical methods of food preservation: salt, sugar, organic acids, SO ₂ , nitrite and nitrates, ethylene oxide, antibiotics, and bacteriocins.	Tutorials, Collaborative, Demonstrations, Project methods, Hands on experience, Experiments,	8
3	Contamination and spoilage of different foods: Cereals, sugar and their products, Milk and milk products, Fruits and vegetables, canned foods, Meat, fish, egg, and poultry.	Tutorials, Collaborative, Demonstrations, Project methods, Hands on experience, Experiments, industrial visit	8
4	Foodborne illness: Food intoxication- Staphylococcal intoxication, botulism. Food infection- Salmonellosis, Clostridium perfringens, Bacillus cereus gastroenteritis, E. coli infection, Yersinia enterocolitica, Listeria monocytogenes, Campylobacter jejuni, and others. Pre-biotic and pro-biotic	utorials, Collaborative, Demonstrations, Project methods, Hands on experience, Experiments, industrial visit	8
5	SCP- Microorganisms used, raw materials used as substrate, condition for growth and production, nutritive value and use of SCP; Fat from microorganisms- Microorganisms used raw materials, production of fat; Production of amino acids; Production of other substances added to foods. Production of enzymes- amylases, invertase, pectolytic enzymes, proteolytic enzymes, and other enzymes	utorials, Collaborative, Demonstrations, Project methods, Hands on experience, Experiments, industrial visit	8

Part C

Modules	Title	Indicative-ABCA/PBU/ Experiments/Field work/ Internships	Bloom's Level	Hours
1	Staining of microorganisms	Experiments	BL3-Apply	2
2	Composition, preparation and sterilization of media	Experiments	BL3-Apply	2
3	Demonstration of techniques for pure culture of microorganisms	Experiments	BL4-Analyze	2
4	Streak plate method	Experiments	BL3-Apply	2
5	Pour plate method.	Experiments	BL3-Apply	2
6	Serial dilution agar plate method	Experiments	BL4-Analyze	2
7	Microbiology testing of milk	PBL	BL4-Analyze	2
8	Serial dilution agar plate method	Experiments	BL4-Analyze	2
9	To visit the various food industries in order to learn the basic methodologies	Industrial Visit	BL2-Understand	5
10	To visualize the effect of antibiotics on the expression and growth of fungi and Bacterial cell.	PBL	BL3-Apply	4
11	To determine the production of primary and secondary metabolites by Endophytic Microorganism.	PBL	BL3-Apply	4

Part D(Marks Distribution)

Theory					
Total Marks	Minimum Passing Marks	External Evaluation	Min. External Evaluation	Internal Evaluation	Min. Internal Evaluation
100	50	40	12	60	
Practical					
Total Marks	Minimum Passing Marks	External Evaluation	Min. External Evaluation	Internal Evaluation	Min. Internal Evaluation
100	50	40	20	60	

Part E

Books	Virendra Kumar Pande Textbook of Food Microbiology 1st Edition
Articles	https://academic.oup.com/jimb
References Books	John C. Ayres Microbiology of Foods 2nd Edition Frazier, W.C. Food Microbiology 4th edition Pelzar, H.J. and Rober, D. Microbiology 5th edition
MOOC Courses	https://onlinecourses.nptel.ac.in/noc24_ag03/preview https://onlinecourses.nptel.ac.in/noc23_ag02/preview https://nptel.ac.in/courses/126105015 https://onlinecourses.nptel.ac.in/noc24_ag07/preview
Videos	https://nptel.ac.in/courses/102105058

Course Articulation Matrix

[illegible]

Syllabus-2023-2024

BSc_Biotechnology

Title of the Course	Pharmaceutical Biotechnology
Course Code	DSE VII (T)

Part A

Year	4th	Semester	8th	Credits	L	T	P	C
					2	0	0	2
Course Type	Embedded theory and lab							
Course Category	Disciplinary Major							
Pre-Requisite/s	Student must know Genetic engineering applications in relation to production of pharmaceuticals and the use of microorganisms in fermentation technology			Co-Requisite/s				
Course Outcomes & Bloom's Level	CO1- To remember the basic concept of enzymes, drug , gene and genome interaction (BL1-Remember) CO2- Understanding the importance of Immobilized enzymes in Pharmaceutical Industries(BL2-Understand) CO3- To apply Genetic engineering applications in relation to production of pharmaceuticals(BL3-Apply) CO4- To understand the Importance of Monoclonal antibodies in Industries(BL2-Understand) CO5- To apply and analyze the Appreciate the use of microorganisms in fermentation technology(BL4-Analyze)							
Coures Elements	Skill Development ✓ Entrepreneurship ✗ Employability ✓ Professional Ethics ✓ Gender ✗ Human Values ✓ Environment ✓		SDG (Goals)		SDG3(Good health and well-being) SDG4(Quality education) SDG8(Decent work and economic growth)			

