

Haldia Institute of Technology, West Bengal

(An Autonomous Institution under Maulana Abul Kalam Azad University of Technology)



Curriculum Structure for Bachelor of Technology in BIOTECHNOLOGY

(Applicable for the Batch of 2022-2026 & 2023-2027)

VISION

To evolve as a pioneer to combat biological challenges and to develop students with sound concepts in Biotechnology who can excel as Leaders in the field of Research, Entrepreneurship, Industry and Management.

MISSION

M1. Implementation of outcome based teaching-learning methodology to fulfil current emerging challenges in various areas of Biotechnology.

M2. To fill up the gap between theory and practical in tune with the challenging demands of Biotechnology based industry and academia.

M3. To emphasize on certain areas such as soft skills, ethics, team spirit, environmental and societal issues for overall development.

PROGRAMME EDUCATIONAL OBJECTIVES (PEOs):

PEO 1: Creating Outcome Based Education in Biotechnology: To imbibe outcome based basic education of Biotechnology for the students to help them excel in all related fields with competence, technical knowledge and analytical skill.

PEO 2: Power to Work in Multidisciplinary Arena Bridging the Gap between Knowledge and Application: To train the students for attainment of multidisciplinary technical skills and modern technology to serve as an individual or as a leader with effective communication apt for industry, research & development sectors.

PEO 3: Competence to Provide Service to the Nation as Well as the Society: To fulfill the needs of society for solving medical, agricultural and environmental problems using biotechnological principle, tools and practices in an ethical and responsible manner.

PROGRAMME SPECIFIC OUTCOMES (PSOs):

PSO 1: An ability to understand the basic concepts of Biotechnology and its application in various fields.

PSO 2: An ability to combine the theoretical and practical knowledge to solve complex biological problems using appropriate analytical skills and modern tools.

PSO 3: An ability to build up a successful career compatible in real world with ethical awareness for developing as a working professional or a self-sustaining entrepreneur.

PROGRAM OUTCOMES (POs):

PO 1: Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

PO 2: Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

PO 3: Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

PO 4: Conduct investigations of complex problems: 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.

PO 5: Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.

PO 6: The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

PO 7: Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

PO 8: Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

PO 9: Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

PO 10: Communication: 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.

PO 11: Project management and finance: 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.

PO 12: Life-long learning: 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.

Definition of Credit

1 Hr. Lecture (L) per week	1 credit
1 Hr. Tutorial (T) per week	1 credit
1 Hr. Practical (P) per week	0.5 credits

A. Range of credits

All B. Tech. programs include a range of credits from 160 to 165.

B. Mandatory Additional Requirement (MAR) for earning B. Tech Degree

Every student, who is admitted to the 4 years B. Tech program from the academic year 2019-20 onwards, is required to earn minimum 100 Activity Points, in addition to the required academic grades for getting B. Tech degree.

The MAR activities, (as per guideline of AICTE / affiliating University, MAKAUT) will provide necessary needs of modern industry and the society. Through this program, irrespective of one's technological field, each student develops the skill of active participation in the co-curricular and extra-curricular activities through SAWYAM based learning activities. Such activities enhance student's employability and global acceptances. Details are given in *Annexure-I*.

C. MOOCs for B. Tech Honours

A student will be eligible to get B.Tech Degree with Honours, if he/she completes an additional 20 credits, through Massive Open Online Courses (MOOCs). The complete description of the MOOCs relevant for the first year course is given in Annexure-II.

D. Guidelines regarding Mandatory Induction Program for the new students

The aim of the Induction Programme is to acclimatize the students to the environment of their engineering institution, give them a flavour of the exciting new world of education that they are entering, provide them with mentoring schemes, and make them aware of their neighbourhood, society and people. This will allow them to evolve as well rounded individuals. Details are given in *Annexure-III*.

