

CURRICULUM & SYLLABUS

Bachelor of Technology in BIOTECHNOLOGY (Program Code: 004)

(Applicable for the Batch of 2026-2030)



Haldia Institute of Technology

[An Autonomous Institute of ICARE]

Approved by: All India Council for Technical Education (AICTE)

***Affiliated to: Maulana Abul Kalam Azad University of Technology, West
Bengal (Formerly Known as WBUT)***

HIT Campus, ICARE Complex, Purba Medinipur - 721657, WB, India

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THE INSTITUTE'S VISION AND MISSION

VISION

To achieve Centre of Excellence in the field of Science, Technology and Management Education for creating dynamic human resources of global standards with capabilities of accepting new challenges.

MISSION

M1: To impart quality and value based education to raise satisfaction level of all stakeholders.

M2: To create competent, creative professionals, and great entrepreneurs who can work as individual or in group in multi-cultural global environments.

M3: To prepare citizens who would grow to be competent enough to contribute significantly with personal integrity and civic responsibility for the betterment of mankind throughout their careers and profession.

VISION AND MISSION OF THE DEPARTMENT (BIOTECHNOLOGY)

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.

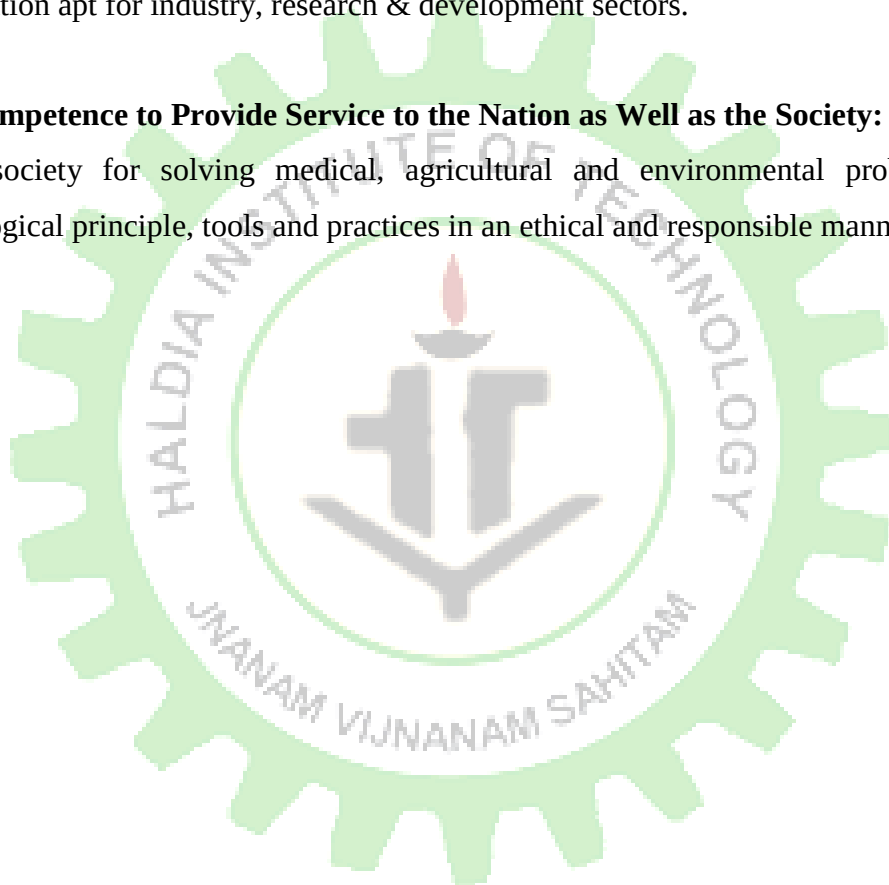
M3: To emphasize on certain areas such as soft skills, ethics, team spirit, environmental and societal issues for overall development.

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.



PROGRAM OUTCOMES (POs)

PO1: Engineering Knowledge: Apply knowledge of mathematics, natural science, computing, engineering fundamentals and an engineering specialization as specified in WK1 to WK4 respectively to develop to the solution of complex engineering problems.

PO2: Problem Analysis: Identify, formulate, review research literature and analyze complex engineering problems reaching substantiated conclusions with consideration for sustainable development. (WK1 to WK4)

PO3: Design / Development of Solutions: Design creative solutions for complex engineering problems and design/develop systems / components / processes to meet identified needs with consideration for the public health and safety, whole-life cost, net zero carbon, culture, society and environment as required. (WK5)

PO4: Conduct Investigations of Complex Problems: Conduct investigations of complex engineering problems using research-based knowledge including design of experiments, modelling, analysis & interpretation of data to provide valid conclusions. (WK8)

PO5: Engineering Tool Usage: Create, select and apply appropriate techniques, resources and modern engineering & IT tools, including prediction and modelling recognizing their limitations to solve complex engineering problems. (WK2 and WK6)

PO6: The Engineer and The World: Analyze and evaluate societal and environmental aspects while solving complex engineering problems for its impact on sustainability with reference to economy, health, safety, legal framework, culture and environment. (WK1, WK5, and WK7)

PO7: Ethics: Apply ethical principles and commit to professional ethics, human values, diversity and inclusion; adhere to national & international laws. (WK9)

PO8: Individual and Collaborative Team work: Function effectively as an individual, and as a member or leader in diverse / multi-disciplinary teams.

