RAJALAKSHMI INSTITUTE OF TECHNOLOGY

BELIEVE IN THE POSSIBILITIES

AN AUTONOMOUS INSTITUTION

B.TECH. BIOTECHNOLOGY

CURRICULUM FOR SEMESTER I TO VIII
(2025-2029 Batch)

REGULATIONS 2023

RAJALAKSHMI INSTITUTE OF TECHNOLOGY
(An Autonomous Institution, Affiliated to Anna University, Chennai)
Kuthambakkam, Chennai - 600124

RAJALAKSHMI INSTITUTE OF TECHNOLOGY, CHENNAI

An Autonomous Institution, Affiliated to Anna University, Chennai

REGULATIONS 2023

CHOICE BASED CREDIT SYSTEM

B. TECH. BIOTECHNOLOGY

I. VISION OF THE DEPARTMENT

- To set a benchmark in biotechnology by fostering a dynamic environment that promotes continuous learning, industry-relevant skills, cutting-edge research, and entrepreneurial spirit, preparing students to excel in global biotechnology arena.

II. MISSION OF THE DEPARTMENT

- To bridge education and industry by imparting strong theoretical foundations, practical skills, and real-world exposure in the biotechnology sector.
- To promote a research-driven environment that encourages innovation, problem-solving, and translational outcomes.
- To foster dynamic partnerships with industry for mutual learning, innovation, and addressing real-world challenges.

III. PROGRAM EDUCATIONAL OBJECTIVES (PEOs)

Graduates can

1. Graduates will build a strong foundation in biotechnology, applying scientific knowledge, critical thinking, and research-driven approaches to solve real-world problems in healthcare, agriculture, environment, and industry.
2. Graduates will acquire industry-relevant biotechnological skills, adapt to evolving technologies, and pursue continuous learning to thrive in professional practice, innovation, or advanced studies.

3. Graduates will exhibit ethical responsibility, leadership, and teamwork while developing sustainable biotechnological solutions that positively impact society and address global challenges.

IV. PROGRAM OUTCOMES (POs)

1. **Engineering Knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
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.
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.
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.
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.
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.
7. **Environment and Sustainability:** understand the impact of the professional engineering solutions to societal and environmental contexts, demonstrate the knowledge of, and need for sustainable development.

8. **Ethics:** Apply ethical principles and commit to professional ethics, responsibilities, and norms of the engineering practice.
9. **Individual and Team Work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
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.
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.
12. **Lifelong 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.

V. PROGRAM SPECIFIC OUTCOMES (PSOs)

The students will be able to

1. Apply biotechnology and engineering knowledge to solve real world problems in biotechnology and allied areas.
2. Demonstrate the use of tools, techniques, and equipment used in biotechnology.
3. Expand their academic knowledge through a multidisciplinary approach that integrates the areas of life science and technology.

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REGULATIONS 2023

CHOICE BASED CREDIT SYSTEM

B. TECH. BIOTECHNOLOGY

CURRICULUM FOR SEMESTER I - VIII

(2025-2029 Batch)

SEMESTER I

Sl.No.	Course Code	Course Title	Category	Periods Per Week			Total Contact Periods	Credits
				L	T	P		
	IP23111	Induction Programme	-	-	-	-	-	0
THEORY COURSES								
1	HS23111	Communicative English	HSMC	3	0	0	3	3
2	CY23111	Engineering Chemistry	BSC	3	0	0	3	3
3	MA23111	Matrices and Calculus	BSC	3	1	0	4	4
4	AD23111	Python for Data Science	ESC	3	0	0	3	3
5	GE23112	தமிழர் மரபு /Heritage of Tamils	HSMC	1	0	0	1	0
LABORATORY ORIENTED THEORY COURSE								
6	GE23131	Engineering Graphics	ESC	2	0	4	6	4
LABORATORY COURSES								
7	CY23121	Chemistry Laboratory	BSC	0	0	2	2	1
8	AD23121	Python for Data Science Laboratory	ESC	0	0	2	2	1
TOTAL								**19**

SEMESTER II

Sl.No.	Course Code	Course Title	Category	Periods Per Week			Total Contact Periods	Credits
				L	T	P		
THEORY COURSES								
1	HS23211	Professional English	HSMC	2	0	0	2	2
2	PH23212	Materials Science for Biotechnologists	BSC	3	0	0	3	3
3	MA23211	Statistics and Numerical Methods	BSC	3	1	0	4	4
4	GE23211	Basic Electrical and Electronics Engineering	ESC	3	0	0	3	3

