



**SIR PADAMPAT SINGHANIA UNIVERSITY**

**UDAIPUR**

**School of Engineering**

**DEPARTMENT OF BIOTECHNOLOGY**

**Course Structure of B. Tech. Degree Programme**

**in**

**Biotechnology**

**Batch: 2021- 2025**



**SIR PADAMPAT SINGHANIA UNIVERSITY**  
**UDAIPUR**

**School of Engineering**  
**DEPARTMENT OF BIOTECHNOLOGY**

**Vision**

The progression of the department of biotechnology through quality teaching and research for generating the biotechnologists with the calibre of bringing sustainable change in the area of biotechnology and beyond and to the society.

**Mission**

- To integrate the theoretical and practical knowledge of biotechnology, widen the horizon for multidisciplinary interactions and practical application for the betterment of the society.
- To generate the biotechnologists with multidimensional skills through an interdisciplinary learning approach.

# B. Tech. Degree Programme

## Course Structure

(2021-2025)

### **Programme Educational Objectives:**

PEO 1: Develop well-fortified foundation in the thrust areas of biotechnology such as Bioprocesses, Molecular Biology, Genetic Engineering, Pharmaceutical Biotechnology, etc. required to work in Biotechnology industries.

PEO 2: Excel in providing ethical solutions as an individual or a member or a leader of a team by investigating, analysing, formulating and solving complex computing problems in multidisciplinary approaches using modern tools.

PEO 3: Exhibit analytical and research skills in the field of Biotechnology for pursuing career in industry, academia and to nurture entrepreneurial endeavors.

PEO 4: To develop biotechnologists with professional ethics to address global and societal issues for sustainable development.

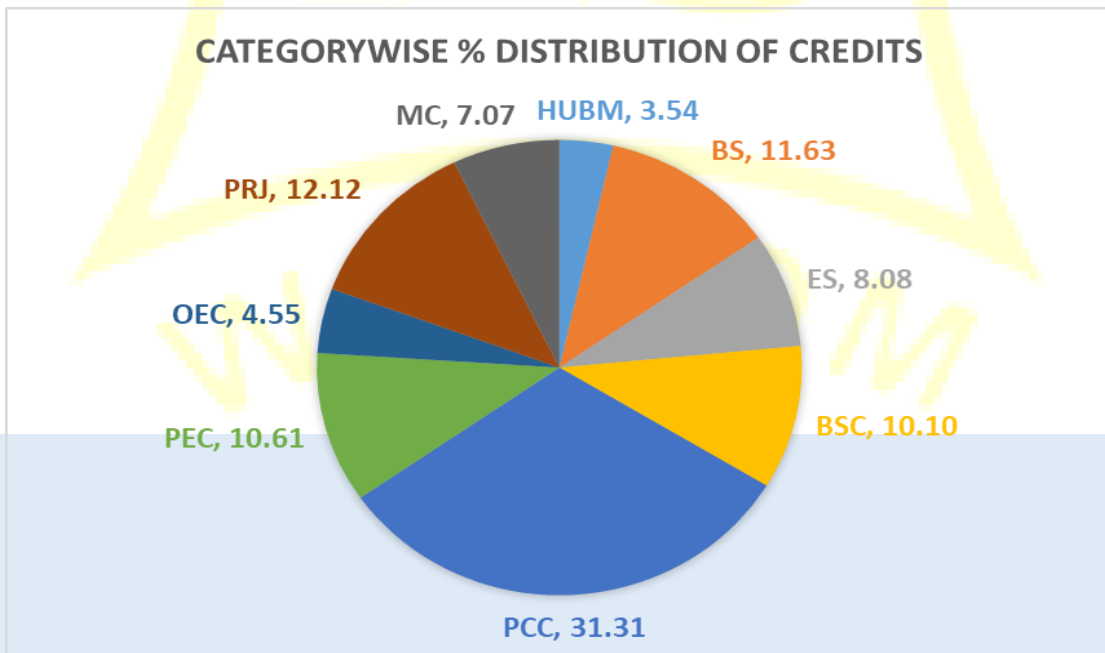
PEO 5: Develop awareness for uplifting health, safety, legal, environmental, ethical and cultural diversity issues for serving the society.