PO9: Communication: Communicate effectively and inclusively within the engineering community and society at large, such as being able to comprehend and write effective reports and design documentation, make effective presentations considering cultural, language, and learning differences

PO10: Project Management and Finance: Apply knowledge and understanding of engineering management principles and economic decision-making and apply these to one's own work, as a member and leader in a team, and to manage projects and in multidisciplinary environments.

PO11: Life-Long Learning: Recognize the need for, and have the preparation and ability for independent & life-long learning; adaptability to new and emerging technologies and critical thinking in the broadest context of technological change. (WK8)

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.



CURRICULUM STRUCTURE

B.TECH 1ST YEAR (SEMESTER I)

Sr. No.	Course Category	Course Code	Course Title	Teaching & Learning Scheme (in hrs per semester)						EXAM SCHEME		
				CI		LI	TW+ SL	Total	Credit	CA	ESE	TOTAL
				L	T	P						
1	BS	BS-M 101	Engineering Mathematics-I	42	14	0	64	120	4	30	70	100
2	BS	BS-PH 102A	Engineering Physics	42	0	0	48	90	3	30	70	100
3	ES	ES-BT 104	Biology for Engineers	28	0	0	32	60	2	30	70	100
4	HSSM	HM-AEC 105	English Language and Technical Communication	28	0	0	32	60	2	30	70	100
5	BS	BS-PH 192A	Engineering Physics Laboratory	0	0	42	3	45	1.5	40	60	100
6	ES	ES-ME 192	Engineering Drawing	0	0	42	3	45	1.5	40	60	100
7	HSSM	HM-AEC 195	Language Laboratory	0	0	28	2	30	1	40	60	100
8	HSSM	HM-IKS 106	Values, Ethics and Indian Knowledge System	28	0	0	32	60	2	30	70	100
9	VSEC	VSEC-181	Soft Skills for Professional Development-I	0	0	28	2	30	1	-	-	100
10	HSSM	AU-181	NCC / NSS / CSP / Yoga	0	0	14	14	28	0	-	-	100
Total				168	14	154	232	568	18			

B.TECH 1ST YEAR (SEMESTER II)

Sr. No.	Course Category	Course Code	Course Title	Teaching & Learning Scheme (in hrs per Semester)						EXAM SCHEME		
				CI		LI	TW + SL	Total	Credit	CA	ESE	TOTAL
				L	T	P						
1	BS	BS-M 201A	Engineering Mathematics-II	42	14	0	64	120	4	30	70	100
2	BS	BS-CH 202A	Engineering Chemistry	42	0	0	48	90	3	30	70	100
3	ES	ES-EE 203A	Basic Electrical & Electronics Engineering	42	0	0	48	90	3	30	70	100
4	ES	ES-CS 203	Programming for Problem Solving	42	14	0	64	120	4	30	70	100
5	ES	ES-BT 201	Bioinspired Engineering	42	0	0	48	90	3	30	70	100
6	BS	BS-CH 292A	Engineering Chemistry Laboratory	0	0	42	3	45	1.5	40	60	100
7	ES	ES-EE 293A	Basic Electrical & Electronics Engineering Laboratory	0	0	42	3	45	1.5	40	60	100
8	ES	ES-CS 293	Programming Laboratory	0	0	42	3	45	1.5	40	60	100
9	ES	ES-ME 291	Workshop Practice	0	0	42	3	45	1.5	40	60	100
Total				210	28	168	284	690	23			

B.TECH 2ND YEAR (SEMESTER III)

