



**Darrang College
(Autonomous),
Tezpur-784001**

**Syllabus for
FYUGP
B.Sc. Biotechnology
SEC Papers**

Approved by :

**Board of Studies (Biotechnology) meeting held on 26-12-2025 &
&
Academic Council vide Resolution no. 2, dated 29-12-2025**

SEC PAPERS OFFERED FOR FYUGP BY DEPT. OF BIOTECHNOLOGY

YEAR	SEM	PAPER CODE	PAPER NAME
1 st	1 st	BIT-SEC-01013	Introduction To Biosafety, Biohazards & Bioethics
	2 nd	BIT-SEC-02013	Microbial Tools And Techniques
2 nd	3 rd	BIT-SEC-03013	Plant Tissue Culture

FYUGP

Department of Biotechnology
Darrang College (Autonomous)
Skill Enhancement Course (SEC)

Detailed Syllabus of I st Semester (SEC) FYUGP Biotechnology	
Title of the Paper	Introduction to Biosafety, Biohazards & Bioethics
Paper Code	BIT-SEC-01013
Semester	I
Total Credit (Theory + Practical)	Theory Credit: 02 Practical Credit: 01 No. of Required Classes: 45 (Theory:30; Practical: 15)
Contact Hours Required	60 (Theory Class:30; Practical Class: 30)
Distribution of Marks	1. End Semester Examination: Total Marks: 30 2. Sessional Examination: Total Marks:20 3. Practical: Total Marks: 25
Course Outcomes	On successful completion of the course, students will be able to- CO1: Gain knowledge on working principles in a laboratory practicing all safety measures CO2: Handle live cultures and disposal of infectious waste CO3: Learn handling of equipments with safety audit.
Course Designer	Dr. Manika Das Katak, Asstt. Professor, Dept. of Biotechnology, Darrang College (Autonomous), Tezpur, Email id;mkdas116@gmail.com Ms. Minakshee Sarmah, Asstt. Professor, Dept. of Biotechnology, Darrang College (Autonomous), Tezpur Dr. Pranjal Pratim Das, Asstt. Professor, Dept. of Biotechnology, Darrang College (Autonomous), Tezpur

Suggested Readings	<ul style="list-style-type: none">a. National guidelines for the establishment and certification of biosafety level containment facility (ICMR)b. Guidelines for Research Involving Recombinant DNA Molecules (NIH Guidelines), Department of Health and Human Services, National Institutes of Health, April 2002. Available from the NIH Office of Biotechnology Activities (phone: 301-496-9838). Also available online at: http://oba.od.nih.gov/rdna/nih_guidelines_oba.htmlc. Wilson, DL, Chosewood, LC., Editors, 2007. CDC/NIH Biosafety in Microbiological and Biomedical Laboratories, 5th Edition, U.S. Govt. Printing Office, Washington, D.C. 2007. Currently available online at: http://www.cdc.gov/od/ohs/biosfty/bmb15/bmb15toc.htm
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SEC-1 (Theory Credit: 02)					
UNIT	CONTENT	L	T	P	Total hrs
I	BIOSAFETY: INTRODUCTION AND GUIDELINES Introduction, biosafety issues; Biological Safety Cabinets & their types; Biosafety Guidelines: Biosafety guidelines and regulations(National and International)	5	2	-	07
II	IBC and Initial Biosafety Training IBC Institutional Biosafety Committee, its role, importance of IBC Biosafety Levels, Standard Laboratory Practices, Documentation Practices	6	2	-	08
III	BIOSAFETY PROCEDURES Antisepsis, disinfection, decontamination, and sterilization, Chemical and physical methods used to inactivate hazardous biological agents, Criteria for the selection of a disinfectant based on risk assessment, Immediate response measures for occupational exposures to biological hazards, Steps and procedures for addressing biohazard spills and releases. Importance of PPE and its applications	5	2	-	07
IV	HAZARD COMMUNICATION STANDARD Hazard Communication, Hazard Communication Standard (HCS), Globally Harmonized System of Classification and Labeling of Chemicals (GHS), Hazard Communication Guidance Documents	5	3	-	08
PRACTICALS					
SEC-1 (Practical Credit: 01)					
UNIT	CONTENT	L	T	P	Total hrs
Lab Experiment	1. To study proper Laboratory waste disposal methods 2. Study on Biohazard waste management in Laboratory 3. To study prevention of biohazard spills 4. Introduction to use of PPE and precautions to be taken for its use	-	-	30	30