Part B

Modules	Contents	Pedagogy	Hours
I	Brief introduction to Biotechnology with reference to Pharmaceutical Sciences, Enzyme Biotechnology- Methods of enzyme immobilization and applications, Biosensors- Working and applications of biosensors in Pharmaceutical Industries, Use of microbes in industry. Production of Enzymes- General consideration - Amylase, Catalase, Peroxidase	Lecture method, demonstrations, experiments, field visit, ABL, PBL	7
II	Basic principles of genetic engineering, cloning vectors, restriction endonucleases and DNA ligase, Recombinant DNA technology. Application of genetic engineering in medicine, production of: i) Interferon ii) Vaccines- hepatitis- B iii) Hormones- Insulin	Lecture method, demonstrations, experiments, field visit, ABL, PBL	8
III	Types of immunity- humoral immunity, cellular immunity, General method of the preparation of bacterial vaccines, toxoids, viral vaccine, antitoxins, serum-immune blood derivatives and other products relative to immunity, Storage conditions and stability of official vaccines	Lecture method, demonstrations, experiments, field visit, ABL, PBL	8
IV	Hybridoma technology- Production, Purification and Applications, Immuno blotting techniques- ELISA, Western blotting, Southern blotting, Introduction to Microbial biotransformation and applications.	Lecture method, demonstrations, experiments, field visit, ABL, PBL	8
V	Fermentation methods and general requirements, study of media, equipments, sterilization methods, aeration process, stirring, Large scale production fermenter design and its various controls, Study of the production of - penicillins, citric acid, Vitamin B12, Glutamic acid, Blood Products: Collection, Processing and Storage of whole human blood, dried human plasma, plasma Substitutes	Lecture method, demonstrations, experiments, field visit, ABL, PBL	7

Part C

Modules	Title	Indicative-ABCA/PBL/ Experiments/Field work/ Internships	Bloom's Level	Hours
I	Isolation of enzymes from natural isolates	PBL	BL3-Apply	1 week
II	production of immobilized enzymes using isolated enzymes	PBL	BL6-Create	7
III	Isolation of genomic DNA	Experiments	BL3-Apply	6
IV	To perform restriction digestion using kit and its visualization using agarose gel electrophoresis	Experiments	BL4-Analyze	7
V	Preparation of culture media and necessary arrangements for production of amino acids	Field work	BL6-Create	30 days
VI	To demonstrate the working of PCR	Industrial Visit	BL2-Understand	5
VII	Preparation of different methods of medicinal plant extracts	Experiments	BL3-Apply	3
VIII	Antibacterial activity.	Experiments	BL4-Analyze	3
IX	Antifungal activity.	Experiments	BL4-Analyze	3
X	Total antioxidant activity.	PBL	BL4-Analyze	5
XI	Phytochemical screening of Primary metabolites.	PBL	BL4-Analyze	6
XII	Phytochemical screening of Secondary metabolites	PBL	BL5-Evaluate	7
XIII	Separation of medicinal plant extracts by chromatography.	PBL	BL4-Analyze	10
XIV	Estimation of ascorbic acid in multivitamin formulations	PBL	BL5-Evaluate	5

Part D(Marks Distribution)

Theory					
Total Marks	Minimum Passing Marks	External Evaluation	Min. External Evaluation	Internal Evaluation	Min. Internal Evaluation
100	40	60	18	40	
Practical					
Total Marks	Minimum Passing Marks	External Evaluation	Min. External Evaluation	Internal Evaluation	Min. Internal Evaluation

Part E

Books	J.W. Goding: Monoclonal Antibodies
Articles	https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3525971/
References Books	B.R. Glick and J.J. Pasternak: Molecular Biotechnology: Principles and Applications of RecombinantDNA: ASM Press Washington D.C. RA Goldshy et. al., : Kuby Immunology J.M. Walker and E.B. Gingold: Molecular Biology and Biotechnology by Royal
MOOC Courses	https://nptel.ac.in/courses/102105342
Videos	https://nptel.ac.in/courses/102105342

Course Articulation Matrix

[illegible]

Syllabus-2023-2024

Bsc_Microbiology

Title of the Course	Pharmaceutical Biotechnology
Course Code	DSE VII (T)