Sl.No.	Course Code	Course Title	Category	Periods Per Week			Total Contact Periods	Credits
				L	T	P		
5	BT23211	Bioorganic Chemistry	PCC	3	0	0	3	3
6	GE23213	தமிழரும் தொழில்நுட்பமும்/ Tamils and Technology	HSMC	1	0	0	1	0
LABORATORY COURSES								
7	PH23221	Physics Laboratory	BSC	0	0	2	2	1
8	GE23224	Design Thinking and IDEA Laboratory	ESC	0	0	2	2	1
9	GE23221	Communication Laboratory / Foreign Language	EEC	0	0	2	2	1
10	BT23221	Bioorganic Chemistry Laboratory	PCC	0	0	2	2	1
NCC/Service Club Credit Course Level 1#				2	0	0	2	2#
TOTAL								**19**

NCC Credit Course Level 1 is offered for NCC students only. The grades earned by the students will be recorded in the Mark Sheet, however the same shall not be considered for the computation of CGPA.

SEMESTER III

Sl.No.	Course Code	Course Title	Category	Periods Per Week			Total Contact Periods	Credits
				L	T	P		
THEORY COURSES								
1	GE23311	Environmental Science and Sustainability	BSC	2	0	0	2	2
2	MA23313	Transforms and Partial Differential Equations	BSC	3	1	0	4	4
3	BT23311	Chemical Process Calculations in Biotechnology	ESC	3	0	0	3	3
4	BT23312	Biochemistry	PCC	3	0	0	3	3
5	BT23313	Cell and Microbiology	PCC	3	0	0	3	3
6	BT23314	Unit Operations	PCC	3	0	0	3	3
LABORATORY COURSES								
7	BT23321	Biochemistry Laboratory	PCC	0	0	4	4	2
8	BT23322	Cell and Microbiology Laboratory	PCC	0	0	4	4	2
INDUSTRY ORIENTED COURSE								
9	Industry Oriented Course I**		EEC	1	-	-	1	1
TOTAL								**23**

**Industry oriented Course I-Student shall select one course from the list given under Industry oriented courses.

SEMESTER IV

Sl.No.	Course Code	Course Title	Category	Periods Per Week			Total Contact Periods	Credits
				L	T	P		
THEORY COURSES								
1	BT23411	Biochemical Thermodynamics	ESC	3	0	0	3	3
2	BT23412	Fluid Flow and Heat Transfer Operations	ESC	3	0	0	3	3
3	BT23413	Analytical Techniques in Biotechnology	PCC	3	0	0	3	3
4	BT23414	Basic Industrial Biotechnology	PCC	3	0	0	3	3
5	BT23415	Industrial Enzymology	PCC	3	0	0	3	3
6	BT23416	Molecular Biology	PCC	3	0	0	3	3
LABORATORY COURSES								
7	BT23421	Analytical Instrumentation Laboratory	PCC	0	0	4	4	2
8	BT23422	Molecular Biology Laboratory	PCC	0	0	4	4	2
INDUSTRY ORIENTED COURSE								
9	Industry Oriented Course II**		EEC	1	-	-	1	1
NCC/Service Club Credit Course Level 2#				3	0	0	3	3#
TOTAL								**23**

NCC Credit Course Level 2 is offered for NCC students and Service Club students only.
The grades earned by the students will be recorded in the Mark Sheet, however the same shall not be considered for the computation of CGPA.

** Industry oriented Course II-Student shall select one course from the list given under Industry oriented courses.

SEMESTER V

Sl.No.	Course Code	Course Title	Category	Periods Per Week			Total Contact Periods	Credits
				L	T	P		
THEORY COURSES								
1	BT23511	Bioprocess Engineering	PCC	3	1	0	4	4
2	BT23512	Genetic Engineering	PCC	3	0	0	3	3
3	BT23513	Mass Transfer Operations	PCC	3	0	0	3	3
4		Professional Elective I	PEC	3	0	0	3	3
5		Professional Elective II	PEC	3	0	0	3	3
6		Mandatory Course-I&	MC	3	0	0	3	0
LABORATORY COURSES								
7	BT23521	Bioprocess Engineering Laboratory	PCC	0	0	4	4	2
8	BT23522	Genetic Engineering Laboratory	PCC	0	0	4	4	2
INDUSTRY ORIENTED COURSE								
9	Industry Oriented Course III**		EEC	1	-	-	1	1
TOTAL								**21**

&Mandatory Course-I is a Non-credit Course (Student shall select one course from the list given under Mandatory Course I).