Detailed Syllabus of IInd Semester (SEC) FYUGP Biotechnology	
Title of the Paper	Microbial Tools and techniques
Paper Code	BIT-SEC-02013
Semester	II
Total Credit (Theory+ Practical)	Theory Credit: 02 Practical Credit: 01 No. of Required Classes: 45 (Theory:30; Practical: 15)
Contact Hours Required	60 (Theory Class:30; Practical Class: 30)
Distribution of Marks	End Semester Examination: Total Marks: 30 Internal Marks: 20 Practical: Total Marks: 25
Course Outcomes	On successful completion of the course, students will be able to: CO1: Apply the knowledge to understand the microbial physiology CO2: Identify the microorganisms based on morphology CO3: Understand the microbial techniques and methods used to culture of microorganisms which is important for microbial product synthesis.
Course Designer	Ms. Minakshee Sarmah, Asstt. Professor, Dept. of Biotechnology, Darrang College, (Autonomous), Tezpur. Email id: minakshee164@gmail.com
Suggested Readings	a. Microbiology by N.J.Pelczar, Jr.E.C.S.Chan and N.R.Krieg;Mac Graw Hill Book Company. b. .General Microbiology by R.Y.Stanier, M.Doudoroff and E.A. Adelberg; Mac Millan India. c. Microbiology by L.M.Prescott, J.P. Harley and D.A.Klein. McGraw Hill. d. Text Book of Microbiology by R. Ananthanarayan and C.K. Joyaram Panikar . Orient Longman, Madras. e. Microbiology: An Introduction–G.J.Tortora, B.R.Funke and C.L. Case. Pearson Education f. Bergey’s manual of Systematic Bacteriology, 2nd Edition. g. Bergey’s manual of Determinative Bacteriology, 9th Edition.

SEC-2 (Theory Credit: 02)

UNIT	CONTENT	L	T	P	Total hrs
I	Introduction to the Microbial World Discovery of microorganism, members of microbial world, distribution of microorganisms in nature, diversity in microbial habitat. Types of microorganisms, Scope and relevance of microbiology, Future of microbiology	6	3	-	09
II	Laboratory tools and techniques in Microbiology a. Study of instruments- Light microscope, Autoclave, Hot air oven, Shaking Incubator, BOD incubator, pH meter, Spectrophotometer, Centrifuge. Colony Counter, Biosafety Cabinet b. Microbial Staining- i. Dyes and stains: Definition, acidic and basic dyes ii. Smear: Fixation, use of mordent, intensifiers and decolorizer. iii. Mechanism of staining. Types of staining: simple and differential staining	8	3	-	11
III	Nutrient media and Culture of microorganisms Different culture media, their use and significance Pure culture techniques: Principles and methods of obtaining pure culture. Preservation techniques of pure cultures	6	4	-	10

PRACTICALS

SEC-2 (Practical Credit: 01)

UNIT	CONTENT	L	T	P	Total hrs
Lab Experiment	1. Disposal of laboratory waste and cultures 2. Staining of bacteria-Gram staining 3. Preparation of different types of microbial media 4. pH adjustment of media by use of pH strip and pH meter 5. Culture methods of bacteria and preparation of stab/slants/glycerol stocks 6. Study of antibiotic resistance in microorganism	-	-	30	30

