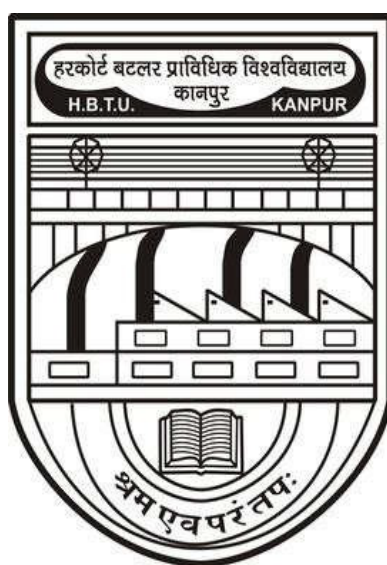


**SEMESTER WISE COURSE STRUCTURE
&
EVALUATION SCHEME**

**B. Tech. Chemical Technology
(Biochemical Engineering)
(Effective from the session 2022-23 for new entrants)**



**HARCOURT BUTLER TECHNICAL UNIVERSITY
KANPUR-208002(UP)–INDIA**

HARCOURT BULTER TECHNICAL UNIVERSITY KANPUR
SCHOOL OF CHEMICAL TECHNOLOGY
DEPARTMENT OF BIOCHEMICAL ENGINEERING
Semester wise Course Structure
B. Tech. Chemical Technology (Biochemical Engineering)
(Applicable from Session 2022-2023 for new entrants)
Year I, Semester-I

Sr. No.	Course Type	Subject Code	Course Title	Credits (L-T-P)	Sessional Marks				ESM	Total Mark
					MSE	TA	Lab	Total		
1.	BSC	NPH 101/102	Engineering Physics	4(3-0-2)	15	20	15	50	50	100
2.	BSC	NMA 101/102	Engineering Mathematics-I	4(3-1-0)	30	20	-	50	50	100
3.	ESC	NEE 101/102	Introduction to Electrical Engineering	4(3-0-2)	15	20	15	50	50	100
4.	ESC	NME 101/102	Introduction to Mechanical Engineering	4(3-1-0)	30	20	-	50	50	100
5.	HSMC	NHS 101/102	Professional Communication	4(2-1-2)	15	20	15	50	50	100
6.	ESC	NCE 103/104	Engineering Graphics	2(0-0-4)	30	20	-	50	50	100
Total Credits					22					

*TA (20) will be divided in three parts (Assignments -10 marks, Quiz -5 marks, Participation in Lecture/Lab Classes-05 marks).

(Applicable from Session 2022-2023 for new entrants)
Year I, Semester-II

Sr. No.	Course Type	Subject Code	Course Title	Credits (L-T-P)	Sessional Marks				ESM	Total Mark	
					MSE	TA	Lab	Total			
1.	BSC	NCY 101/102	Engineering Chemistry	4(3-0-2)	15	20	15	50	50	100	
2.	ESC	NCS 101/102	Introduction to Computer Science & Engineering	4(3-1-0)	30	20	-	50	50	100	
3.	ESC	NET 101/102	Introduction to Electronics Engineering	4(3-1-0)	30	20	-	50	50	100	
4.	ESC	NCE 101/102	Introduction to Civil Engineering	4(3-1-0)	30	20	-	50	50	100	
5.	ESC	NCT 101/102	Introduction to Chemical Engineering & Chemical Technology	4(3-1-0)	30	20	-	50	50	100	
6.	ESC	NWS 101/102	Workshop Practice	2(0-0-4)	-	20	30	50	50	100	
Total Credits					22						

*TA (20) will be divided in three parts (Assignments -10 marks, Quiz -5 marks, Participation in Lecture/Lab Classes-05 marks).

(Applicable from Session 2023-2024)
Year-II, Semester-III

S.No	Course Type	Course Title	Subject Code	Credits	Periods			Sessional Marks					ESE	Total Marks	
					L	T	P	MSE		TA*	TOTAL				
								Theory	Lab						
1	BSC	Engineering Mathematics-II	NMA-201	4	3	1	0	15	15	-	-	20	50	50	100
2	ESC	Fluid Mechanics and Mechanical Operations	NCT-201	4	3	0	2	15	-	15	-	20	50	50	100
3	PCC	Fundamental of Life Processes	NBE-201	4	3	1	0	15	15	-	-	20	50	50	100
4	PCC	Industrial Microbiology	NBE-203	4	3	1	0	15	15	-	-	20	50	50	100
5	PCC	Chemical Process Calculations	NCT-203	3	3	0	0	15	15	-	-	20	50	50	100
6	HSMC	Economics & Management	NHS-201/202	3	3	0	0	15	15	-	-	20	50	50	100
7	PCC	Microbial Techniques Lab	NBE-207	2	0	0	4	-	-	15	15	20	50	50	100
Total Credits:24															700

*TA (20) will be divided in three parts (Assignments -10 marks, Quiz -5 marks, Participation in Lecture/Lab Classes-05 marks).