** Industry oriented Course III-Student shall select one course from the list given under Industry oriented courses.

SEMESTER VI

Sl.No.	Course Code	Course Title	Category	Periods Per Week			Total Contact Periods	Credits
				L	T	P		
THEORY COURSES								
1	BT23611	Downstream Processing	PCC	3	0	0	3	3
2	BT23612	Immunology	PCC	3	0	0	3	3
3		Professional Elective III	PEC	3	0	0	3	3
4		Professional Elective IV	PEC	3	0	0	3	3
5		Open Elective-I*	OEC	3	0	0	3	3
6		Open Elective-II*	OEC	3	0	0	3	3
7		Mandatory Course-II[&]	MC	3	0	0	3	0
LABORATORY COURSES								
8	BT23621	Downstream Processing Laboratory	PCC	0	0	4	4	2
9	BT23622	Immunology Laboratory	PCC	0	0	4	4	2
10	BT23623	Mini Project	EEC	0	0	4	4	2
NCC/Service Club Credit Course Level 3[#]				3	0	0	3	3[#]
TOTAL								**24**

*Open Elective – I and II Shall be chosen from the list of open electives offered by other Programmes.

[&]Mandatory Course-II is a Non-credit Course (Student shall select one course from the list given under Mandatory Course-II)

[#]NCC Credit Course Level 3 is offered for NCC students only. The grades earned by the students will be recorded in the Mark Sheet, however the same shall not be considered for the computation of CGPA.

SEMESTER VII

Sl.No.	Course Code	Course Title	Category	Periods Per Week			Total Contact Periods	Credits
				L	T	P		
THEORY COURSES								
1	GE23711	Human Values and Ethics	HMSC	2	0	0	2	2
2		Elective Management[$]	HMSC	3	0	0	3	3
3	BT23711	Bioinformatics	PCC	3	0	0	3	3
4		Professional Elective V	PEC	3	0	0	3	3
5		Professional Elective VI	PEC	3	0	0	3	3
LABORATORY COURSES								
6	BT23721	Bioinformatics Laboratory	PCC	0	0	4	4	2
7	BT23722	Internship/ Certification Course	EEC	-	-	-	-	2
TOTAL								**18**

[$] Elective –Management shall be chosen from the list of Elective Management Courses.

SEMESTER VIII

Sl.No.	Course Code	Course Title	Category	Periods Per Week			Total Contact Periods	Credits
				L	T	P		
THEORY COURSE								
1		Open Elective-III*	OEC	3	0	0	3	3
LABORATORY COURSE								
2	BT23821	Project Work	EEC	0	0	20	20	10
TOTAL								**13**

*Open Elective III- Shall be chosen from the list of Open Electives offered by other programmes.

TOTAL CREDITS: 160

ELECTIVE – MANAGEMENT COURSES

Sl.No.	Course Code	Course Title	Category	Periods Per Week			Total Contact Periods	Credits
				L	T	P		
1	GE23712	Engineering Economics and Financial Accounting	HSMC	3	0	0	3	3
2	GE23713	Human Resource Management	HSMC	3	0	0	3	3
3	GE23714	Knowledge Management	HSMC	3	0	0	3	3
4	GE23715	Principles of Management	HSMC	3	0	0	3	3
5	GE23716	Software Project Management	HSMC	3	0	0	3	3
6	GE23717	Total Quality Management	HSMC	3	0	0	3	3
7	GE23718	Management Information Systems	HSMC	3	0	0	3	3

MANDATORY COURSES I

Sl.No.	Course Code	Course Title	Category	Periods Per Week			Total Contact Periods	Credits
				L	T	P		
1	MX23511	Disaster Risk Reduction and Management	MC	3	0	0	3	0
2	MX23512	Elements of Literature	MC	3	0	0	3	0
3	MX23513	Film Appreciation	MC	3	0	0	3	0
4	MX23514	Introduction to Women and Gender Studies	MC	3	0	0	3	0