## Program Outcomes

PO1	Engineering knowledge	Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO2	Problem Analysis	Identify, formulate, review research literature, and analyse complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences and engineering sciences.
PO3	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.
PO4	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 for complex problems
PO5	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
PO6	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.
PO7	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.
PO8	Ethics	Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
PO9	Individual and team work	Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
PO10	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.
PO11	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.
PO12	Life-long learning	Recognize the need for, and have the preparation and ability to engage in independent and lifelong learning in the broadest context of technological change.
<b>Programme Specific Outcomes:</b>		
PSO1	Acquire the in-depth theoretical knowledge and practical skills of basic & advanced biotechnology along with interdisciplinary subjects and apply in the core and allied fields.	
PSO2	Provide technical solutions to the problems in biotechnology and life sciences and guide towards emerging concepts and developments in biotechnology and related areas	

### Category wise distribution of Credits

S. No	Category	Credits	%
1	Humanities and Social Sciences including Management, Regulatory courses (HUBM)	7	3.54
2	Basic Science courses (BSC)	27	13.64
3	Engineering Science courses including workshop, drawing, basics of electrical/mechanical/computer etc. (ES)	16	8.08
4	Biological Science courses including laboratory (BS)	18	9.09
5	Professional core courses (PCC)	62	31.31
6	Professional Elective courses relevant to chosen specialization/branch (APCC/PEC)	21	10.61
7	Open subjects – Electives from other technical and /or emerging subjects (OEC)	9	4.55
8	Project work, seminar and internship in industry or elsewhere (PRJ)	24	12.12
9	Audit Course/ Mandatory Courses (MC)/Value added Course (VC)	14	7.07
	Total	198	--



### Semester wise CBCS

S. No	Semester	Credits/ Semester	Contact hours/ week	CBCS Credit	% CBCS/ Sem	% CBCS (Overall)
1	Sem I	22	25	4	18.18	2.02
2	Sem II	28	31/32	16	57.14	8.08
3	Sem III	26	26	8	30.77	4.04
4	Sem IV	30	28	9	30.00	4.55
5	Sem V	26	26	6	23.08	3.03
6	Sem VI	28	25	9	32.14	4.55
7	Sem VII	26	15	11	42.31	5.56
8	Sem VIII	12	-	0	-	0.00
	<b>Total</b>	<b>198</b>	<b>-</b>	<b>63</b>		<b>31.82</b>

## Course Structure: B. Tech. BT 2021-2025

### Semester - I

S. No.	Course Code	Category	Course Title	L	T	P	S	Credit (s)	Hrs/Week
1	ME-1201	ES	Workshop Practice-I	0	0	1	0	1	2
2	CS-1201	ES	C Programming	2	0	1	0	3	4
3	EC-1201	ES	Introduction to IOT	0	0	1	0	1	2
4	PH-1003	BSC	Physics-I (Choose any one)	3	0	1	0	4	5
	PH-1004		1) Introduction to Electromagnetic Theory						
	PH-1005		2) Introduction to Mechanics						
	PH-1006		3) Oscillation, Waves and Optics						
	PH-1007		4) Quantum Mechanics for Engineers						
		5) Semiconductor Physics							
5	CH-1004	BSC	Engineering Chemistry-I	3	0	1	0	4	5
6	MA-1004	BSC	Mathematics-I	3	1	0	0	4	4
5	HU-1011	HU	Professional and Business Communication	2	1	0	0	3	3
6	AM-2001	MC	Anandam – an exercise of trusteeship	-	-	-	2	2	-
<b>Total</b>								<b>22</b>	<b>25</b>

Note: The course codes are given based on the level. The first digit in the four digit represents the level as: Level 0- Remember & Understand, Level 1- Apply, Level 2- Analyse, Level 3- Evaluate, Level 4- Create.