(Applicable from Session 2023-2024)
Year-II, Semester-IV

S. No	Course Type	Course Title	Subject Code	Credits	Periods			Sessional Marks					ESE	Total Marks	
					L	T	P	MS E		TA*	TOTAL				
								Theory	Lab						
1	BSC	Modern Analytical Techniques	NCY-202	4	3	1	0	15	15	-	-	20	50	50	100
2	ESC	Computer Oriented Numerical Methods	NMA-204	4	3	0	2	15	-	15	-	20	50	50	100
3	PCC	Biochemistry	NBE-202	4	3	1	0	15	15	-	-	20	50	50	100
4	PCC	Chemical Engineering Thermodynamics	NCT-204	4	3	1	0	15	15	-	-	20	50	50	100
5	PCC	Heat Transfer Operations	NCT-202	3	2	1	0	15	15	-	-	20	50	50	100
6	PCC	Environmental Biotechnology	NBE-204	3	3	0	0	15	15	-	-	20	50	50	100
7	PCC	Biochemical Analysis Lab.	NBE-206	2	0	0	4	-	-	15	15	20	50	50	100
Total Credits: 24															700

*TA (20) will be divided in three parts (Assignments -10 marks, Quiz -5 marks, Participation in Lecture/Lab Classes-05 marks).

(Applicable from Session 2024-2025)
Year-III, Semester-V

S. No	Course Type	Course Title	Subject Code	Credits	Periods			Sessional Marks					ESE	Total Marks	
					L	T	P	MSE		TA*	TOTAL				
								Theory	LAB						
1	PCC	Bioinformatics	NBE-301	4	3	0	2	15	-	15	-	20	50	50	100
2	PCC	Bioprocess Engg.	NBE-303	4	3	1	0	15	15	-	-	20	50	50	100
3	PCC	Enzyme Engineering and Technology	NBE-305	3	2	1	0	15	15	-	-	20	50	50	100
4	PCC	Mass Transfer Operations	NCT	3	3	0	0	15	15	-	-	20	50	50	100
5	PCC	Chemical Reaction Engineering	NCT	3	3	0	0	15	15	-	-	20	50	50	100
6	PCC	Bioprocess Engg. Lab.	NBE-307	3	0	0	6	-	-	15	15	20	50	50	100
7	HSMC	Entrepreneurship	NHS-301/302	2	2	0	0	15	15	-	-	20	50	50	100
Total Credits: 22														700	

*TA (20) will be divide in three parts (Assignments -10 marks, Quiz -5 marks , Participation in Lecture/Lab Classes-05 marks).

**(Applicable from Session 2024-2025)
Year- III, Semester-VI**

S .No	Course Type	Course Title	Subject Code	Credits	Periods			Sessional Marks						ESE	Total Marks
					L	T	P	MSE		TA*	TOTAL				
								Theory	Lab						
1	PCC	Instrumentation & Process Control	NCT	4	3	0	2	15	-	15	-	20	50	50	100
2	PCC	Downstream Techniques in Bioprocesses	NBE-302	4	3	0	2	15	-	15	-	20	50	50	100
3	PCC	Biomolecules in Pharmaceutical	NBE-304	3	2	1	0	15	15	-	-	20	50	50	100
4	PCC	Fermentation Technology	NBE-306	3	2	1	0	15	15	-	-	20	50	50	100
5	PCC	Fermentation & Environmental Lab	NBE-308	3	0	0	6	-	-	15	15	20	50	50	100
6	PEC-I	Program Elective –I 1. Process Equipment Design 2. Process Modeling & Simulation 3. Process Optimization	NCT	3	3	0	0	15	15	-	-	20	50	50	100
7	OEC-I	Microbial Technology	OBE-302	2	2	0	0	15	15	-		20	50	50	100
Total Credits: 22															700

*TA (20) will be divided in three parts (Assignments -10 marks, Quiz -5 marks, Participation in Lecture/Lab Classes-05 marks).

(Applicable from Session 2025-2026)
Year-IV, Semester-VII

S. No	Course Type	Course Title	Subject Code	Credits	Periods			Sessional Marks						ESE	Total Marks
					L	T	P	MSE		TA*	TOTAL				
								Theory	LAB						
1	PEC-II	Program Elective-II 1. Bioreactor Design 2. Metabolic Engg. 3. Green Energy and Sustainability	NBE-401 NBE-403 NBE-405	4	3	1	0	15	15	-	-	20	50	50	100
2	PEC-III	Program Elective-III 1. Plant Cell Biotechnology 2. Food Biotechnology 3. Membrane Application in Bioprocesses	NBE-407 NBE-409 NBE-411	3	3	0	0	15	15	-	-	20	50	50	100
3	PEC-IV	Program Elective-IV 1. IPR & Biosafety Regulation 2. Biosensors 3. Nanobiotechnology	NBE-413 NBE-415 NBE-417	3	3	0	0	15	15	-	-	20	50	50	100
4	Industrial Training	Industrial Training	NBE-419	2	0	0	4**	-	-	-	-	-	50	50	100
5	OEC-II	Fundamentals of Enzyme Engineering	OBE-401	2	2	0	0	15	15	-	-	20	50	50	100
6	Minor Project	Minor Project	NBE-421	6	0	0	12	-	-	-	-	-	50	50	100
7	Seminar	Seminar	NBE-423	2	0	0	4**	-	-	-	-	-	50	50	100
Total Credits:22														700	

*TA (20) will be divided in three parts (Assignments -10 marks, Quiz -5 marks, Participation in Lecture/Lab Classes-05 marks).