Part A								
Year	4th	Semester	8th	Credits	L	T	P	C
					2	0	0	2
Course Type	Embedded theory and lab							
Course Category	Disciplinary Major							
Pre-Requisite/s	Student must know Genetic engineering applications in relation to production of pharmaceuticals and the use of microorganisms in fermentation technology			Co-Requisite/s				
Course Outcomes & Bloom's Level	CO1- To remember the basic concept of enzymes, drug , gene and genome interaction (BL1-Remember) CO2- Understanding the importance of Immobilized enzymes in Pharmaceutical Industries(BL2-Understand) CO3- To apply Genetic engineering applications in relation to production of pharmaceuticals(BL3-Apply) CO4- To understand the Importance of Monoclonal antibodies in Industries(BL2-Understand) CO5- To apply and analyze the Appreciate the use of microorganisms in fermentation technology(BL4-Analyze)							
Coures Elements	Skill Development ✓ Entrepreneurship ✗ Employability ✓ Professional Ethics ✓ Gender ✗ Human Values ✓ Environment ✓		SDG (Goals)	SDG3(Good health and well-being) SDG4(Quality education) SDG8(Decent work and economic growth) SDG9(Industry Innovation and Infrastructure)				

Part B			
Modules	Contents	Pedagogy	Hours
I	Brief introduction to Biotechnology with reference to Pharmaceutical Sciences, Enzyme Biotechnology- Methods of enzyme immobilization and applications, Biosensors- Working and applications of biosensors in Pharmaceutical Industries, Use of microbes in industry. Production of Enzymes- General consideration - Amylase, Catalase, Peroxidase	Lecture method, demonstrations, experiments, field visit, ABL, PBL	7
II	Basic principles of genetic engineering, cloning vectors, restriction endonucleases and DNA ligase, Recombinant DNA technology. Application of genetic engineering in medicine, production of: i) Interferon ii) Vaccines- hepatitis- B iii) Hormones- Insulin	Lecture method, demonstrations, experiments, field visit, ABL, PBL	8
III	Types of immunity- humoral immunity, cellular immunity, General method of the preparation of bacterial vaccines, toxoids, viral vaccine, antitoxins, serum-immune blood derivatives and other products relative to immunity, Storage conditions and stability of official vaccines	Lecture method, demonstrations, experiments, field visit, ABL, PBL	8
IV	Hybridoma technology- Production, Purification and Applications, Immuno blotting techniques- ELISA, Western blotting, Southern blotting, Introduction to Microbial biotransformation and applications.	Lecture method, demonstrations, experiments, field visit, ABL, PBL	8
V	Fermentation methods and general requirements, study of media, equipments, sterilization methods, aeration process, stirring, Large scale production fermenter design and its various controls, Study of the production of - penicillins, citric acid, Vitamin B12, Glutamic acid, Blood Products: Collection, Processing and Storage of whole human blood, dried human plasma, plasma Substitutes	Lecture method, demonstrations, experiments, field visit, ABL, PBL	7

Part C				
Modules	Title	Indicative-ABCA/PBL/ Experiments/Field work/ Internships	Bloom's Level	Hours
I	Isolation of enzymes from natural isolates	PBL	BL3-Apply	1 week
II	production of immobilized enzymes using isolated enzymes	PBL	BL6-Create	7
III	Isolation of genomic DNA	Experiments	BL3-Apply	6
IV	To perform restriction digestion using kit and its visualization using agarose gel electrophoresis	Experiments	BL4-Analyze	7
V	Preparation of culture media and necessary arrangements for production of amino acids	Field work	BL6-Create	30 days
VI	To demonstrate the working of PCR	Industrial Visit	BL2-Understand	5

Part D(Marks Distribution)

Theory					
Total Marks	Minimum Passing Marks	External Evaluation	Min. External Evaluation	Internal Evaluation	Min. Internal Evaluation
100	40	60	18	40	
Practical					
Total Marks	Minimum Passing Marks	External Evaluation	Min. External Evaluation	Internal Evaluation	Min. Internal Evaluation

Part E

Books	J.W. Goding: Monoclonal Antibodies
Articles	https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3525971/
References Books	B.R. Glick and J.J. Pasternak: Molecular Biotechnology: Principles and Applications of Recombinant DNA: ASM Press Washington D.C. RA Goldsby et. al., : Kuby Immunology J.M. Walker and E.B. Gingold: Molecular Biology and Biotechnology by Royal
MOOC Courses	https://nptel.ac.in/courses/102105342
Videos	https://nptel.ac.in/courses/102105342

[illegible]

Part A

Part BPart D(Marks Distribution)Part F

Course Articulation Matrix

[illegible]

[illegible]

Part APart B

Part D(Marks Distribution)

Part E

Course Articulation Matrix

[illegible]

Part APart BPart D(Marks Distribution)Part E

Course Articulation Matrix

[illegible]

Part A

Part BPart D(Marks Distribution)Part E

Course Articulation Matrix

[illegible]

[illegible]