E. Group division

Group-A

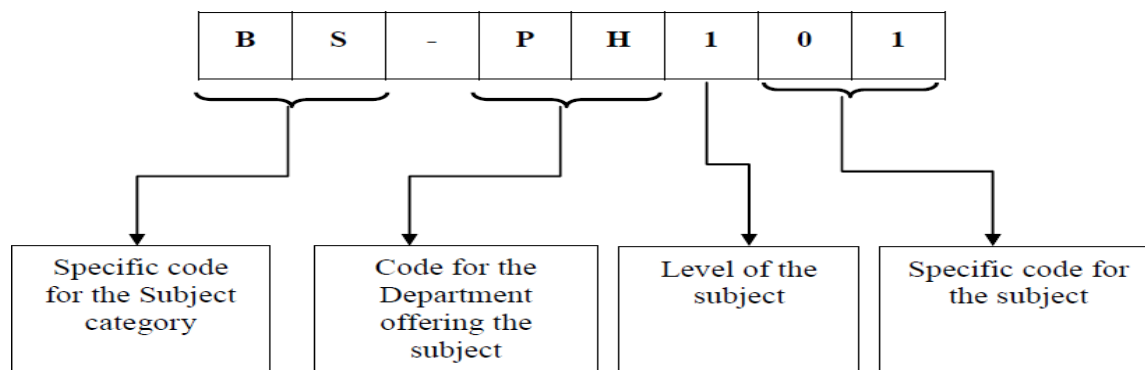
All non-IT based programme like - Mechanical Engineering (ME), Chemical Engineering (CHE), Civil Engineering (CE), Electrical Engineering (EE), Applied Electronics & Instrumentation Engineering (AEIE), Biotechnology (BT), Food Technology (FT).

Group-B

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All IT-based programme like – Computer Science & Engineering (CSE), Computer Science & Engineering (Cyber Security), Computer Science & Engineering (Data Science), Computer Science & Engineering (Artificial Intelligence & Machine Learning), Information Technology, Electronics & Communication Engineering (ECE).

Subject Numbering Scheme:



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2ND YEAR-3RD SEMESTER

A. THEORY (3rd Sem)							
Code	Field	Theory	Contact Hours/Week				Cr. Points
			L	T	P	Total	
HM-BT301	Humanities and social Science and Management course	Ethics and Patenting in Biotechnology	3	0	0	3	3
PC-BT301	Professional Core	Biological Thermodynamics and Kinetics	2	0	0	2	2
PC-BT302	Professional Core	Structure of Biomolecules	3	0	0	3	3
PC-BT303	Professional Core	Biochemistry	3	0	0	3	3
PE-BT301	Professional Core Elective	Industrial Stoichiometry	3	0	0	3	3
BS-BT301	Basic Science Course	Microbiology	3	0	0	3	3
Total of Theory						17	17
B. PRACTICAL (3rd Sem)							
Code	Field	Practical	Contact Hours/Week				Cr. Points
			L	T	P	Total	
PC-BT391	Professional Core	Biomolecular Analysis Lab	0	0	3	3	1.5
HM-BT391	Humanities and social Science and Management course	Technical Report Writing and Language Lab Practices	0	0	2	2	1
PC-BT392	Professional Core	Biochemistry Lab	0	0	3	3	1.5
BS-BT391	Basic Science Course	Microbiology Lab	0	0	3	3	1.5
Total of Practical						11	5.5
C. SESSIONAL (3rd Sem)							
SI-BT381	Summer Internship	Summer Internship-I [Seminar/Training /Workshop (online/offline)]	0	0	20	20	2
Total of 3rd Semester						48	24.5