MANDATORY COURSES II

Sl.No.	Course Code	Course Title	Category	Periods Per Week			Total Contact Periods	Credits
				L	T	P		
1	MX23611	History of Science and Technology in India	MC	3	0	0	3	0
2	MX23612	Industrial Safety	MC	3	0	0	3	0
3	MX23613	State, Nation Building and Politics in India	MC	3	0	0	3	0
4	MX23614	Well Being with Traditional Practices -Yoga, Ayurveda and Siddha	MC	3	0	0	3	0

PROFESSIONAL ELECTIVE COURSES: VERTICALS

S. No	Vertical 1	Vertical 2	Vertical 3	Vertical 4	Vertical 5	Vertical 6	Vertical 7	Vertical 8
	Bioprocess Technology	**Biosciences**	**Medical Biotechnology**	**Biochemical Engineering**	**Food Biotechnology**	**Computational Biotechnology**	**Quality and Regulatory Affairs**	**Agro Biotechnology**
1	**BT23V11** Bioprocess Control and Instrumentation	**BT23V21** Human Genetics	**BT23V31** Biopharmaceuticals and Biosimilars	**BT23V41** Bioenergetics	**BT23V51** Introduction to Food Biotechnology	**BT23V61** Programming for Bioinformatics Applications	**BT23V71** Clinical Trials and Healthcare Policies in Biotechnology	**BT23V81** Plant Anatomy
2	**BT23V12** Fermentation Technology	**BT23V22** Biosensors	**BT23V32** Cancer Biology	**BT23V42** Transport Phenomena in Biological System	**BT23V52** Enzymes in Food and Feed Industry	**BT23V62** Fundamentals of Algorithms for Bioinformatics	**BT23V72** Biotechnological Products and its Validation	**BT23V82** Therapeutic Application of Phytochemicals
3	**BT23V13** Food Processing and Technology	**BT23V23** Bio-Nanotechnology	**BT23V33** Biomaterials	**BT23V43** Bioenergy and Biofuels	**BT23V53** Food Fermentation Technology	**BT23V63** Molecular Modelling	**BT23V73** Quality Assurance and Quality Control in Biotechnology	**BT23V83** Biofertilizer Production and Mushroom Cultivation
4	**BT23V14** Bioreactor Design and Scale-up Process	**BT23V24** Stem Cell Technology	**BT23V34** Tissue Engineering	**BT23V44** Environmental Biotechnology	**BT23V54** Biological Instrumentation and Process Control	**BT23V64** Computer Aided Drug Design	**BT23V74** Entrepreneurship and Patent Design	**BT23V84** Biotechnological Approach in Crop Improvement
5	**BT23V15** Bioprocess Modelling and Simulation	**BT23V25** Protein Engineering	**BT23V35** Molecular Therapeutics and Diagnostics	**BT23V45** Applied Chemical Reaction Engineering	**BT23V55** Food Allergens and Toxicology	**BT23V65** Metabolomics and Metabolic Engineering	**BT23V75** Intellectual Property Rights in Biotechnology	**BT23V85** Advance Techniques in Agroforestry
6	**BT23V16** Bioreactor Consideration for Recombinant Products	**BT23V26** Modern Bio Analytical Techniques	**BT23V36** Biomedical Engineering	**BT23V46** Enzyme Immobilization Technology	**BT23V56** Genetic Engineering and Genetically Modified Foods	**BT23V66** Data Mining and Machine Learning Techniques for Bioinformatics	**BT23V76** Biosafety and Hazard Management	**BT23V86** Plant Tissue Culture and Transformation Techniques
7	**BT23V17** Membrane Separation Technology	**BT23V27** Molecular Pathogenesis and Disease Diagnosis	**BT23V37** Medical Waste Management	**BT23V47** Optimization of Chemical Processes	**BT23V57** Functional Foods and Nutraceuticals	**BT23V67** Structural Biology	**BT23V77** Food Safety and Quality Assurance	**BT23V87** Pathogenesis Related Proteins in Plants

Registration of Professional Elective Courses from Verticals:

A student can choose all the Professional Elective Courses either from one of the verticals or a combination of courses from all verticals in a semester. However, students irrespective of enrolling for additional courses for B.E. / B. Tech. (Hons.) are not permitted to choose more than one course from a row. Students are permitted to enroll more than one elective course from the same vertical in a semester. In the subsequent semesters students are permitted to enroll one more course in a row, provided if he/she has cleared the earlier course of the same row.

