



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

**Syllabus for
FYUGP
Biotechnology
(SEC)**

Approved by :

Board of Studies meeting held on 31-07-2025

&

Academic Council vide Resolution no. 04, dated- 12-08-2025



DARRANG COLLEGE (AUTONOMOUS)

SYLLABUS

FYUGP IN BIOTECHNOLOGY

SKILL ENHANCEMENT COURSE (SEC) PAPER

Course eligibility

The student should have passed Class XII in Biology,
Chemistry and Physics

Approved by

Board of Studies (Biotechnology) meeting held on 31th July, 2025,
Darrang College

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INTRODUCTION

The Four Year Degree Programme (FYUGP) in Biotechnology as one of the core subject, designed to develop a scientific temperament to find out technological interface in modern areas of biotechnology to achieve its goal at applied level. It will help the students to become critical and curious in their outlook about modern Biotechnology. The courses are designed to impart the essential basics in biotechnology as well as its advanced fields.

This syllabus of FYUGP Biotechnology at Darrang College (Autonomous) has been designed in alignment with National Education Policy (NEP) 2020, which emphasizes a holistic, multidisciplinary, and flexible education system and preparedness for facing the challenges with promising solutions.

Aims of FYUGP B.Sc. in Biotechnology

The aims of various courses in the FYUGP Biotechnology programme are:

- **To develop proficiency and critical thinking, scientific reasoning, and analytical skills** in the theory as well as practical experiments that enable students to approach scientific problems methodically and creatively.
- **To explore the cognitive level of students at its maximum level**, by enriching knowledge of students in the modern areas of biotechnology and its application in medical science, agriculture, industry, proteomics, genomics, bioinformatics, nano-biotechnology etc.
- **To understand biotechnology and its potential in developing the nation**, it will create awareness about the socio, ethical and environmental aspects of the course also.
- **To promote experiential learning through practical laboratory work, fieldwork, and research projects**, encouraging innovation, curiosity and hands-on skills through Practical experiments and Project works.
- **To prepare students for diverse career aspects** like opting for higher studies, research, teaching, industry, entrepreneurship and public service, by integrating skill development and value-added courses.

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- **To achieve the goal of this course in applied as well as research level.** The course structure will develop hands on skill to manage equipments, laboratory experiments, individual or group-projects along with case study reports and preparation of research proposals at advanced level
- **To foster interdisciplinary learning and flexibility,** in accordance with NEP 2020, allowing students to explore the interdisciplinary aspects.
- **To enhance communication skills and ensuring** that students can effectively disseminate scientific knowledge and for solving societal and environmental problems.

Programme outcome of FYUGP Biotechnology

No.	Programme Outcomes (POs)
PO- 1	Critical thinking ○ Analyze information objectively and make areas on judgment ○ Draw reasonable conclusions from a set of information, and discriminate between useful and less useful details to solve problems or make decisions ○ Identify logical flaws in the arguments of others ○ Evaluate data, facts, observable phenomena, and research findings to draw valid and relevant results that are domain-specific
PO- 2	Complex problem-solving ○ Solve different kinds of problems in familiar and no-familiar contexts and apply the learning to real-life situations ○ Analyze a problem, generate and implement as solution and to assess the success of the plan ○ Understand how the solution will affect both the people involved and the surrounding environment
PO- 3	Creativity ○ Produce or develop original work, theories and techniques ○ Think in multiple ways for making connections between seemingly unrelated concepts or phenomena ○ Add a unique perspective or improve existing ideas or solutions ○ Generate, develop and express original ideas that are useful or have values

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PO- 4	Communication skills ○ Convey or share ideas or feelings effectively ○ Use words in delivering the intended message with utmost clarity ○ Engage the audience effectively ○ Be a good listener who are able to understand, respond and empathize with the speaker ○ Confidently share views and express himself/herself
PO- 5	Leadership qualities ○ Work effectively and lead respectfully with diverse teams ○ Build a team working towards a common goal ○ Motivate a group of people and make them achieve the best possible solution. ○ Help and support others in their difficult times to tide overtheadverse situations with courage
PO- 6	Learning ‘how to learn’ skills ○ Acquire new knowledge and skills, including ‘learning how to learn skills, that are necessary for pursuing learning activities throughout life, through self-paced and self-directed learning ○ Work independently, identify appropriate resources required for further learning ○ Acquire organizational skills and time management to set self-defined goals and targets with timelines ○ Inculcate a healthy attitude to be a lifelong learner
PO- 7	Digital and technological skills ○ Use ICT in a variety of learning and work situations, access, evaluate, and use a variety of relevant information sources ○ Use appropriate software for analysis of data ○ Understand the pitfalls in the digital world and keep safe from them
PO- 8	Value inculcation ○ Embrace and practice constitutional, humanistic, ethical, and moral values in life including universal human values of truth, righteous conduct, peace, love, nonviolence, scientific temper, citizenship values ○ Formulate a position/argument about an ethical issue from multiple perspectives ○ Identify ethical issues related to work, and follow ethical practices, including avoiding unethical behaviour such as fabrication, falsification or misrepresentation of data, or committing plagiarism, and adhering to intellectual property rights ○ Adopt an objective, unbiased and truthful actions in all aspects of work

Teaching Learning Process

Learners should be encouraged to focus on key areas of the course and spend time on learning the course fundamentals and their application. In teaching and learning pedagogy, there should be a shift from domain-based approach to the experiential-based approach. This course, shall include lectures followed by laboratory hours for developing hands on skill practically for handling biohazard substances.