Syllabus-2023-2024

BSc_FoodTechnology

Title of the Course	Cooperation Marketing & Finance
Course Code	SEC V

Part A

Year	3rd	Semester	5th	Credits	L	T	P	C
					2	0	0	2
Course Type	Theory only							
Course Category	Specialization Elective Courses							
Pre-Requisite/s	Student Should acquainted with the basic knowledge of entrepreneurship and supply chain			Co-Requisite/s	Student Should acquainted with the basic knowledge of business and startups			
Course Outcomes & Bloom's Level	CO1- CO1: Communicate with required clarity ensuring that the information communicated is clear and accurate(BL1-Remember) CO2- CO2: Comprehend and apply basic computer working, basic operating system and uses internet services to get accustomed & take benefit of IT developments in the industry.(BL2-Understand) CO3- CO3: To demonstrate knowledge of entrepreneurship and identify establishment for supporting the development of businesses/entrepreneurship.(BL3-Apply) CO4- CO4: To illustrate procedures to achieve a safe working environment in line with occupational health, safety, environment regulations.(BL4-Analyze) CO5- CO5: Comply time management technique in day-to-day work(BL5-Evaluate)							
Coures Elements	Skill Development ✓ Entrepreneurship ✗ Employability ✓ Professional Ethics ✓ Gender ✗ Human Values ✗ Environment ✗		SDG (Goals)	SDG4(Quality education)				

Part B

Modules	Contents	Pedagogy	Hours
1	Concept of Entrepreneurship Definition of Entrepreneurship given by various economists the ideal definition –The conceptual model of Entrepreneurship given by John Kao. Views given by Schumpeter Walker & Drucker on Entrepreneurship - Entrepreneur and Manager -Enterprise and Entrepreneur. Managing Creativity Issues to be addressed in working the definition of creativity –Definition -Attributes of a creative person - Creative Thinking and Motivation - Managing Creativity - Organizational Actions that enhance and hinder Creativity -Organizational priorities and Creativity -Managerial responsibilities in a creative organization	Lecture method, audio/Video clips, group discussion, quiz	8
2	Definition of Small Business - Composition of Small Business- Economic Contribution of Small Business. Strategic Planning for Small Business -Steps in Strategic Planning - Develop a clear Mission Statement -Assess Organization Strengths - Conduct a thorough Market Segment Analysis -Analyze Competitors - Create Company Goals - Formulate Strategic Options and Select appropriate Strategies (Focus, Cost leadership & Differentiation) - Translate Strategic Plans into Action Plans-Establish accurate Controls. Why Strategic Planning fails in Small Business. Forms of Ownership: Sole Proprietorship, Partnership & Corporation form of Organization -Advantages and Disadvantages, Franchising- What is Franchising - Advantages and Disadvantages to Franchising - Franchise Evaluation Checklist –Franchise contracts - Types of Franchise arrangements.	lecture method, audio/video clips, group discussion, quiz	8
3	Introduction: Project - definition, features, types, infrastructure creation-a special type of projects, significance of infrastructure in economic development, bottlenecks in the infrastructure creation, Project Identification: Idea generation, Project screening, Feasibility study, The advantages and disadvantages of starting your business –The advantages and disadvantages of buying all existing business – Critical areas to be examined while buying all existing business - Determining the value of a business – Financial Record Keeping – Profit Planning & Cost Control, Project costing: Breakdown structure of the project, cost estimation of the project, factor affecting the cost of the project, Costing with alternative configurations/specifications. Project Appraisal: technical appraisal, marketing appraisal, legal and environment appraisal, financial appraisal- cost estimation of the project and evaluating project using pay back and NPV, Detailed project report – introduction, Introduction to SCBA.	Audio/Video clips, group discussion, lecture with ppt, quiz	8
4	Arrangement of funds: Traditional sources of financing – Equity shares, preference shares, Debentures/bonds, loan from financial institutions Loan syndication and consortium finance; Alternative sources of financing- Foreign Issue, FDI & FII, ECB, Private equity, Securitization, BOT projects, PPP, Venture capital / Incubation fund, Franchising etc;	Audio/Video clips, group discussion, lecture with ppt, quiz	8
5	Role played by various Financial Institutions like IDBI, ICICI and IFCI: Special Role played by SIDBI and Commercial Banks – Approval of term loan applications by Commercial Banks – How to decide about a suitable agency for assistance Role played by SFCR and NSIC; Project Implementation: Project contracts – Principles, practical aspects of contracts; legal aspects of project management, global tender, Negotiation for projects, Project insurance, Human resource management, network analysis	Audio/Video clips, group discussion, lecture with ppt, quiz	8

Part D(Marks Distribution)

Theory					
Total Marks	Minimum Passing Marks	External Evaluation	Min. External Evaluation	Internal Evaluation	Min. Internal Evaluation
100	40	60	18	40	0
Practical					
Total Marks	Minimum Passing Marks	External Evaluation	Min. External Evaluation	Internal Evaluation	Min. Internal Evaluation
0	0	0	0	0	0