INDUSTRY ORIENTED COURSES

Sl.No.	Course Code	Course Title	Category	Periods Per Week			Total Contact Periods	Credits
				L	T	P		
1	BT23IC1	Marine Food Technology	EEC	1	-	-	-	1
2	BT23IC2	Process Validation and Quality Assurance for Bioproducts	EEC	1	-	-	-	1
3	BT23IC3	Fundamentals of Liquid Chromatography	EEC	1	-	-	-	1
4	BT23IC4	Commercial Products from Marine Algae	EEC	1	-	-	-	1

PROFESSIONAL ELECTIVE COURSES: VERTICALS

VERTICAL 1: BIOPROCESS TECHNOLOGY

Sl.No.	Course Code	Course Title	Category	Periods Per Week			Total Contact Periods	Credits
				L	T	P		
1.	BT23V11	Bioprocess Control and Instrumentation	PEC	3	0	0	3	3
2.	BT23V12	Fermentation Technology	PEC	3	0	0	3	3
3.	BT23V13	Food Processing and Technology	PEC	3	0	0	3	3
4.	BT23V14	Bioreactor Design and Scale-up Process	PEC	3	0	0	3	3
5.	BT23V15	Bioprocess Modelling and Simulation	PEC	3	0	0	3	3
6.	BT23V16	Bioreactor Consideration for Recombinant Products	PEC	3	0	0	3	3
7.	BT23V17	Membrane Separation Technology	PEC	3	0	0	3	3

VERTICAL 2: BIOSCIENCES

Sl.No.	Course Code	Course Title	Category	Periods Per Week			Total Contact Periods	Credits
				L	T	P		
1.	BT23V21	Human Genetics	PEC	3	0	0	3	3
2.	BT23V22	Biosensors	PEC	3	0	0	3	3
3.	BT23V23	Bio-Nanotechnology	PEC	3	0	0	3	3
4.	BT23V24	Stem Cell Technology	PEC	3	0	0	3	3
5.	BT23V25	Protein Engineering	PEC	3	0	0	3	3
6.	BT23V26	Modern Bio Analytical Techniques	PEC	3	0	0	3	3
7.	BT23V27	Molecular Pathogenesis and Disease Diagnosis	PEC	3	0	0	3	3

VERTICAL 3: MEDICAL BIOTECHNOLOGY

Sl.No.	Course Code	Course Title	Category	Periods Per Week			Total Contact Periods	Credits
				L	T	P		
1.	BT23V31	Biopharmaceuticals and Biosimilars	PEC	3	0	0	3	3
2.	BT23V32	Cancer Biology	PEC	3	0	0	3	3
3.	BT23V33	Biomaterials	PEC	3	0	0	3	3
4.	BT23V34	Tissue Engineering	PEC	3	0	0	3	3
5.	BT23V35	Molecular Therapeutics and Diagnostics	PEC	3	0	0	3	3
6.	BT23V36	Biomedical Engineering	PEC	3	0	0	3	3
7.	BT23V37	Medical Waste Management	PEC	3	0	0	3	3

VERTICAL 4: BIOCHEMICAL ENGINEERING

Sl.No.	Course Code	Course Title	Category	Periods Per Week			Total Contact Periods	Credits
				L	T	P		
1.	BT23V41	Bioenergetics	PEC	3	0	0	3	3
2.	BT23V42	Transport Phenomena in Biological System	PEC	3	0	0	3	3
3.	BT23V43	Bioenergy and Biofuels	PEC	3	0	0	3	3
4.	BT23V44	Environmental Biotechnology	PEC	3	0	0	3	3
5.	BT23V45	Applied Chemical Reaction Engineering	PEC	3	0	0	3	3
6.	BT23V46	Enzyme Immobilization Technology	PEC	3	0	0	3	3
7.	BT23V47	Optimization of Chemical Processess	PEC	3	0	0	3	3

VERTICAL 5: FOOD BIOTECHNOLOGY

Sl.No.	Course Code	Course Title	Category	Periods Per Week			Total Contact Periods	Credits
				L	T	P		
1.	BT23V51	Introduction to Food Biotechnology	PEC	3	0	0	3	3
2.	BT23V52	Enzymes in Food and Feed Industry	PEC	3	0	0	3	3
3.	BT23V53	Food Fermentation Technology	PEC	3	0	0	3	3
4.	BT23V54	Biological Instrumentation and Process Control	PEC	3	0	0	3	3
5.	BT23V55	Food Allergens and Toxicology	PEC	3	0	0	3	3
6.	BT23V56	Genetic Engineering and Genetically Modified Foods	PEC	3	0	0	3	3
7.	BT23V57	Functional Foods and Nutraceuticals	PEC	3	0	0	3	3