Detailed Syllabus of IIIrd Semester FYUGP Biotechnology

Title of the Paper	PLANT TISSUE CULTURE
Paper Code	BIT-SEC-03013
Semester	III
Total Credit (Theory+ Practical)	Theory Credit: 02 Practical Credit: 01 No. of Required Classes: 45 (Theory:30; Practical: 15)
Contact Hours Required	60 (Theory Class:30; Practical Class: 30)
Distribution of Marks	End Semester Examination: Total Marks: 30 Internal Marks: 20 Practical: Total Marks: 25
Course Outcome	Upon completion of the course the graduate will be able to CO1: Understand fundamentals of plant tissue culture and its tools CO2: Evaluate how plant tissue culture techniques is useful in research and agriculture CO3: To understand genetic variation mechanisms and to evaluate its applications in agriculture CO4: Evaluate how to improve the quality of plants through genetic engineering methods
Course Designer	Dr. Manika Das Kataki, Asstt. Professor, Dept. of Biotechnology, Darrang College, (Autonomous), Tezpur Email id; mkdas116@gmail.com
Suggested Readings	<ol style="list-style-type: none"> 1. Plant Biotechnology-Recent Advances(2000), P C Trivedi, Panima Publishing Corporation, New Delhi 2. Introduction to Plant Biotechnology(2020), H S Chawla, Oxford &IBH publishing Co. Pvt. Ltd, New Delhi 3. Basics of Biotechnology(2004), A J Nair; Laxmi Publications, New Delhi 4. An Introduction to Plant Tissue Culture(2016), M K Razdan, Oxford &IBH Publishing Co. Pvt. Ltd., New Delhi 5. Role of Biotechnology in Medicinal and aromatic plants(2011), Irfan A Khanand Atiya Khanum, Ukaaz Publications, Hyderabad 6. Plant Cell, Tissue, and Organ Culture-Fundamental Methods(2004)OL Gamburg, G C Phillips Narosa Publishing House, New Delhi 7. Culture of Animal Cells: A Manual of Basic Technique and Specialized Applications-7th Edition (2016)-Freshney R I, Wiley –Blackwell 8. Animal Cell Culture: APracticalApproach,3rdEdition(2000) –Masters J,OUP Oxford 9. Biotechnology(2015)-BD Singh, Kalyani Publisher 10. Biotechnology, 5thEdition(2009)–Smith J E, Cambridge

SEC-3 (Theory Credit: 02)					
UNIT	CONTENT	L	T	P	Total hrs
I	Introduction to Plant Tissue Culture Introduction to plant tissue culture: Basics of Plant Tissue Culture/Micropropagation, Importance of plant tissue culture, Basic Set up of a plant tissue culture lab. Fundamental principles of in-vitro plant cultures: Major Tools and Instrumentation, Selection of explant, familiarization, and use of plant growth regulators. Composition of tissue culture media-media components and its functions, Various types of commercially available media. Sterilization Methods-Steam sterilization, Dry sterilization, Filter sterilization, surface sterilization of explants	6	3	-	09
II	In-vitro Cultures-Types & Applications Types of <i>in-vitro</i> cultures: Callus cultures, cell suspension cultures, organ cultures-root cultures, hairy root cultures, embryo cultures, Plant secondary metabolites production through cell, tissue and organ cultures, Advantages, and disadvantages of <i>in-vitro</i> methods	8	3	-	11
III	Somaclonal Variation and Somatic Hybridization Somaclonal Variation: Possible reasons for somaclonal variations, Selection of somaclones. Applications of somaclonal variations in agriculture and Horticulture, Merits, and demerits of somaclonal variation. Protoplast-isolation and culturing of protoplast-principle and application, Regeneration of protoplasts, protoplast fusion and somatic hybridization-selection of hybrid cells	6	4	-	10
PRACTICALS					
SEC-3 (Practical Credit: 01)					
UNIT	CONTENT	L	T	P	Total hrs
Lab Experiment	1. Preparation of Macro, Micronutrient solution, Hormonal& Vitamin solutions 2. Prepare MS medium for plant tissue culture. 3. Callus generation from plant explant. 4. Micropropagation of commercially important plants	-	-	30	30