## Semester – II

S. No.	Course Code	Category	Course Title	L	T	P	S	Credit (s)	Hrs/Week
1	ME-1203	ES	Engineering Drawing	0	0	2	1	3	4
2			<b>Engineering Science course:</b> Workshop Practice-II <b>(Options to choose any Two)</b>						
	CS-1202	ES	1) Computer Workshop	0	0	1	0	1	4
	ES-1202		2) Electronics and Electrical Engineering Workshop	0	0	1	0	1	
	ME-1202		3) Mechanical Engineering Workshop						
CE-1101	4) Civil Engineering Workshop								
3	ES-1203	ES	Basics of Electrical and Electronics Engineering	3	0	1	0	4	5
4			Computational Fundamentals <b>(Options to choose any one)</b>						
	CS-1203	ES	1) Scilab Programming	0	0	1	1	2	2
	CS-1204		2) Advanced Excel Computing						
CS-1205	3) Introduction to Python Programming								
5			<b>(Option to Choose any Two)</b>						
	PH-XXXX	BSC	1) Physics-II*	3	0	1	0	4	9/10
	CH-XXXX		2) Chemistry-II**	3	0	1	0	4	
MA-XXXX	3) Advanced Mathematics***		3	1	0	0	4		
6	BT-0001	BSC	Biology for Engineers	1	0	0	0	1	1
7	CH-1002	BSC	Environmental Studies	2	0	0	0	2	2
8			<b>(Options to choose any One)</b>						
	BM-1114	BM	1) Business Ethics	1	0	0	0	1	1
	BM-1115		2) Business Environment						
BM-1116	3) Principles of Management								
9			<b>(Options to choose any One)</b>						
	HU-1012	HU	1) Oral and Written Communication Skills	0	3	0	0	3	3
HU-1013	2) Public Speaking								
10	AM-2002	MC	Anandam – an exercise of trusteeship	-	-	-	2	2	-
<b>Total</b>								<b>28</b>	<b>31/32</b>

\*Options for Physics-II, \*\*Options for Chemistry-II, \*\*\*Options for Advanced Mathematics



## Options for Basic sciences courses (Physics, Chemistry &amp; Mathematics)

S. No.	Subject Code	Name of the Subject	Credits	Semester
<b>*Physics-I &amp; Physics-II</b>				
1	PH-1003	Introduction to Electromagnetic Theory	3-0-1-0-4	Sem I & Sem II
2	PH-1004	Introduction to Mechanics	3-0-1-0-4	
3	PH-1005	Oscillation, Waves and Optics	3-0-1-0-4	
4	PH-1006	Quantum Mechanics for Engineers	3-0-1-0-4	
5	PH-1007	Semiconductor Physics	3-0-1-0-4	
<b>**Chemistry (Optional)**</b>				
1	CH-1005	Engineering Chemistry-II	3-0-1-0-4	Sem II
2	CH-1006	Applied Organic Chemistry	3-0-1-0-4	
<b>***Mathematics (Optional)**</b>				
1	MA-1005	Optional Mathematics – II	3-1-0-0-4	Sem II
2	MA-1006	Data Analysis and Interpretation	3-1-0-0-4	



### Semester –III

S. No.	Course Code	Cate- Gory	Course Title	L	T	P	S	Credit (s)	Hrs/ Week
1	BT-1201	BS	Biochemistry/ MOOC Course	3	0	0	0	3	3
2	BT-1202	BS	Biochemistry Lab	0	0	1	0	1	2
3	BT-1203	BS	Cell Biology/ MOOC Course	2	0	0	0	2	2
4	BT-1204	BS	Microbiology/ MOOC Course	3	0	0	0	3	3
5	BT-1205	BS	Microbiology Lab	0	0	2	0	2	4
6	BT-1206	PCC	Process Calculations	2	0	0	1	3	2
7	BT-1207	PCC	Transport Processes and Applications	3	1	0	0	4	4
8	BT-1208	PCC	Transport Processes and Applications Lab	0	0	1	1	2	2
9	MA-2012	BSC	Mathematics for Biotechnology	3	1	0	0	4	4
10	AM-2003	MC	Anandam-an exercise of trusteeship	0	0	0	2	2	-
Total Credits								26	-
Total Contact hours/week									26

Note: The self-study component may be given to the students as a project having a combination of courses. The component of the individual course can then be evaluated under the respective course.