VERTICAL 6: COMPUTATIONAL BIOTECHNOLOGY

Sl.No.	Course Code	Course Title	Category	Periods Per Week			Total Contact Periods	Credits
				L	T	P		
1.	BT23V61	Programming for Bioinformatics Applications	PEC	3	0	0	3	3
2.	BT23V62	Fundamentals of Algorithms for Bioinformatics	PEC	3	0	0	3	3
3.	BT23V63	Molecular Modelling	PEC	2	1	0	3	3
4.	BT23V64	Computer Aided Drug Design	PEC	3	0	0	3	3
5.	BT23V65	Metabolomics and Metabolic Engineering	PEC	3	0	0	3	3
6.	BT23V66	Data Mining and Machine Learning Techniques for Bioinformatics	PEC	3	0	0	3	3
7.	BT23V67	Structural Biology	PEC	3	0	0	3	3

VERTICAL 7: QUALITY AND REGULATORY AFFAIRS

Sl.No.	Course Code	Course Title	Category	Periods Per Week			Total Contact Periods	Credits
				L	T	P		
1.	BT23V71	Clinical Trials and Healthcare Policies in Biotechnology	PEC	3	0	0	3	3
2.	BT23V72	Biotechnological Products and its Validation	PEC	3	0	0	3	3
3.	BT23V73	Quality Assurance and Quality Control in Biotechnology	PEC	3	0	0	3	3
4.	BT23V74	Entrepreneurship and Patent Design	PEC	3	0	0	3	3
5.	BT23V75	Intellectual Property Rights in Biotechnology	PEC	3	0	0	3	3
6.	BT23V76	Biosafety and Hazard Management	PEC	3	0	0	3	3
7.	BT23V77	Food Safety and Quality Assurance	PEC	3	0	0	3	3

VERTICAL 8: AGRO BIOTECHNOLOGY

Sl.No.	Course Code	Course Title	Category	Periods Per Week			Total Contact Periods	Credits
				L	T	P		
1.	BT23V81	Plant Anatomy	PEC	3	0	0	3	3
2.	BT23V82	Therapeutic Application of Phytochemicals	PEC	3	0	0	3	3
3.	BT23V83	Biofertilizer Production and Mushroom Cultivation	PEC	3	0	0	3	3
4.	BT23V84	Biotechnological Approach in Crop Improvement	PEC	3	0	0	3	3
5.	BT23V85	Advance Techniques in Agroforestry	PEC	3	0	0	3	3
6.	BT23V86	Plant Tissue Culture and Transformation Techniques	PEC	3	0	0	3	3
7.	BT23V87	Pathogenesis Related Proteins in Plants	PEC	3	0	0	3	3

OPEN ELECTIVES

(Students shall choose the open elective courses, such that the course contents are not similar to any other course contents/title under other course categories).

OPEN ELECTIVES – I

Sl.No.	Course Code	Course Title	Category	Periods Per Week			Total Contact Periods	Credits
				L	T	P		
1.	O23AD11	Programming for Data Science	OEC	3	0	0	3	3
2.	O23AL11	Fundamentals of AI and ML	OEC	3	0	0	3	3
3.	O23BT11	Mushroom Cultivation and Vermicomposting	OEC	3	0	0	3	3
4.	O23CB11	Software Testing	OEC	3	0	0	3	3
5.	O23CC11	AI for Robotics	OEC	3	0	0	3	3
6.	O23CS11	Introduction to Cloud Computing	OEC	3	0	0	3	3
7.	O23EC11	Space Engineering	OEC	3	0	0	3	3
8.	O23EC12	IT in Agricultural System	OEC	3	0	0	3	3
9.	O23EV11	Fundamentals of VLSI	OEC	3	0	0	3	3
10.	O23MA11	Probability and Statistics for Data Analytics	OEC	3	0	0	3	3
11.	O23ME11	Foundation of Robotics	OEC	3	0	0	3	3