Part E

Books	Scarborough, N. M., Wilson, D. L., & Zimmerer, T. (2009, January 1). Effective Small Business Management.
Articles	
References Books	Desai, V. (2001, January 1). Dynamics of Entrepreneurial Development and Management.
MOOC Courses	https://nptel.ac.in/courses/110106141
Videos	https://www.youtube.com/watch?v=N3-FZn_iQFU&t=3s

Syllabus-2023-2024

Bsc_Microbiology

Title of the Course	Organic Farming
Course Code	SEC V (T)

Part A

Year	3rd	Semester	5th	Credits	L	T	P	C
					2	0	1	3
Course Type	Embedded theory and lab							
Course Category	Skill Enhancement Courses							
Pre-Requisite/s	Student must be aware of basic plant physiology and soil classification			Co-Requisite/s				
Course Outcomes & Bloom's Level	CO1- Students will understand various principles, need and prospect of organic farming including the importance of sustainability, biodiversity and ecological balance. (BL2-Understand) CO2- To equip learners with the knowledge and skills necessary to practice sustainable agriculture and the production of healthy, organic food (BL2-Understand) CO3- Students will gain hands on experience through field work, farm visits or practical exercises to apply their knowledge in a real world setting (BL3-Apply) CO4- learners will explore the significance of soil health in organic farming and various methods to enhance soil fertility through composting and crop rotation. (BL4-Analyze) CO5- Students will learn about marketing organic products, understanding consumer demand and the economic aspect of Organic farming (BL6-Create)							
Coures Elements	Skill Development ✓ Entrepreneurship ✓ Employability ✓ Professional Ethics ✓ Gender ✕ Human Values ✕ Environment ✓		SDG (Goals)	SDG2(Zero hunger) SDG3(Good health and well-being) SDG4(Quality education) SDG6(Clean water and sanitation) SDG7(Affordable and clean energy) SDG8(Decent work and economic growth) SDG11(Sustainable cities and economies) SDG13(Climate action) SDG15(Life on land)				

Part B

Modules	Contents	Pedagogy	Hours
I	History and development, IFOAM Definition and Principle- health, fairness, ecology and care, Methods, advantages and limitations, Need of Organic farming in present context and future prospects- barrier	Lecture methods, group discussions, demonstrations, field work, experiments, ABL, PBL, Trainings	7
II	ORGANIC ECOSYSTEM & THEIR CONCEPT Structure and function, Productivity, Decomposition, Nutrient cycling, Eutrophication, Biological magnification	Lecture methods, group discussions, demonstrations, field work, experiments, ABL, PBL, Trainings	8
III	SOIL □ Definition, Composition of Soil- Soil texture and Types, Soil structure, Soil Profile, Humus & Soil pH, Role of Soil in Organic Farming, Soil factors affecting plant Growth: light, heat, water, humidity, pH and Nutrition, C: N ratio of good fertile Soil	Lecture methods, group discussions, demonstrations, field work, experiments, ABL, PBL, Trainings	7
IV	PLANT NUTRITION □ Structural organization & function of different Plant organ, Plant nutrient- Micro and Macro, Importance & Deficiency, Symptoms, Sources : Organic, Green manure- Method of composting, Benefit & Limitations, oil microorganism: Mycorrhiza, Rhizosphere- Significance	Lecture methods, group discussions, demonstrations, field work, experiments, ABL, PBL, Trainings	8

Part C

Modules	Title	Indicative-ABCA/PBL/ Experiments/Field work/ Internships	Bloom's Level	Hours
I	Visit to Organic farm to study the various components, identification and utilization of Organic products.	Field work		6
II	Preparation of Organic Compost-Over ground compost, Pit compost, Liquid compost, Vermi compost.	PBL	BL3-Apply	1 MONTH
III	Preparation of Neem products and other botanicals for Pest and disease control	Internships	BL6-Create	1 MONTH
IV	Weed control through organic way	Experiments	BL3-Apply	30 days
V	Soil analysis: pH determination.	Experiments	BL4-Analyze	2
VI	Seed bed preparation, seed selection and seedling preparation	Experiments	BL3-Apply	1 WEEK
VII	Method of application of different types of fertilizer and Green manure.	PBL	BL3-Apply	1 MONTH
VIII	Preparation of Panchagavya/ Amrit Jol	PBL	BL6-Create	1 MONTH

Part D(Marks Distribution)

Theory					
Total Marks	Minimum Passing Marks	External Evaluation	Min. External Evaluation	Internal Evaluation	Min. Internal Evaluation
100	40	60	18	40	
Practical					
Total Marks	Minimum Passing Marks	External Evaluation	Min. External Evaluation	Internal Evaluation	Min. Internal Evaluation
100	50	60	30	40	