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2ND YEAR-4TH SEMESTER

A. THEORY (4th Sem)							
Code	Field	Theory	Contact Hours/Week				Cr. Points
			L	T	P	Total	
OE-BT401	Open Elective Course	Numerical Methods and Biostatistics	3	1	0	4	4
OE-BT402	Open Elective Course	Data Structure and Algorithms	3	0	0	3	3
*MC-BT401	Mandatory Course (Non Credit)	Environmental Science/ Engg.	2	0	0	2	0
ES-BT401	Engineering Science	Transfer Operation I	3	0	0	3	3
PC-BT402	Professional Core	Molecular Biology	3	0	0	3	3
PC-BT403	Professional Core	Industrial Biotechnology and Enzyme Technology	3	0	0	3	3
Total of Theory						18	16
B. PRACTICAL (4th Sem)							
Code	Field	Practical	Contact Hours/Week				Cr. Points
			L	T	P	Total	
OE-BT491	Open Elective Course	Numerical Methods and Biostatistics Lab	0	0	2	2	1
OE-BT492	Open Elective Course	Data Structure and Algorithms Lab	0	0	2	2	1
ES-BT491	Engineering Science	Transfer Operation I Lab	0	0	2	2	1
PC-BT491	Professional Core	Molecular Biology Lab	0	0	2	2	1
Total of Practical						8	4
C. SESSIONAL (4th Sem)							
SI-BT481	Summer Internship	Summer Internship-II (Assessment by Seminar/Viva Voce (online/offline))	0	0	20	20	2
Total of 4th Semester						46	22
Total Credit in 2nd year : 46.5							

NB: * Indicates Sessional Paper

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3RD YEAR-5TH SEMESTER

A. THEORY (5th Sem)								
Code	Field	Theory	Contact Hours/Week				Cr. Points	
			L	T	P	Total		
HM-BT501	Humanities and social Science and Management course	Fundamentals of Management for Engineers	2	0	0	2	2	
PC-BT501	Professional Core	Genetics	3	1	0	4	4	
PC-BT502	Professional Core	Bioinformatics	3	0	0	3	3	
ES-BT501	Engineering Science	Transfer Operation -II	3	0	0	3	3	
OE-BT501	Open Elective Course	Data Base Management System and Computer Networking	3	0	0	3	3	
PE-BT501	Professional Core Elective	Bioreactor Design And Analysis	3	1	0	4	4	
Total of Theory						19	19	
B. PRACTICAL (5th Sem)								
Code	Field	Practical	Contact Hours/Week				Cr. Points	
			L	T	P	Total		
PC-BT591	Professional Core	Genetics Lab	0	0	3	3	1.5	
PC-BT592	Professional Core	Bioinformatics Lab	0	0	3	3	1.5	
ES-BT591	Engineering Science	Transfer operation -II	0	0	3	3	1.5	
OE-BT591	Open Elective Course	Data Base Management System Lab	0	0	3	3	1.5	
Total of Practical						12	6	
C. SESSIONAL (5th Sem)								
SI-BT581	Summer Internship	Summer Internship-III (Seminar/Training /Workshop) (online/offline)	0	0	15	15	1.5	
Total of 5th Semester						46	26.5	

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3RD YEAR-6TH SEMESTER

A. THEORY (6 th Sem)							
Code	Field	Theory	Contact Hours/Week				Cr. Points
			L	T	P	Total	
HM-BT601	Humanities and social Science and Management course	Project Management and Entrepreneurship	2	0	0	2	2
PC-BT601	Professional Core	Recombinant DNA Technology	3	0	0	3	3
PC-BT602	Professional Core	Immunology	3	0	0	3	3
PC-BT603	Professional Core	Plant Biotechnology	3	0	0	3	3
PC-BT604	Professional Core	Downstream Processing	3	0	0	3	3
PE-BT602	Professional Core Elective	Animal Cell Culture & Animal Biotechnology	3	0	0	3	3
Total of Theory						17	17
B. PRACTICAL (6 th Sem)							
Code	Field	Practical	Contact Hours/Week				Cr. Points
			L	T	P	Total	
PC-BT691	Professional Core	Recombinant DNA Technology Lab	0	0	2	2	1
PC-BT692	Professional Core	Immunology Lab	0	0	2	2	1
PC-BT693	Professional Core	Plant Biotechnology Lab	0	0	2	2	1
PC-BT694	Professional Core	Fermentation Technology and Downstream Processing Lab	0	0	2	2	1
*HM-BT691	Humanities and social Science and Management course	Technical and Popular science article writing and Seminar Presentation (Based on Review article by PPT)	0	0	2	2	1
*MC-BT691	Mandatory Course (Non Credit)	Sports & Yoga (MC-BT691A) / Personality Development Through Life Enlightenment Skills (MC-BT691B)	0	0	2	2	0
Total of Practical						12	5
C. SESSIONAL (6 th Sem)							
SI-BT681	Summer Internship	Summer Internship-IV (Seminar/Training /Workshop) (online/offline)	0	0	15	15	1.5
Total of 6th Semester						44	23.5
Total Credit in 3rd year : 50							

