

### 13. Courses of Study and Scheme of Assessment BTECH BIOTECHNOLOGY

(2015 REGULATIONS)  
(Minimum credits to be earned: 182)

Code No.	Course	Hours / week			Credits	Maximum marks			
		Lecture	Tutorial	Practical		CA	FE	Total	CAT
<b>SEMESTER I</b>									
15B101	Calculus and its Applications	3	2	0	4	50	50	100	BS
15B102	Physics	3	0	0	3	50	50	100	BS
15B103	Chemistry	3	0	0	3	50	50	100	BS
15B104	Problem Solving and C Programming	2	2	0	3	50	50	100	ES
15B105	Basics of Electrical and Electronics Engineering	3	0	0	3	50	50	100	ES
15T104	English Language Proficiency	2	2	0	3	50	50	100	HS
15B110	Engineering Graphics	0	0	4	2	100	-	100	ES
15B111	Physics Laboratory I	0	0	2	1	100	-	100	BS
15B112	Chemistry Laboratory I	0	0	2	1	100	-	100	BS
15B214	Personality and Character Development	0	0	**	Grade	-	-	-	MC
<b>Total 30 hrs</b>		<b>16</b>	<b>6</b>	<b>8</b>	<b>23</b>	<b>650</b>	<b>250</b>	<b>900</b>	
<b>SEMESTER II</b>									
15B201	Complex variables and Transforms	3	2	0	4	50	50	100	BS
15B202	Biomolecules	3	0	0	3	50	50	100	PC
15B203	C++ and Data Structures	3	2	0	4	50	50	100	ES
15B204	Applied Physics	3	0	0	3	50	50	100	BS
15B205	Organic Chemistry	3	0	0	3	50	50	100	BS
15_____	Language Elective	3	0	0	3	50	50	100	HS
15B210	Laboratory Practices	0	0	4	2	100	-	100	ES
15B211	Physics Laboratory II	0	0	2	1	100	-	100	BS
15B212	Chemistry Laboratory II	0	0	2	1	100	-	100	BS
15B214	Personality and Character Development	0	0	**	Grade	-	-	-	MC
<b>Total 30 hrs</b>		<b>18</b>	<b>4</b>	<b>8</b>	<b>24</b>	<b>600</b>	<b>300</b>	<b>900</b>	

CA - Continuous Assessment

FE - Final Examination

Grade - Completed / Not Completed

\*\* - Total 40 hrs in I & II semesters put together. Grade: Completed / Not Completed.

**CAT-Category; BS – Basic Science; HS – Humanities & Social Sciences; ES – Engineering Sciences; PC – Professional Core; PE – Professional Elective; OE – Open Elective; EEC – Employability Enhancement Course; MC – Mandatory Course**

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Code No.	Course	Hours / week			Credits	Maximum marks				
		Lecture	Tutorial	Practical		CA	FE	Total	CAT	
<b>SEMESTER II – Summer Term €</b>										
15B215	Professional Skills	6	0	9	2	100	-	100	EEC	
15B216	In-Plant Training and Technical Seminar	6	0	9	2	100	-	100	EEC	
<b>Total 30 hrs</b>		<b>12</b>	<b>0</b>	<b>18</b>	<b>4</b>	<b>200</b>	<b>-</b>	<b>200</b>		

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€ - These courses will be conducted prior to the commencement of the third semester for a period of 4 weeks during summer term.

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		Lecture	Tutorial	Practical		CA	FE	Total	CAT
<b>SEMESTER III</b>									
15B301	Numerical Methods	2	2	0	3	50	50	100	BS
15B302	Biochemical Metabolism	3	0	0	3	50	50	100	PC
15B303	Introductory Chemical Engineering	3	2	0	4	50	50	100	ES
15B304	General Microbiology	3	0	0	3	50	50	100	PC
15B305	Cell Biology	3	0	0	3	50	50	100	PC
15T070	Economics for Engineers	3	0	0	3	50	50	100	HS
15B310	Biochemistry Laboratory	0	0	4	2	100	-	100	PC
15B311	Microbial and Cell Biology Laboratory	0	0	4	2	100	-	100	PC
<b>Total 29 hrs</b>		<b>17</b>	<b>4</b>	<b>8</b>	<b>23</b>	<b>500</b>	<b>300</b>	<b>800</b>	
<b>SEMESTER IV</b>									
15B401	Biostatistics	2	2	0	3	50	50	100	BS
15B402	Unit Operations	3	2	0	4	50	50	100	ES
15B403	Industrial Biotechnology	3	0	0	3	50	50	100	PC
15B404	Molecular Biology	3	0	0	3	50	50	100	PC
15B405	Analytical Methods and Instrumentation	3	0	0	3	50	50	100	PC
15____	Open Elective I*	3	0	0	3	50	50	100	OE
15B410	Molecular Biology Laboratory	0	0	4	2	100	-	100	PC
15B411	Chemical Engineering Laboratory	0	0	4	2	100	-	100	ES
<b>Total 28 hrs</b>		<b>17</b>	<b>4</b>	<b>8</b>	<b>23</b>	<b>500</b>	<b>300</b>	<b>800</b>	

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\* – LTPC for open electives can be either 3 0 0 3 or 2 2 0 3.