## Semester – IV

S. No.	Course Code	Cate-Gory	Course Title	L	T	P	S	Credit (s)	Hrs/ Week
1	BT-1209	BSC	Molecular Genetics	3	1	0	0	4	4
2	BT-2201	PCC	Analytical Methods in Biotechnology/ MOOC Course	3	0	0	0	3	3
3	BT-2202	PCC	Analytical Methods in Biotechnology Lab	0	0	1	1	2	2
4	BT-2203	PCC	Biochemical Thermodynamics	2	1	0	1	4	3
5	BT-3201	PCC	Enzyme Engineering	3	0	0	1	4	3
6	BT-3202	PCC	Enzyme Engineering Lab	0	0	2	0	2	4
7	BT-3203	PCC	Immunology and Immunotechnology	3	0	0	0	3	3
8	BT-XXXX	PEC	Department Level Optional Course –I	3	0	0	0	3	3
9	MA-2016	BS	Biostatistics/ MOOC Course	3	0	0	0	3	3
10	AM-2004	MC	Anandam-an exercise of trusteeship	0	0	0	2	2	-
Total Credits								30	-
Total Contact hours/week									28

## Semester – V

S. No.	Course Code	Cate- Gory	Course Title	L	T	P	S	Credit (s)	Hrs/ Week
1	BT-3204	PCC	Bioinformatics	2	0	0	0	2	2
2	BT-3205	PCC	Bioinformatics Lab	0	0	1	1	2	2
3	BT-3206	PCC	Fermentation Technology	3	0	0	1	4	3
4	BT-3207	PCC	Fermentation Technology Lab	0	0	2	0	2	4
5	BT-3208	PCC	Genetic Engineering	3	0	0	1	4	3
6	BT-3209	PCC	Genetic Engineering Lab	0	0	2	0	2	4
7	BT-3210	PCC	Immunology and Immunotechnology Lab	0	0	1	1	2	2
8	BT-XXXX	PEC	Department Level Optional Course – II	3	0	0	0	3	3
9	XX-XXXX	OEC	University Level Optional Course – I	3	0	0	0	3	3
10	AM-2005	MC	Anandam-an exercise of trusteeship	0	0	0	2	2	-
Total Credits								26	-
Total Contact hours/week									26

## Semester – VI

S. No.	Course Code	Category	Course Title	L	T	P	S	Credit (s)	Hrs/Week
1	BT-3211	PCC	Bioseparation & Downstream Processing Technology	3	0	0	0	3	3
2	BT-3212	PCC	Bioseparation & Downstream Processing Technology Lab	0	0	1	1	2	2
3	BT-4201	PCC	Bioreactor Analysis and Design	3	1	0	0	4	4
4	BT-3213	PCC	Cell & Tissue Culture	3	0	0	0	3	3
5	BT-3214	PCC	Cell & Tissue Culture Lab	0	0	2	0	2	4
6	BT-4100	PRJ	Minor Project	0	0	0	3	3	0
7	BT-XXXX	PEC	Department Level Optional Course – III	3	0	0	0	3	3
8	BT-XXXX	PEC	Department Level Optional Course – IV	3	0	0	0	3	3
9	XX-XXXX	OEC	University level optional course-II	3	0	0	0	3	3
10	AM-2006	MC	Anandam-an exercise of trusteeship	0	0	0	2	2	-
Total Credits								28	-
Total Contact hours/week									25