Part E

Books	Sharma, Arun K. 2002. A Handbook of Organic farming. Agrobios, India. Sathe, T.V. 2004. Vermiculture and Organic Farming. Daya Publishers Gupta, M., 2004. Organic Agriculture Development in India. ABD publishers, Jaipur, India. Dr. Pratiksha Raghavanoki. Handbook of Organic Farming
Articles	https://www.sciencedirect.com/topics/agricultural-and-biological-sciences/organic-farming
References Books	Dongarjal R. P. and Zade S.B. 2019. Insect Ecology and Integrated Pest Management, Akinik Publications, New Delhi. Dushyent Gehlot. 2005. Organic Farming- standards, accreditation, certification and inspection. Agribios, India.
MOOC Courses	https://nptel.ac.in/courses/126105014
Videos	https://nptel.ac.in/courses/126105014

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Syllabus-2023-2024

BSc_PCM

Title of the Course	India in 21st century
Course Code	VAC0101[T]

Part A								
Year	1st	Semester	1st	Credits	L	T	P	C
					2	00	00	2
Course Type	Theory only							
Course Category	Skill Enhancement Courses							
Pre-Requisite/s	1. "Understanding of Sociological Concepts": A foundational knowledge of sociological concepts is essential to grasp the composition of Indian society discussed in Unit I. This includes understanding social institutions, cultural environments, and threats to national integration. 2. "Historical Background": Familiarity with the history of India, particularly the Indian Freedom Movement, is crucial for comprehending Unit II. Knowledge of events such as the Revolt of 1857, the emergence of nationalism, and the various phases of the freedom struggle provides context for understanding the birth of the Indian nation-state. 3. "Awareness of Political Movements": A basic understanding of political movements in India, particularly those led by figures like Gandhi, is necessary for Unit III. Familiarity with concepts like non-cooperation, civil disobedience, and the Quit India movement aids in analyzing the dynamics of Indian freedom and partition. 4. "Knowledge of Post-Independence Era": Understanding the phases of nation-building since independence is vital for Unit IV. This includes awareness of the planned progress era, populist policies, and the paradigm shift towards liberalization and globalization. Knowledge of responses from different societal groups and regions enriches the understanding of India's post-independence journey. 5. "Global Awareness": Unit V delves into global concerns such as environmental issues, globalization, and movements for democracy and sustainability. A broad understanding of global trends and their impact on nations is necessary to engage with this content effectively.				Co-Requisite/s			
Course Outcomes & Bloom's Level	CO1- 1. Students are able to define, identify and explain the process of Indian Freedom movement and development of political Institutions.(BL1-Remember) CO2- 2. Students are able to summarize and extract the time before Independence and after Independence India.(BL2-Understand) CO3- 3. Students are able to evaluate India society, Its nature and agencies of social change with reference to modernization.(BL5-Evaluate) CO4- 4. Students are able to write the historical accounts that shaped the very nature and character of 20 and 21 st century India with reference to Nation Building and constitution(BL6-Create)							
Coures Elements	Skill Development ✓ Entrepreneurship ✗ Employability ✗ Professional Ethics ✓ Gender ✓ Human Values ✓ Environment ✗		SDG (Goals)		SDG3(Good health and well-being) SDG4(Quality education) SDG5(Gender equality) SDG10(Reduced inequalities) SDG12(Responsible consumption and production) SDG13(Climate action)			

Part B			
Modules	Contents	Pedagogy	Hours
1	1. Composition of Indian Society Society. (a) Introduction of Nature of India society and Indian nation state. (b) Major Social Institutions and Organization and threats to national integration (c) Social and Cultural Environment of India Society in 19th ,20th and 21st century.	- Lectures and visual PowerPoint slides - Students read text and commentary on assigned topics as well as published research articles before the lectures - Students read cases discussed in the text-books, as well as more detailed articles. - Students participate in class discussions to crystallize the concepts	5
2	Unit II Indian Freedom Movement- emergence. 5 1) Revolt of 1857 . Rise of nationalism & Birth of Congress 2). Partition of Bengal & swadeshi movement, Home rule movement Round table conferences 3) Revolutionary movements, Gandhian movements (i) Non-Cooperation (ii) Civil Disobedience (iii) Quit India movement	- Lectures and visual PowerPoint slides - Students read text and commentary on assigned topics as well as published research articles before the lectures - Students read cases discussed in the text-books, as well as more detailed articles. - Students participate in class discussions to crystallize the concepts	5
3	Unit 3 Indian freedom and Partition 5 1.) Communalism – Rise & spread (11.) Muslim league & its politics , Hindu communalism . 11.) India's partition & independence References	- Lectures and visual PowerPoint slides - Students read text and commentary on assigned topics as well as published research articles before the lectures - Students read cases discussed in the text-books, as well as more detailed articles. - Students participate in class discussions to crystallize the concepts	5
4	UNIT IV Nation building Since Independence 5 3 stages of making of the Indian Nation state: - 3 . Era of planned progress. (1951-1971) Period of Populist policies and programmes (1971 to 1992) Period of paradigm shift towards liberalization and globalization (since 1992). Responses of various classes, communities and regions.	- Lectures and visual PowerPoint slides - Students read text and commentary on assigned topics as well as published research articles before the lectures - Students read cases discussed in the text-books, as well as more detailed articles. - Students participate in class discussions to crystallize the concepts	5
5	Unit V Nation Building and Global Concern 5 a. Environmental concerns in 21st century b. Question of Globalization and its Impact c. Global Movement for Democracy and sustainability	- Lectures and visual PowerPoint slides - Students read text and commentary on assigned topics as well as published research articles before the lectures - Students read cases discussed in the text-books, as well as more detailed articles. - Students participate in class discussions to crystallize the concepts	4