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4TH YEAR-7TH SEMESTER

A. THEORY (7 th Sem)							
Code	Field	Theory	Contact Hours/Week				Cr. Points
			L	T	P	Total	
PC-BT701	Professional Core	Food Biotechnology (PC-BT701)	3	0	0	3	3
PE-BT701	Professional Core Elective	Renewable Energy Technology (PE-BT701A)	3	0	0	3	3
		Genomics and Proteomics (PE-BT701B)					
		Medical Informatics (PE-BT701C)					
		Bioprocess and Process Instrumentation (PE-BT701D)					
		Forensic Science (PE-BT701E)					
PE-BT702	Professional Core Elective	Biomaterials (PE-BT702A)	2	0	0	2	2
		Biosensor and Diagnostics (PE-BT702B)					
		Medical & Pharmaceutical Biotechnology (PE-BT702C)					
		Introduction to Python Programming for Biotechnology (PE-BT702D)					
OE-BT701	Open Elective Courses	Biosafety (OE-BT701A)	2	0	0	2	2
		Soft Skill (OE-BT701B)					
		Research Methodology (OE-BT701C)					
Total of Theory						10	10
B. PRACTICAL (7 th Sem)							
Code	Field	Practical/ Sessional	Contact Hours/Week				Cr. Points
			L	T	P	Total	
HM-BT791	Humanities and social Science and Management course	Group Discussion	0	0	1	1	0.5
PC-BT791	Professional Core	Food Biotechnology Lab (PC-BT791)	0	0	2	2	1
Total of Practical						3	1.5
C. SESSIONAL (7 th Sem)							
PW-BT781	Project	Project work-I (In-House/Industry/ Research Institute)	0	0	4	4	2
SI-BT781	Summer Internship	Summer Internship-V (Seminar/Training /Workshop) (online/offline)	0	0	15	15	1.5
Total of Sessional						19	3.5
Total of 7th Semester						32	15

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4TH YEAR-8TH SEMESTER

A. Theory (8 th Sem)								
Code	Field	Theory	Contact Hours/Week				Cr. Points	
			L	T	P	Total		
-								
B. SESSIONAL (8 th Sem)								
PW-BT881	Project	Project work-II (In-House/Industry/ Research Institute)	0	0	18	18	9	
SI-BT881	Summer Internship	Summer Internship-VI (Seminar/Training /Workshop) (online/offline)	0	0	15	15	1.5	
Total of Sessional						33	10.5	
Total of 8th Semester						33	10.5	
Total Credit in 4th year : 25.5								

Code	Field		Different year	Total Credit	Additional Credits
BS	Basic Science Courses		1st year :	38	8
ES	Engineering Science Courses		2nd year :	46.5	4
PC	Professional Core Courses		3rd year :	50	4
PE	Professional Core Electives		4th year :	25.5	4
HM	Humanities, Social Sciences including Management		Total:	160	20
OE	Open Elective course	Additional 20 credits are required for the Degree of Bachelor of Technology with Honours. These additional 20 credits to be acquired with online courses (MOOCs) as per AICTE for obtaining B.Tech Honours degree which are distributed over four years in the following way: For first year : 8 credits For second year : 4 credits For third year : 4 credits For fourth year : 4 credits			
MC	Mandatory Course				
SI	Summer Internship				
PW	Project				