## Semester – VII

S. No.	Course Code	Category	Course Title	L	T	P	S	Credit (s)	Hrs/Week
1	BT-2204	PCC	IPR, Bioethics & Biosafety	2	0	0	1	3	2
2	BT-3215	APCC	Environmental Biotechnology/ MOOC Course	2	0	0	0	2	2
3	BT-3216	APCC	Environmental Biotechnology Lab	0	0	1	0	1	2
4	BT-3300	PRJ	Summer Internship	0	0	0	3	3	0
5	BT-4200	PRJ	Major Project	0	0	0	6	6	0
6	BT-XXXX	PEC	Department Level Optional Course – V	3	0	0	0	3	3
7	BT-XXXX	PEC	Department Level Optional Course – VI	3	0	0	0	3	3
8	XX-XXXX	OEC	University Level Optional Course – III	3	0	0	0	3	3
9	AM-2007	MC	Anandam-an exercise of trusteeship	0	0	0	2	2	-
Total Credits								26	-
Total Contact hours/week									15

## Semester – VIII

S. No.	Course Code	Category	Course Title	L	T	P	S	Credit (s)	Hrs/Week
1	BT-4300	PRJ	Thesis/Industrial Training	0	0	0	12	12	-
<b>Total Credits</b>								<b>12</b>	<b>-</b>
<b>Total Contact hours/week</b>									<b>-</b>



### List of Department Level Optional Course(s) – I

S. No.	Course Code	Course Title	L	T	P	S	Credit (s)	Hrs/ week
1	BT-1301	Phytochemicals and Herbal Medicines	3	0	0	1	4	3
2	BT-1302	Structural Biology	3	0	0	0	3	3

### List of Department Level Optional Course(s) – II

S. No.	Course Code	Course Title	L	T	P	S	Credit (s)	Hrs/ Week
1	BT-2301	Biopharmaceutical Technology	3	0	0	0	3	3
2	BT-2302	Biosensors & Diagnosis	3	0	0	0	3	3

### List of Department Level Optional Course(s) – III

S. No.	Course Code	Course Title	L	T	P	S	Credit (s)	Hrs/ Week
1	BT-3301	Bioprocess Equipment Design and Scale Up	3	0	0	0	3	3
2	BT-3302	Bioprocess Modelling & Simulation	3	0	1	0	4	5
3	BT-2303	Food Processing Technology	3	0	1	0	4	5
4	BT-2304	Process Control & Instrumentation	3	0	0	0	3	3



### List of Department Level Optional Course(s) – IV

S. No.	Course Code	Course Title	L	T	P	S	Credit (s)	Hrs/ Week
1	BT-2305	Protein Engineering	3	0	0	0	3	3
2	BT-3303	Molecular Modelling and Drug Design	3	0	0	0	3	3
3	BT-3304	Genomics Technology	3	0	0	0	3	3
4	BT-3305	Metabolic Engineering	3	0	0	0	3	3

### List of Department Level Optional Course(s) – V

S. No.	Course Code	Course Title	L	T	P	S	Credit (s)	Hrs/ Week
1	BT-2306	Stem Cell & Tissue Engineering	3	0	0	0	3	3
2	BT-3306	Advances in rDNA Technology and Applications	3	0	0	0	3	3
3	BT-3307	Cancer Biology	3	0	0	0	3	3
4	BT-3308	Agriculture Biotechnology	3	0	0	0	3	3

### List of Department Level Optional Course(s) – VI

S. No.	Course Code	Course Title	L	T	P	S	Credit (s)	Hrs/ Week
1	BT-2307	Good Laboratory Practices	3	0	0	0	3	3
2	BT-3309	Entrepreneurship & Startup	3	0	0	0	3	3

## University Level Optional Course(s)-I

S. No.	Course Code	Course Title	L	T	P	S	Credit (s)	Hrs/ Week
1	BT-2351	Bioprocess Engineering	3	0	0	0	3	3
2	CS-3001	Simulation & Modelling	3	0	0	0	3	3
3	CS-3002	Text Analytics	3	0	0	0	3	3
4	EC-2290	Battery Management Systems	3	0	0	0	3	3
5	EE-2290	Non-Conventional Energy Sources	3	0	0	0	3	3
6	EE-2291	Applications of Power Electronics In Renewable Energy	2	0	1	0	3	4
7	EE-2293	Advanced Electrical Machines	3	0	0	0	3	3
8	ME-1204	Economics for Engineers	3	0	0	0	3	3
9	ME-1205	Technology and Society	3	0	0	0	3	3
10	HU-3011	Fun with Drama	0	3	0	0	3	3
11	HU-3012	Indian Writings in English	0	3	0	0	3	3
12	HU-3013	Language through Literature and Films	0	3	0	0	3	3
13	MA-3001	Mathematical Statistics	3	0	0	0	3	0
14	PH-3203	Nonlinear Dynamics & Chaos: with applications to biology	3	0	0	0	3	0