Part D(Marks Distribution)

Theory					
Total Marks	Minimum Passing Marks	External Evaluation	Min. External Evaluation	Internal Evaluation	Min. Internal Evaluation
100	40	40	12	60	28
Practical					
Total Marks	Minimum Passing Marks	External Evaluation	Min. External Evaluation	Internal Evaluation	Min. Internal Evaluation
00	00	00		00	

Part E

Books	1. Bose, N.K. 1967, Culture and Society in India. Bombay: Asia Publishing House 2. Dube, S.C. 1990, Indian village.(New Delhi: National Book Trust.) 3. Percival Spear : History of Indian Society , Penguin , 1966. 4. Uberoi, Patricia : Family , kinship and Marriage , New Delhi : oxford University Press , 1995 , PP 50 to 73 , 416 to 451 5. Gandhi , M K : Removal of Untouchability , Navjeevan Publishing House , Ahmadabad , 1954
Articles	
References Books	1. A Nagraj, 1998, Jeevan Vidya ek Parichay, Divya Path Sansthan, Amarkantak.
MOOC Courses	
Videos	1. https://www.youtube.com/watch?v=i8N6YRTJsDk 2. https://youtu.be/MWsT7x3qd3E 3. https://www.youtube.com/watch?v=pQghqJSUAK4&list= 4. https://youtu.be/9BEU8A_JZPU 5. https://youtu.be/pPsKQwaZ4dg

Course Articulation Matrix

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Syllabus-2023-2024

BSc_ComputerScience

Title of the Course	India in 21st century
Course Code	VAC0101[T]

Part A								
Year	1st	Semester	1st	Credits	L	T	P	C
					2	0	0	2
Course Type	Theory only							
Course Category	Add-On Courses							
Pre-Requisite/s	1. "Understanding of Sociological Concepts": A foundational knowledge of sociological concepts is essential to grasp the composition of Indian society discussed in Unit I. This includes understanding social institutions, cultural environments, and threats to national integration. 2. "Historical Background": Familiarity with the history of India, particularly the Indian Freedom Movement, is crucial for comprehending Unit II. Knowledge of events such as the Revolt of 1857, the emergence of nationalism, and the various phases of the freedom struggle provides context for understanding the birth of the Indian nation-state. 3. "Awareness of Political Movements": A basic understanding of political movements in India, particularly those led by figures like Gandhi, is necessary for Unit III. Familiarity with concepts like non-cooperation, civil disobedience, and the Quit India movement aids in analyzing the dynamics of Indian freedom and partition. 4. "Knowledge of Post-Independence Era": Understanding the phases of nation-building since independence is vital for Unit IV. This includes awareness of the planned progress era, populist policies, and the paradigm shift towards liberalization and globalization. Knowledge of responses from different societal groups and regions enriches the understanding of India's post-independence journey. 5. "Global Awareness": Unit V delves into global concerns such as environmental issues, globalization, and movements for democracy and sustainability. A broad understanding of global trends and their impact on nations is necessary to engage with this content effectively.				Co-Requisite/s		Here are five co-requisites for the course outlined: 1. "Foundational Understanding of Sociological Concepts": - Understanding social institutions, cultural environments, and threats to national integration is fundamental. - Familiarity with sociological theories such as functionalism, conflict theory, and symbolic interactionism can provide a deeper comprehension of societal dynamics. 2. "Historical Context of India": - Knowledge of Indian history, including the colonial period, the struggle for independence, and post-independence developments, offers context for understanding the evolution of Indian society. - Understanding the socio-economic impacts of colonial rule and the transition to independence enhances insight into contemporary social issues. 3. "Understanding of Political Movements in India": - Knowledge of key figures, ideologies, and strategies of political movements in India, including those led by Gandhi, Nehru, and other prominent leaders, is essential. - Awareness of the socio-political context of colonial India and the role of various stakeholders in the struggle for independence enriches understanding. 4. "Familiarity with Post-Independence Developments": - Understanding the socio-economic and political changes in post-independence India, including the Nehruvian era, economic reforms, and social movements, is crucial. - Awareness of key policies, such as the Green Revolution, reservation system, and economic liberalization, provides insights into contemporary Indian society. 5. "Global Perspective and Awareness": - Knowledge of global trends in areas such as technology, economics, environment, and geopolitics enhances understanding of India's position in the global context. - Understanding global issues like climate change, international trade, and human rights movements enables students to analyze their impact on India and vice versa.	
Course Outcomes & Bloom's Level	CO1- 1. Students are able to define, identify and explain the process of Indian Freedom movement and development of political Institutions.(BL1-Remember) CO2- 2. Students are able to summarize and extract the time before Independence and after Independence India.(BL2-Understand) CO3- 3. Students are able to evaluate India society, Its nature and agencies of social change with reference to modernization.(BL5-Evaluate) CO4- 4. Students are able to write the historical accounts that shaped the very nature and character of 20 and 21 st century India with reference to Nation Building and constitution(BL6-Create)							
Coures Elements	Skill Development ✓ Entrepreneurship ✗ Employability ✗ Professional Ethics ✓ Gender ✓ Human Values ✓ Environment ✗		SDG (Goals)		SDG3(Good health and well-being) SDG4(Quality education) SDG5(Gender equality) SDG10(Reduced inequalities) SDG12(Responsible consumption and production) SDG13(Climate action)			