** Presentation

**(Applicable from Session 2025-2026)
Year -IV, Semester-VIII**

S. No.	Course Type	Course Title	Subject Code	Credits	Periods			Sessional Marks						ESE	Total Marks
					L	T	P	MSE		TA*	Total				
								Theory	Lab						
1	PEC-V	Program Elective-V 1. Bioprocess Instrumentation 2. Biochemical calculations and Plant Design 3. Protein Science & Engineering	NBE-402 NBE-404 NBE-406	4	3	1	0	15	15	-	-	20	50	50	100
2	OEC-III	Bioresource Technology	OBE-402	2	2	0	0	15	15	-	-	20	50	50	100
3	Project	Project**	NBE-408	16	0	0	24	50	50	-	--	100	200	200	400
Total Credits:22														600	

*TA (20) will be divided in three parts (Assignments -10 marks, Quiz -5 marks, Participation in Lecture/Lab Classes-05 marks).

** Mid Semester Progress Presentations

Harcourt Butler Technical University

DEPARTMENT OF CHEMICAL TECHNOLOGY (BIOCHEMICAL ENGINEERING)

SCHOOL OF CHEMICAL TECHNOLOGY

I. Vision

The department of Biochemical Engineering aspires to be globally recognized center to develop professionals with technical knowledge and skills, leadership qualities and strong ethical values for successful career in Biochemical and allied industries, research and development organizations.

II. Mission

The mission of the Department of Chemical Technology (Biochemical Engineering) -

- M1** : To develop state-of-the-art facilities to impart technical knowledge and skill to the graduate and post graduate students for Biochemical and allied industries and research organizations.
- M2** : To be a center of research and development for betterment of society in sustainable manner.
- M3** : To develop state-of-art the technologies for testing and consultancy for industry and society.
- M4** : To cultivate strong ethical values to be a successful professionals and to become life-long learners.

III. Program Educational objectives (PEOs) for B.Tech. Chemical Technology (Biochemical Engineering) -

IV. The educational objectives of B.Tech. Chemical Technology (Biochemical Engineering) program are:

- PEO1** : To produce globally competent technical manpower in the field of Biochemical, products , processing and allied areas to cater the need of country
- PEO2** : To impart knowledge for development of innovation designs production materials and processes for sustainable development of society
- PEO3** : To serve the industry to meet the challenges in terms of quality assurance and standardization to with stand the global competitiveness
- PEO4** : To be able to discharge duties with professional attitudes and ethics

Program outcomes (POs) of B.Tech. Chemical Technology (Biochemical Engineering)

Graduating Students of B.Tech. Chemical Technology (Biochemical Engineering)

program will be able to:

Program Outcomes (POs)		Graduate Attributes(GAs)
PO1	Apply the knowledge of mathematics, science engineering fundamentals and Engineering concepts for the solution of complex engineering problems	Engineering Knowledge
PO2	Identify formulate, review literature and analyze complex problems related to Chemical Technology- Biochemical Engineering reaching substantiated conclusions using first principles of mathematics and engineering sciences	Problem Analysis
PO3	Design solution for complex problems in Chemical Technology- Biochemical Engineering and design system components or process that meet the specified needs with appropriate consideration for the public health and safety, and cultural, societal and environmental considerations	Design /Development
PO4	Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions	Conduct Investigations
PO5	Create, select and apply appropriate techniques, resources and modern engineering tools such as optimization techniques, simulations, including predication and modeling to complex process engineering problems with an understanding of their limitations.	Modern Tool Usage
PO6	Apply contextual knowledge with justification to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to engineering and Chemical Technology- Biochemical Engineering professional practice	The Engineer & Society
PO7	Understand the impact of the professional engineering and Chemical Technology- Biochemical Engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development	Environment and sustainability
PO8	Apply ethical principles and commit to professional ethics adhering to the norms of the engineering and Chemical Technology- Biochemical Engineering practice	Ethics
PO9	Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings	Individual and team work
PO10	Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.	Communication
PO11	Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.	Project management and finance
PO12	Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.	Life-long learning

Program Specific Outcomes (PSOs) for B.Tech. Chemical Technology (Biochemical Engineering) program are:

Graduating Students of B.Tech. Chemical Technology (Biochemical Engineering) program will be able:

- PSO1** : to apply practical skills, technical knowledge in major streams such as Biology, manufacturing, processing, and applications areas of engineering and technology in Biochemical Engineering and allied industries
- PSO2** : to take-up career in research organizations or to pursue higher studies in Biochemical Engineering and interdisciplinary programs with high regard for ethical values, environmental and social issues.