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Code No.	Course	Hours / week				Maximum marks			
		Lecture	Tutorial	Practical	Credits	CA	FE	Total	CAT
<b>SEMESTER V</b>									
15B501	Thermodynamics of Biochemical Systems	2	2	0	3	50	50	100	PC
15B502	Enzyme Engineering and Technology	3	0	0	3	50	50	100	PC
15B503	Genetic Engineering	3	0	0	3	50	50	100	PC
15B504	Mass transfer operations	2	2	0	3	50	50	100	ES
15B505	Immunology	3	0	0	3	50	50	100	PC
15____	Open Elective II*	3	0	0	3	50	50	100	OE
15B510	Genetic Engineering Laboratory	0	0	4	2	100	-	100	PC
15B511	Enzyme engineering Laboratory	0	0	4	2	100	-	100	PC
15B520	Industrial Visit cum Lecture	0	0	4	2	100	-	100	EEC
<b>Total 30 hrs</b>		<b>16</b>	<b>4</b>	<b>12</b>	<b>24</b>	<b>600</b>	<b>300</b>	<b>900</b>	
<b>SEMESTER VI</b>									
15B601	Bioprocess Engineering	2	2	0	3	50	50	100	PC
15B602	Genomics and Proteomics	3	0	0	3	50	50	100	PC
15B603	Bioreaction Engineering	2	2	0	3	50	50	100	PC
15B604	Bioethics, IPR and Biosafety	3	0	0	3	50	50	100	PC
15B____	Professional Elective I	3	0	0	3	50	50	100	PE
15____	Open Elective III*	3	0	0	3	50	50	100	OE
15B610	Bioprocess Laboratory	0	0	4	2	100	-	100	PC
15B611	Immunology Laboratory	0	0	4	2	100	-	100	PC
15B620	Innovation Practices	0	0	4	2	100	-	100	EEC
<b>Total 30 hrs</b>		<b>16</b>	<b>4</b>	<b>12</b>	<b>24</b>	<b>600</b>	<b>300</b>	<b>900</b>	

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Code No.	Course	Hours / week				Maximum marks			
		Lecture	Tutorial	Practical	Credits	CA	FE	Total	CA
<b>SEMESTER VII</b>									
15B701	Bioinformatics	3	0	0	3	50	50	100	PC
15B702	Down Stream Processing	3	0	0	3	50	50	100	PC
15B703	Environmental Science and Engineering	2	0	0	2	50	50	100	HS
15B__	Professional Elective II	3	0	0	3	50	50	100	PE
15B__	Professional Elective III	3	0	0	3	50	50	100	PE
15B__	Professional Elective IV	3	0	0	3	50	50	100	PE
15B710	Bioinformatics Laboratory	0	0	4	2	100	-	100	PC
15B711	Down Stream Process Laboratory	0	0	4	2	100	-	100	PC
15B720	Project Work I	0	0	4	2	100	-	100	EEC
Total 29 hrs		17	0	12	23	600	300	900	
<b>SEMESTER VIII</b>									
15B__	Professional Elective V	3	0	0	3	50	50	100	PE
15B__	Professional Elective VI	3	0	0	3	50	50	100	PE
15B820	Project Work II	0	0	16	8	50	50	100	EEC
Total 22 hrs		6	0	16	14	150	150	300	

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## LANGUAGE ELECTIVES

15T080	Communication Skills for Engineers
15T081	Basic German
15T082	Basic French
15T083	Basic Japanese

## OPEN ELECTIVES

(Students can opt for all open electives from single stream or several streams)

### MATHEMATICS

15OH01	Advanced Linear Algebra
15OH02	Algebraic Structures
15OH03	Calculus of Variations and Tensor Analysis
15OH04	Graph Theory and its Applications
15OH05	Mathematical Finance
15OH06	Mathematical Modeling and Simulation
15OH07	Number Theory for Computing
15OH08	Operations Research
15OH09	Reliability and Quality Control
15OH10	Soft Computing
15OH11	Stochastic Models

### PHYSICS

15OH20	Analytical Techniques for Materials Characterization
15OH21	Laser Technology
15OH22	Micro Electromechanical Systems
15OH23	Nanomaterials and Applications
15OH24	Physics for Solar PV Systems and Solid-State Lighting Systems
15OH25	Sensors for Engineering Applications
15OH26	Thin Film Technology
15OH27	Nonlinear Science and Engineering Applications
15OH28	Nonlinear Fiber Optics
15OH29	Chaotronics

### CHEMISTRY

15OH30	Analytical Chemistry
15OH33	Chemical Sensors and Biosensors

### COMPUTER APPLICATIONS

15OH46	Computer Graphics and Virtual Reality
15OH47	Data and File Structures
15OH48	Database Management System
15OH49	High Performance Computing
15OH50	Mainframe Systems
15OH51	Mobile Application Development
15OH52	Multicore Programming
15OH53	Object Oriented Programming
15OH54	Programming in Python
15OH55	Responsive Web Design
15OH56	Social Web Mining
15OH57	Software Engineering
15OH58	Java Programming
15OH59	Geographic Information System
15OH60	Programming for Robotics