Part B			
Modules	Contents	Pedagogy	Hours
1	Composition of Indian Society Society- (a) Introduction of Nature of India society and Indian nation state. (b) Major Social Institutions and Organization and threats to national integration (c) Social and Cultural Environment of India Society in 19th ,20th and 21st century.	• Lectures and visual PowerPoint slides • Students read text and commentary on assigned topics as well as published research articles before the lectures • Students read cases discussed in the text-books, as well as more detailed articles. • Students participate in class discussions to crystallize the concepts	5
2	Unit II Indian Freedom Movement- emergence. 1) Revolt of 1857 , Rise of nationalism & Birth of Congress 2). Partition of Bengal & swadeshi movement, Home rule movement Round table conferences 3) Revolutionary movements, Gandhian movements (i) Non-Cooperation (ii) Civil Disobedience (iii) Quit India movement	• Lectures and visual PowerPoint slides • Students read text and commentary on assigned topics as well as published research articles before the lectures • Students read cases discussed in the text-books, as well as more detailed articles. • Students participate in class discussions to crystallize the concept	5
3	Unit 3 Indian freedom and Partition 1). Communalism – Rise & spread (11.) Muslim league & its politics , Hindu communalism . 11.) India's partition & independence References	• Lectures and visual PowerPoint slides • Students read text and commentary on assigned topics as well as published research articles before the lectures • Students read cases discussed in the text-books, as well as more detailed articles. • Students participate in class discussions to crystallize the concept	5
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5	Unit V Nation Building and Global Concern a. Environmental concerns in 21st century b. Question of Globalization and its Impact c. Global Movement for Democracy and sustainability	• Lectures and visual PowerPoint slides • Students read text and commentary on assigned topics as well as published research articles before the lectures • Students read cases discussed in the text-books, as well as more detailed articles. • Students participate in class discussions to crystallize the concept	4

Part C				
Modules	Title	Indicative-ABCA/PBL/ Experiments/Field work/ Internships	Bloom's Level	Hours
1 Quiz & Flip Class room		PBL		2

Part D(Marks Distribution)

Theory					
Total Marks	Minimum Passing Marks	External Evaluation	Min. External Evaluation	Internal Evaluation	Min. Internal Evaluation
100	40	60	28	40	12
Practical					
Total Marks	Minimum Passing Marks	External Evaluation	Min. External Evaluation	Internal Evaluation	Min. Internal Evaluation
00	00	00		00	

Part E

Books	1. Bose, N. 1967, Culture and Society in India. Bombay: Asia Publishing House 2. Dube, S.C. 1990, Indian village.(New Delhi: National Book Trust.) 3. Percival Spear : History of Indian Society , Penguin , 1966. 4. Uberoi, Patricia : Family , kinship and Marriage , New Delhi : oxford University Press , 1995 , PP 50 to 73 , 416 to 451 5. Gandhi , M K : Removal of Untouchability , Navjeevan Publishing House , Ahmadabad , 1954
Articles	
References Books	1. A Nagraj. 1998, Jeevan Vidya ek Parichay, Divya Path Sansthan, Amarkantak.
MOOC Courses	
Videos	1. https://www.youtube.com/watch?v=i8N6YRTJsDk 2. https://youtu.be/MWsT7x3qd3E 3. https://www.youtube.com/watch?v=pQghqJSUAK4&list=5 4. https://youtu.be/9BEU8A_JZPU

Course Articulation Matrix

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