Lectures should include good proportion of visuals learning component and ICT enabled delivery. In order to achieve its objective of focused process based learning and holistic development the department uses various teaching methodologies such as, lecture method, group discussion, problem solving, and other innovative method such as case studies, laboratory work, project work, study/ field visits.

Different pedagogical methods and techniques are to be used both in the classroom through the following ways:

- Lecture
- Tutorials/Remedial classes
- Power-point Presentation
- Google Classroom
- Seminars/workshops/conferences
- Project Work/Dissertation
- Educational tours/Trips

Teaching Learning Tools

- White/Green/BlackBoard
- LCD projectors
- Smart Board
- Learning through Practical Lab. experiments
- Educational trips/Industry/field visits

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Evaluation/Assessment

- Assignment Work
- Project Work
- Educational Trips/Industry/Field Visit Report
- Class Seminar Presentation (PPT)
- Internal semester/Sessional examinations(Theory)
- End Semester examinations (Theory and Practical)

LTP Components of FYUGP BIOTECHNOLOGY 1ST SEM. SEC

Title of the Course	Introduction to Biosafety, Biohazard and Bioethics
Course Code	Paper Code-BIT-SEC-01013
Total Credit (Theory+ Practical)	☐ Theory Credit: 02 ☐ Practical Credit: 01
Contact Hours	30 hours (Theory) + 30 hours (Practical)
Distribution of Marks	Total marks : 75 External (Theory+Practical) 55 (30+25) Internal 20 Sessional Exam:10marks, Home Assignment:3marks, ClassTest:4marks, Attendance:3 marks
Course Outcome	• Gain knowledge on working principles in a laboratory practicing all safety measures- handling of live cultures, disposal of infectious waste, and handling of equipments with safety audit. • Get an insight into basic Biosafety guidelines • Analyze and manage the risks involved with GMOs/infectious agents • Understand the International Agreements and Regulations on Biosafety.

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Course Designer	Dr. Manika Das Kataki, Asstt. Professor, Dept. of Biotechnology, Darrang College, Tezpur Ms. Minakshee Sarmah, Asstt. Professor, Dept. of Biotechnology, Darrang College, Tezpur Dr. Pranjal Pratim Das, Asstt. Professor, Dept. of Biotechnology, Darrang College, Tezpur
Reference Books	1. Sateesh MK (2010) Bioethics and Biosafety, I. K. International Pvt Ltd. 2. Sree Krishna V (2007) Bioethics and Biosafety in Biotechnology, New age international publishers 3. National guidelines for the establishment and certification of biosafety level containment facility (ICMR) 4. 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.html 5. 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/bmbl5/bmbl5toc.htm

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FYUGP 2nd sem Skill Enhancement Course (SEC)

INTRODUCTION: The Microbiology course delves deeply into the microbial world, covering key aspects from past discoveries to practical applications in various fields. It equips students with a strong foundation in microbiology, necessary lab skills, and a thorough understanding of microbial functions, uses and control, ethods vital in scientific and industrial contexts.

LTP Components of FYUGP BIOTECHNOLOGY 2nd SEM. SEC

Title of the Course	Microbial Tools and techniques
Course Code	Paper Code-BIT-SEC-02023
Total Credit (Theory+ Practical)	☐ Theory Credit: 02 ☐ Practical Credit: 01
Contact Hours	30 hours (Theory) + 30 hours (Practical)
Distribution of Marks	Total marks : 75 External (Theory+Practical) 55 (30+25) Internal 20 Sessional Exam:10marks, Home Assignment:3marks, ClassTest:4marks, Attendance:3 marks
Course Outcome	On successful completion of the course, students will be able to: • Understand and learn the microbial techniques and methods used to culture of microorganisms which is important for microbial product synthesis. • Apply the knowledge to understand the microbial physiology and to identify the microorganisms. • Understand strategies for microbial control. • Analyse disinfectants and their modes of action. • Differentiate between culture media types and understand factors affecting microbial growth

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	Gain practical skills in sampling, isolation, staining, and morphology observation
Course Designer	Dr. Manika Das Kataki, Asstt. Professor, Dept. of Biotechnology, Darrang College, Tezpur Ms. Minakshee Sarmah, Asstt. Professor, Dept. of Biotechnology, Darrang College, Tezpur Dr. Pranjal Pratim Das, Asstt. Professor, Dept. of Biotechnology, Darrang College, Tezpur
Reference Books	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.

Semester-II (Theory Credit:02)					
UNIT	CONTENT	L	T	P	TOTAL HRS
I	Introduction to the Microbial World - Distribution of microorganisms in nature, diversity in microbial habitat. Types of microorganisms, - Impact of microorganisms in environment and its impact on human life.	10		10	20
II	Laboratory tools and techniques in Microbiology	10		10	20

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	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- Dyes and stains: Definition, acidic and basic dyes Smear: Fixation, use of mordant, intensifiers and decolorizing agents. Mechanism of staining. Types of staining: simple and differential staining				
III	Nutrient media and Culture of microorganisms a) Different culture media, their use and significance b) Pure culture techniques: Principles and methods of obtaining pure culture. Preservation techniques of pure cultures	10		10	20
		TOTAL HOURS			60
Semester-II (Practical Credit:01)					
UNIT	CONTENT	L	T	P	TOTAL HOURS
I	1. Sterilization technique 2. Disposal of laboratory waste and cultures 3. Staining of bacteria - Gram staining 4. Preparation of different types of microbial media 5. pH adjustment of media by use of pH strip and pH meter 6. Culture methods of bacteria and preparation of stab/slants/glycerol stock 7. Study of antibiotic resistance in microorganism	-	-	3hrs/ each	30