Sr. No.	Course Category	Course Code	Course Title	Teaching & Learning Scheme (in hrs per Semester)						EXAM SCHEME		
				CI		LI	TW + SL	Total	Credit	CA	ESE	TOTAL
				L	T	P						
1	BSC	BS-BT 301	Bioprocess Calculations	42	0	0	48	90	3	30	70	100
2	BSC	BS-BT 302	Biological Thermodynamics and Kinetics	42	0	0	48	90	3	30	70	100
3	PCC	PC-BT 301	Structure of Biomolecules	42	0	0	48	90	3	30	70	100
4	PCC	PC-BT 302	Biochemistry	42	0	0	48	90	3	30	70	100
5	PCC	PC-BT 303	Microbiology	42	0	0	48	90	3	30	70	100
6	PCC	PC-BT 304	Food Biotechnology	42	0	0	48	90	3	30	70	100
7	PCC	PC-BT 391	Biomolecular Analysis Laboratory	0	0	28	2	30	1	40	60	100
8	PCC	PC-BT 392	Biochemistry Laboratory	0	0	28	2	30	1	40	60	100
9	PCC	PC-BT 393	Microbiology Laboratory	0	0	28	2	30	1	40	60	100
10	PCC	PC-BT 394	Food Biotechnology Laboratory	0	0	28	2	30	1	40	60	100
11	VSEC	VS-BT 381	Mental Health Management in Industrial Scenario	0	0	14	16	30	1	-	-	100
12	HSSM	AU-BT 381	Community Service Towards Environmental Sustainability	0	0	14	16	30	0	-	-	100
Total				252	0	126	312	690	23			

B.TECH 2ND YEAR (SEMESTER IV)

Sr. No.	Course Category	Course Code	Course Title	Teaching & Learning Scheme (in hrs per Semester)						EXAM SCHEME		
				CI		LI	TW + SL	Total	Credit	CA	ESE	TOTAL
				L	T	P						
1	ESC	ES-BT 401	Bioprocess Transfer Operations	42	0	0	48	90	3	30	70	100
2	PCC	PC-BT 401	Cell and Molecular Biology	42	14	0	64	120	4	30	70	100
3	PCC	PC-BT 402	Genetics and Genetic Engineering	42	14	0	64	120	4	30	70	100
4	PCC	PC-BT 403	Immunology	42	0	0	48	90	3	30	70	100
5	OEC	OE-BT 401A	Data Structure and Algorithms	42	0	0	48	90	3	30	70	100
		OE-BT 401B	Foundations of Data Science for Biotechnology									
		OE-BT 401C	Basics of Drug Design and Delivery System									
6	HSSM	HM-BT401	Fundamentals of Management for Engineers	28	0	0	32	60	2	30	70	100
7	ESC	ES-BT 491	Bioprocess Transfer Operations Laboratory	0	0	28	2	30	1	40	60	100
8	PCC	PC-BT 491	Cell and Molecular Biology Laboratory	0	0	42	3	45	1.5	40	60	100
9	PCC	PC-BT 492	Genetics and Genetic Engineering Laboratory	0	0	42	3	45	1.5	40	60	100
10	PCC	PC-BT 493	Immunology Laboratory	0	0	28	2	30	1	40	60	100
11	OEC	OE-BT 491A	Data Structure and Algorithms Laboratory	0	0	28	2	30	1	40	60	100
		OE-BT 491B	Foundations of Data Science for Biotechnology Laboratory									
		OE-BT 491C	Drug Design and Delivery Systems Laboratory									
12	VSEC	VSEC-481	Soft Skills for Professional Development - II	0	0	28	2	30	1	-	-	100
Total				238	28	196	318	780	26			

B.TECH 3RD YEAR (SEMESTER V)

Sr. No.	Course Category	Course Code	Course Title	Teaching & Learning Scheme (in hrs per Semester)						EXAM SCHEME		
				CI		LI	TW + SL	Total	Credit	CA	ESE	TOTAL
				L	T	P						
1	ESC	ES-BT 501	Bioprocess Engineering and Bioreactor Design	42	0	0	48	90	3	30	70	100
2	PCC	PC-BT 501	Recombinant DNA Technology	42	14	0	64	120	4	30	70	100
3	PCC	PC-BT 502	Bioinformatics	42	14	0	64	120	4	30	70	100
4	PEC	PE-BT 501A	Renewable Energy Technology	42	0	0	48	90	3	30	70	100
		PE-BT 501B	Environmental Biotechnology									
		PE-BT 501C	Agricultural Biotechnology									
5	OEC	OE-BT 501A	Data Base Management System and Computer Networking	42	0	0	48	90	3	30	70	100
		OE-BT 501B	Nanotechnology									
		OE-BT 501C	Marine Biotechnology									
6	HSSM	HM-BT 501	Biosafety, Bioethics and IPR in Biotechnology	28	0	0	32	60	2	30	70	100
7	ESC	ES-BT 591	Bioprocess Engineering and Bioreactor Design Laboratory	0	0	28	2	30	1	40	60	100
8	PCC	PC-BT 591	Recombinant DNA Technology Laboratory	0	0	42	3	45	1.5	40	60	100
9	PCC	PC-BT 592	Bioinformatics Laboratory	0	0	42	3	45	1.5	40	60	100
10	OEC	OE-BT 591A	Data Base Management System and Computer Networking Laboratory	0	0	28	2	30	1	40	60	100
		OE-BT 591B	Nanotechnology Laboratory									
		OE-BT 591C	Marine Biotechnology Laboratory									
Total				238	28	140	314	720	24			