OPEN ELECTIVES – II

Sl.No.	Course Code	Course Title	Category	Periods Per Week			Total Contact Periods	Credits
				L	T	P		
1.	O23AD21	Data science Fundamentals	OEC	3	0	0	3	3
2.	O23AL21	Fundamentals of Data Analytics	OEC	3	0	0	3	3
3.	O23BT21	Biofuels	OEC	3	0	0	3	3
4.	O23CB21	Essentials of Digital Marketing	OEC	3	0	0	3	3
5.	O23CC21	Space Science	OEC	3	0	0	3	3
6.	O23CS21	Introduction to Cyber Security	OEC	3	0	0	3	3
7.	O23EC21	Wearable Devices and its Applications	OEC	3	0	0	3	3
8.	O23EC22	Introduction to IoT	OEC	3	0	0	3	3
9.	O23EV21	Electrical, Electronics and Magnetic Materials	OEC	3	0	0	3	3
10.	O23MA21	Optimization Techniques	OEC	3	0	0	3	3
11.	O23ME21	Mechanical Foundations of Mechatronic Systems	OEC	3	0	0	3	3

OPEN ELECTIVES – III

Sl.No.	Course Code	Course Title	Category	Periods Per Week			Total Contact Periods	Credits
				L	T	P		
1.	O23AD31	AI for Industrial Applications	OEC	3	0	0	3	3
2.	O23AL31	Information Technology Essentials	OEC	3	0	0	3	3
3.	O23BT31	Forensic Technology	OEC	3	0	0	3	3
4.	O23CB31	Start-up and Innovations	OEC	3	0	0	3	3
5.	O23CC31	Introduction to R Programming	OEC	3	0	0	3	3
6.	O23CS31	Introduction to Blockchain	OEC	3	0	0	3	3
7.	O23EC31	Batteries and Management Systems	OEC	3	0	0	3	3
8.	O23EC32	Basics of Biomedical Instrumentation	OEC	3	0	0	3	3
9.	O23EV31	HDL Programming	OEC	3	0	0	3	3
10.	O23MA31	Multivariate Data Analysis	OEC	3	0	0	3	3
11.	O23ME31	Introduction to 3D Printing Technologies	OEC	3	0	0	3	3

SUMMARY

Name of the Programme: B. Tech. Biotechnology									
Sl.No.	Subject Area	Credits per Semester							Total Credits
		I	II	III	IV	V	VI	VII	VIII	
1	HSMC	3	2					5		10
2	BSC	8	8	6						22
3	ESC	8	4	3	6					21
4	PCC		4	13	16	14	10	5		62
5	PEC					6	6	6		18
6	OEC						6		3	9
7	EEC		1	1	1	1	2	2	10	18
8	Non-Credit /(Mandatory)	√	√			√	√			
Total		19	19	23	23	21	24	18	13	160

ENROLLMENT FOR B.E. / B. TECH MINOR DEGREE (OPTIONAL)

A student can also optionally register for additional courses (18 credits) and become eligible for the award of B.E. / B. Tech (Honours) or Minor Degree.

For B.E. / B. Tech. (Honours), a student shall register for the additional courses (18 credits) from semester V onwards. These courses shall be from the same vertical or a combination of different verticals of the same programmes of study only.

For minor degree, a student shall register for the additional courses (18 credits) from semester V onwards. All these courses have to be in a particular vertical from any one of the other programmes, Moreover, for minor degree the student can register for courses from any one of the following verticals also.

VERTICALS FOR MINOR DEGREE

(In addition to all the verticals of other programmes)

(Choice of courses for Minor degree is to be made from any one vertical of other programmes or from anyone of the following verticals)

Sl.No.	Vertical 1	Vertical 2	Vertical 3	Vertical 4	Vertical 5
	Fintech and Blockchain	**Entrepreneurship**	**Business Data Analytics**	**Internet of Things**	**Quantum Technologies**
1	**CS23M01** Banking, Financial Services and Insurance	**ME23M01** Foundations of Entrepreneurship	**CB23M01** Data Mining for Business Intelligence	**EC23M01** IoT Architecture	**VL23M01** Mathematical Foundations for Quantum Computing
2	**CS23M02** Financial Management	**ME23M02** Team Building and Leadership Management for Business	**CB23M02** Financial Analytics	**EC23M02** IoT Device Programming	**VL23M02** Fundamentals of Quantum Computing
3	**CS23M03** Fintech Personal Finance and Payments	**ME23M03** Creativity and Innovation in Entrepreneurship	**CB23M03** Human Resource Analytics	**EC23M03** IoT Foundations	**VL23M03** Quantum Materials
4	**CS23M04** Fundamentals of Investment	**ME23M04** Principles of Marketing Management for Business	**CB23M04** Marketing and Social Media Web Analytics	**EC23M04** Industrial Internet of Things	**VL23M04** Quantum Information Science
5	**CS23M05** Introduction to Blockchain and its Applications	**ME23M05** Human Resource Management for Entrepreneurs	**CB23M05** Operation and Supply Chain Analytics	**EC23M05** IoT Protocols	**VL23M05** Quantum Measurement and Control
6	**CS23M06** Introduction to Fintech	**ME23M06** Financing New Business Ventures	**CB23M06** Statistics for Management	**EC23M06** Sensor Technologies and IoT	**VL23M06** Quantum Communication
7	-	-	-	-	**VL23M07** Quantum Optics
8	-	-	-	-	**VL23M08** Quantum Cryptography