### HUMANITIES

15OH61	An Introduction to Indian Constitution
15OH62	Entrepreneurship
15OH63	Human Resource Management
15OH64	Industrial Psychology

15OH65	Principles of Management
15OH66	Business Statistics
15OH67	Disaster Management
15OH68	Financial and Managerial Accounting
15OH69	Marketing Management
15OH70	Defence Practices and Disaster Management

### ENGLISH

15OH75	English and Soft Skills for Employability
15OH76	English for Competitive Examinations
15OH77	German Language – International Level A1.1
15OH78	German Language – International Level A1.2

### APPLIED MATHEMATICS AND COMPUTATIONAL SCIENCES

15OH81	Data Structures and Algorithms
15OH82	Optimization Techniques
15OH83	Data Science
15OH84	Data Visualization
15OH85	Artificial Intelligence
15OH86	Pervasive Computing
15OH87	Parallel and Distributed Computing
15OH88	Cyber Security
15OH89	Randomized Algorithms
15OH90	Approximation Algorithms
15OH91	Network Science
15OH92	Applied Stochastic Processes
15OH93	Modelling and Simulation
15OH94	Graph Algorithms

### OPEN ELECTIVES OFFERED BY THE ENGINEERING DEPARTMENTS

15MH02	Total Quality Management	(Dept. of Mechanical Engineering)
15RH02	Introduction to Robotics & Automation	(Dept. of Robotics and Automation Engineering)
15IH03	Graphics and Multimedia	(Dept. of Information Technology)

### PROFESSIONAL ELECTIVES

#### GENERAL ELECTIVES

15B001	Plant Biotechnology
15B002	Environmental Biotechnology
15B003	Pharmaceutical Technology
15B004	Food Science and Technology
15B005	Animal Biotechnology
15B006	Bioprocess Plant Design, Economics and Biosafety
15B007	Medical Genetics
15B008	Nanomaterials for Bioapplications
15B009	Smart Nanoparticles in Cancer Therapy

#### RESEARCH ELECTIVES

15B021	Research Topics in Cancer Biology
15B022	Molecular Pathogenesis
15B023	Developmental Biology
15B024	Protein Engineering
15B025	Immunotechnology
15B026	Biofuel Technology
15B027	Studies in Paradigmatic Developments in Biology

15B028 Advances in Genomics  
15B029 Systems Biology

### **ONE CREDIT COURSES**

#### **OFFERED BY THE DEPARTMENT**

15BF01 Challenges in fruit and vegetable processing industry  
15BF02 Herbal Medicines  
15BF03 Biocatalysis and biotransformation  
15BF04 Next generation sequence analysis  
15BF05 Directed Evolution for Enzyme Engineering  
15BF06 Quality Assurance and Control in Food Industry  
15BF07 Challenges in Large Scale Bioprocess  
15BF08 Safety Practices and Management in Process Industries  
15BF09 Patents and Copyrights

#### **OFFERED BY HUMANITIES**

15OF01 Export – Import Management  
15OF02 Insurance & Risk Management  
15OF03 Values and Ethics at Work Place  
15OF04 Development of Industrialisation  
15OF05 Creativity and Social Enterprise  
15OF06 Social and Psychological Well Being  
15OF13 Security Analysis and Portfolio Management  
15OF14 Implementation of Quality Management System  
15OF15 Financial Management  
15OF16 Personality Development Through Transactional Analysis

#### **OFFERED BY THE DEPARTMENT OF ENGLISH**

15OF10 Corporate Communication  
15OF11 Interpersonal and Organizational Communication  
15OF12 Human Values Through Literature

#### **OFFERED BY THE DEPARTMENT OF MATHEMATICS**

15OF21 Principles of Business Analytics



## SUMMARY OF CREDIT DISTRIBUTION

B.TECH BIOTECHNOLOGY												
S. No	Course Work subject Area	Credits Per Semester								Total Credit	Credit Range	
		I	II	III	IV	V	VI	VII	VIII		Min	Max
1	<b>HS</b>	3	3	3	0	0	0	2	0	11	9	18
2	<b>BS</b>	12	12	3	3	0	0	0	0	30	27	36
3	<b>ES</b>	8	6	4	6	3	0	0	0	27	27	36
4	<b>PC</b>	0	3	13	11	16	16	10	0	69	54	72
5	<b>PE</b>	0	0	0	0	0	3	9	6	18	18	27
6	<b>OE</b>	0	0	0	3	3	3	0	0	9	9	18
7	<b>EEC</b>	0	<b>0 + 4*</b>	0	0	2	2	2	8	18	18	27
	<b>Total</b>	23	<b>24+4*</b>	23	23	24	24	23	14	<b>182</b>	<b>175</b>	<b>185</b>

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