## University Level Optional Course(s)-II

S. No.	Course Code	Course Title	L	T	P	S	Credit (s)	Hrs/ Week
1	CE-4047	Disaster Management and Mitigation Measures	3	0	0	0	3	3
2	CS-3003	Management Information System	3	0	0	0	3	3
3	CS-3004	Cyber Security and Laws	3	0	0	0	3	3
4	EC-2291	Building IoT Applications	2	0	1	0	3	4
5	EE-2294	Energy Audit & Management	3	0	0	0	3	3
6	EE-2295	Distributed Generation & Microgrid	3	0	0	0	3	3
7	ME-3233	Solar Energy and Application	3	0	0	0	3	3
8	ME-3234	Project Management	3	0	0	0	3	3
9	HU-3014	Intercultural Communication	0	3	0	0	3	3
10	HU-3015	Interview Skills	0	3	0	0	3	3
11	MA-3004	Modern Algebra	3	0	0	0	3	3
12	PH-3201	Nanotechnology	3	0	0	0	3	3
13	PH-3202	Nanomaterials	3	0	0	0	3	3

### University Level Optional Course(s)-III

S. No.	Course Code	Course Title	L	T	P	S	Credit	Hrs/ Week
1	BT-2352	Green Technology	3	0	0	0	3	3
2	CE-4048	Environmental Management	3	0	0	0	3	3
3	CS-4001	Research Methodology	3	0	0	0	3	3
4	CS-4002	Digital Business Management	3	0	0	0	3	3
5	EC-2293	Robotics & Automation	2	0	1	0	3	4
6	EE-2297	Control System Components	3	0	0	0	3	3
7	EE-2296	Testing of Electrical Equipments	3	0	0	0	3	3
8	ME-4203	Flexible Manufacturing System	3	0	0	0	3	3
9	ME-3235	Operation Research	3	0	0	0	3	3
10	HU-3016	Interpersonal Communication	0	3	0	0	3	3
11	HU-3017	Soft Skills	0	3	0	0	3	3
12	HU-2011	Professional Mannerisms and Grooming	0	3	0	0	3	3
13	MA-3002	Optimization Techniques	3	0	0	0	3	3
14	MA-3003	Graph Theory	3	0	0	0	3	3
15	MA-3005	Special Functions	3	0	0	0	3	3
16	PH-2201	Biophysics	3	0	0	0	3	3
17	PH-3101	Molecular Spectroscopy	3	0	0	0	3	3
18	CH-2101	Medicinal plants in drug discovery	3	0	0	0	3	3
19	BM-2203	Strategic Management	3	0	0	0	3	3
20	BMF-2101	Basics of Financial Services	3	0	0	0	3	3
21	BM-2201	Business Planning & Entrepreneurial Management	3	0	0	0	3	3

### List of Value added courses (VC, Optional)

S. No.	Course Code	Semester	Course Title	L	T	P	S	Credit (s)	Hrs/Week
1	EP-2001	II	Project Endeavour	-	-	-	1	1	-
2	EP-2002	III	Project Endeavour	-	-	-	1	1	-
3	EP-4001	IV	Project Endeavour	-	-	-	2	2	-
4	EP-2003	V	Project Endeavour	-	-	-	1	1	-
5	EP-4002	VI	Project Endeavour	-	-	-	2	2	-
6	EP-2004	VII	Project Endeavour	-	-	-	1	1	-
7	EP-4003	VIII	Project Endeavour	-	-	-	2	2	-