VERTICAL 1: FINTECH AND BLOCK CHAIN

Sl.No.	Course Code	Course Title	Category	Periods Per Week			Total Contact Periods	Credits
				L	T	P		
1.	CS23M01	Banking, Financial Services and Insurance	Minor	3	0	0	3	3
2.	CS23M02	Financial Management	Minor	3	0	0	3	3
3.	CS23M03	Fintech Personal Finance and Payments	Minor	3	0	0	3	3
4.	CS23M04	Fundamentals of Investment	Minor	3	0	0	3	3
5.	CS23M05	Introduction to Blockchain and its Applications	Minor	3	0	0	3	3
6.	CS23M06	Introduction to Fintech	Minor	3	0	0	3	3

VERTICAL 2: ENTREPRENEURSHIP

Sl.No.	Course Code	Course Title	Category	Periods Per Week			Total Contact Periods	Credits
				L	T	P		
1.	ME23M01	Foundations of Entrepreneurship	Minor	3	0	0	3	3
2.	ME23M02	Team Building and Leadership Management for Business	Minor	3	0	0	3	3
3.	ME23M03	Creativity and Innovation in Entrepreneurship	Minor	3	0	0	3	3
4.	ME23M04	Principles of Marketing Management for Business	Minor	3	0	0	3	3
5.	ME23M05	Human Resource Management for Entrepreneurs	Minor	3	0	0	3	3
6.	ME23M06	Financing New Business Ventures	Minor	3	0	0	3	3

VERTICAL 3: BUSINESS DATA ANALYTICS

Sl.No.	Course Code	Course Title	Category	Periods Per Week			Total Contact Periods	Credits
				L	T	P		
1.	CB23M01	Data mining for Business Intelligence	Minor	3	0	0	3	3
2.	CB23M02	Financial Analytics	Minor	3	0	0	3	3
3.	CB23M03	Human Resource Analytics	Minor	3	0	0	3	3
4.	CB23M04	Marketing and Social Media Web Analytics	Minor	3	0	0	3	3
5.	CB23M05	Operation and Supply Chain Analytics	Minor	3	0	0	3	3
6.	CB23M06	Statistics for Management	Minor	3	0	0	3	3

VERTICAL 4: INTERNET OF THINGS

Sl.No.	Course Code	Course Title	Category	Periods Per Week			Total Contact Periods	Credits
				L	T	P		
1.	EC23M01	IoT Architecture	Minor	3	0	0	3	3
2.	EC23M02	IoT Device Programming	Minor	3	0	0	3	3
3.	EC23M03	IoT Foundations	Minor	3	0	0	3	3
4.	EC23M04	Industrial Internet of Things	Minor	3	0	0	3	3
5.	EC23M05	IoT Protocols	Minor	3	0	0	3	3
6.	EC23M06	Sensor Technologies and IoT	Minor	3	0	0	3	3

VERTICAL 5: QUANTUM TECHNOLOGIES

Sl.No.	Course Code	Course Title	Category	Periods Per Week			Total Contact Periods	Credits
				L	T	P		
1.	VL23M01	Mathematical Foundations for Quantum Computing	Minor	3	0	0	3	3
2.	VL23M02	Fundamentals of Quantum Computing	Minor	3	0	0	3	3
3.	VL23M03	Quantum Materials	Minor	3	0	0	3	3
4.	VL23M04	Quantum Information Science	Minor	2	0	2	4	3
5.	VL23M05	Quantum Measurement and Control	Minor	3	0	0	3	3
6.	VL23M06	Quantum Communication	Minor	2	0	2	4	3
7.	VL23M07	Quantum Optics	Minor	3	0	0	3	3
8.	VL23M08	Quantum Cryptography	Minor	3	0	0	3	3