B.TECH 3RD YEAR (SEMESTER VI)

Sr. No.	Course Category	Course Code	Course Title	Teaching & Learning Scheme (in hrs per Semester)						EXAM SCHEME		
				CI		LI	TW + SL	Total	Credit	CA	ESE	TOTAL
				L	T	P						
1	PCC	PC-BT 601	Plant Biotechnology	42	14	0	64	120	4	30	70	100
2	PCC	PC-BT 602	Bioseparation Engineering	42	14	0	64	120	4	30	70	100
3	PCC	PC-BT 603	Animal Cell Culture & Animal Biotechnology	42	14	0	64	120	4	30	70	100
4	PEC	PE-BT 601A	Data Analysis and Visualization with Python in Biotechnology	42	0	0	48	90	3	30	70	100
		PE-BT 601B	Research Methodology									
		PE-BT 601C	Biomaterials									
		PE-BT 601D	Biostatistics									
5	PEC	PE-BT 602A	Gene Expression and Transgenics	42	0	0	48	90	3	30	70	100
		PE-BT 602B	Clinical Embryology									
		PE-BT 602C	Cancer Biology and Therapeutics									
		PE-BT 602D	Pharmaceutical Biotechnology									
6	HSSM	HM-BT 601	Entrepreneurship and Startup in Biotechnology	28	0	0	32	60	2	30	70	100
7	PCC	PC-BT 691	Plant Biotechnology Laboratory	0	0	42	3	45	1.5	40	60	100
8	PCC	PC-BT 692	Bioseparation Engineering Laboratory	0	0	42	3	45	1.5	40	60	100
9	VSEC	VS-BT 681	Technical Writing and Presentation	0	0	14	16	30	1	-	-	100
10	HSSM	AU-BT 681	Sports and Yoga	0	0	14	16	30	0	-	-	100
Total				238	42	112	358	750	24			

B.TECH 4TH YEAR (SEMESTER VII)

Sr. No.	Course Category	Course Code	Course Title	Teaching & Learning Scheme (in hrs per Semester)						EXAM SCHEME		
				CI		LI	TW + SL	Total	Credit	CA	ESE	TOTAL
				L	T	P						
1	PEC	PE-BT 701A	Tissue Engineering	42	0	0	48	90	3	30	70	100
		PE-BT 701B	Advanced Food Engineering and Management									
		PE-BT 701C	Introduction to Artificial Intelligence & Machine Learning									
		PE-BT 701D	Protein Engineering									
2	OEC	OE-BT 701A	Forensic Science	42	0	0	48	90	3	30	70	100
		OE-BT 701B	Medical Parasitology									
		OE-BT 701C	Biomedical Instrumentation									
		OE-BT 701D	Healthcare Informatics									
		OE-BT 701E	Laboratory Informatics									
3	EEC	EE-BT 781	Internship-I [Seminar / Training / Workshop (Online / Offline)]	15	0	60	60	135	3	-	-	100
4	EEC	EE-BT 782	Project Work-I (In House / Industry / Research Institute)	20	0	80	80	180	4	-	-	100
Total				119	0	140	236	495	13			

B.TECH 4TH YEAR (SEMESTER VIII)

Sr. No.	Course Category	Course Code	Course Title	Teaching & Learning Scheme (in hrs per Semester)						EXAM SCHEME		
				CI		LI	TW + SL	Total	Credit	CA	ESE	TOTAL
				L	T	P						
1	EEC	EE-BT 881	Internship-II [Seminar / Training / Workshop (Online / Offline)]	15	0	60	60	135	3	-	-	100
2	EEC	EE-BT 882	Project Work-II (In House / Industry / Research Institute)	40	0	160	160	360	8	-	-	100
Total				55	0	220	220	495	11			

DISTRIBUTION OF CREDITS

Course Category / Semester	Program Course		Programme Course		Multidisciplinary Course	Skill Course	Multidisciplinary Holistic Development - Humanities, Social Science and Management + Liberal Learning					Employment Enhancement Course				Total
	Basic Science (BS)	Engineering Science (ES)	Programme Core (PC)	Programme Elective (PE)	Open Elective (OE / MDM)	Vocational and Skill Enhancement Course (VSEC)	Ability enhance Course	Indian Knowledge System	Value Education	Co-curricular	Entrepreneurship / Economics / Management	Res. meth	Mini Project	Project	Internship	
1 st	8.5	3.5				1	3	2								18
2 nd	8.5	14.5														23
3 rd	6		16			1				0						23
4 th		4	15		4	1	2									26
5 th		4	11	3	4				2							24
6 th			15	6		1				0	2					24
7 th				3	3									7		13
8 th														11		11
Total	23	26	57	12	11	4	5	2	2	0	2			18		162