VIT Vidyalankar Institute of Technology
Accredited A+ by NAAC

Vidyalankar Institute of Technology

An Autonomous Institute affiliated to University of Mumbai

Bachelor of Technology

in

Biomedical Engineering

Programme Structure (R-2022)

(As per AICTE guidelines, with effect from Academic Year 2022-23)

Preamble

To meet the challenge of ensuring excellence in engineering education, the issue of quality needs to be addressed, debated, and taken forward in a systematic manner. Therefore, autonomy for Vidyalankar Institute of Technology is not merely a transition from pre-cooked syllabi to self-designed curriculum. The autonomous curriculum of the Institute offers required academic flexibility with emphasis on industry requirements and market trends, employability and problem-solving approach which leads to improving competency level of learners with diverse strengths. In line with this, the curriculum framework designed is **Choice-Based Credit and Grading System (CBCGS)**. The number of credits for each category of courses learnt by learners, internships and projects is finalized considering the scope of study and the ability that a learner should gain through the programme. The overall credits and approach of curriculum proposed is in line with AICTE model curriculum.

The curriculum comprises courses from various categories like basic sciences, humanities and social sciences, engineering sciences, general education and branch specific courses including professional electives and open electives. The curriculum has core courses of branch of engineering positioned and sequenced to achieve sequential and integral learning of the entire breadth of the specific branch. These courses are completed by the third year of the engineering programme that enables learners to prepare for higher education during their final year. Professional elective courses, that begins from third year of programme, offer flexibility and diversity to learners to choose specialization from a basket of recent developments in their field of technology. The selection of unique professional elective courses based on industrial requirements and organizing them into tracks is a salient feature of this curricula ensuring employability. Open Elective courses cover multi-disciplinary, special skill development, project management and similar knowledge that make learners capable of working in an industrial environment.

For holistic development of learners, apart from technical courses, Humanities and Social Science courses develop the required soft-skills and attitude amongst learners. Our curriculum also introduces Social Service Internship and Internship with institutes abroad along with courses like Design Thinking, Wellness - Body, Mind & Spirit, Indian Traditional Knowledge System under General Education category. These general education courses aim to create balance in brain hemispheres and hence improve learners' clarity in thoughts and responses.

Additionally, curriculum provides add-on Honours/Minor degree that involves field/ domain study. Learner can avail themselves of this degree by completing requirement of additional 18 credits.

Thus, the academic plan of VIT envisages a shift from summative to formative and competency-based learning system which will enhance learner's ability towards higher education, employability and entrepreneurship.

Chairman, Board of Studies
Department of Biomedical Engineering
Vidyalankar Institute of Technology

Chairman, Academic Council
Vidyalankar Institute of Technology

COMPETENCE BASED COURSE CATEGORIES AND CREDIT ALLOTMENT

Sr. No.	Competence	Course Category	Credits /Audit
I	Knowledge	Basic Science	24
II		Engineering Science	15
III		Core	48
IV	Skills	Professional Elective	18
V		Open Elective	15
VI		Project and Internship	18
VII	Attitude	Humanities, Social Sciences and Management	12
VIII		General Education	14
		Total	**164**

Learner is expected to complete requirement of 164 credits (with minimum credits under each category as mentioned above) for B.Tech. degree in Biomedical Engineering.

Additionally, learners can choose to avail Honours/ Minor Degree by completing requirements of 18 credits, which will be over and above the 164 credits required for B.Tech. degree.

Structure of Honours/Minor Degree Programme

Sr. No.	Category	Credits
1	Course Work	9
2	Industry Interaction	1
3	Survey Paper	2
4	Seminar	2
5	Specialized Project	4
Total		**18**

For details of add-on Honors/Minor Degree refer to Honours/Minor Degree document of B.Tech. Biomedical Engineering Programme applicable for R-2022 curriculum.

Definition of Credit

Duration	Credit
1 Hr. Lecture (L)per week	1
1 Hr. Tutorial (T)per week	1
1 Hr. Practical(P) per week	0.5

Courses Under Various Categories

I. Basic Science Courses

Sr. No.	Course Code	Course Title	Hours Per Week			Credits	Preferred Semester
			Theory	Practical	Tutorial		
1	BS20T*	Physics for Biomedical Engineering	2	-	-	2	1
2	BS20P*	Physics for Biomedical Engineering Lab	-	2	-	1	1
3	BS02*	Engineering Mathematics-I	3	-	-	3	1
4	BS16T*	Engineering Chemistry	2		-	2	2
5	BS16P*	Engineering Chemistry Lab	-	2	-	1	2
6	BS04*	Engineering Mathematics-II	3	-	-	3	2
7	BS06	Engineering Mathematics - III	3	-	-	3	3
8	BS18T	Human Anatomy & Physiology	2	-	-	2	3
9	BS18P	Human Anatomy & Physiology Lab	-	2	-	1	3
10	BS08	Engineering Mathematics-IV	3	-	-	3	4
11	BS13T	Basics of VLSI	2	-		2	5
12	BS13P	Basics of VLSI Lab		2	-	1	5

*** Courses exempted for Direct Second Year (DSY) students who will secure admission through lateral entry from the A.Y. 2023-24.**

II. Engineering Science Courses:

Sr. No.	Course Code	Course Title	Hours Per Week			Credits	Preferred Semester
			Theory	Practical	Tutorial		
1	ES02T*	Engineering Mechanics	2	-	-	2	1
2	ES02P*	Engineering Mechanics Lab	-	2	-	1	1
3	ES04T*	Structured Programming	2	-	-	2	1
4	ES04P*	Structured Programming Lab	-	2	-	1	1
5	ES08T*	Basic Electrical & Electronics Engineering	2	-	-	2	1
6	ES08P*	Basic Electrical & Electronics Engineering Lab	-	2	-	1	1

Sr. No.	Course Code	Course Title	Hours Per Week			Credits	Preferred Semester
			Theory	Practical	Tutorial		
7	ES01T*	Engineering Graphics	2	-	-	2	2
8	ES01P*	Engineering Graphics Lab	-	2	-	1	2
9	ES05T*	Object Oriented Programming	2	-	-	2	2
10	ES05P*	Object Oriented Programming Lab	-	2	-	1	2

*** Courses exempted for Direct Second Year (DSY) students who will secure admission through lateral entry from the A.Y. 2023-24.**

III. Core Courses

Sr. No.	Course Code	Course Title	Hours Per Week			Credits	Preferred Semester
			Theory	Practical	Tutorial		
1	BM01T	Digital logic design and analysis	2	-	-	2	4
2	BM01P	Digital logic design and analysis Lab	-	2	-	1	4
3	BM02	Biomechanics Prosthetics and Orthotics	2	-	1	3	3
4	BM03T	Electronic Devices and Circuits	2	-	-	2	3
5	BM03P	Electronic Devices and Circuits Lab	-	2	-	1	3
6	BM04T	Biomedical Transducers and Control Systems	2	-	-	2	4
7	BM04P	Biomedical Transducers and Control Systems Lab	-	2	-	1	4
8	BM05T	Analytical and Clinical Equipment	2	-	-	2	4
9	BM05P	Analytical and Clinical Equipment Lab	-	2	-	1	4
10	BM06T	Linear Integrated Circuits	2	-	-	2	4
11	BM06P	Linear Integrated Circuits Lab	-	2	-	1	4
12	BM07T	Biological Modelling and Simulation	2	-	-	2	4
13	BM07P	Biological Modelling and Simulation Lab	-	2	-	1	4
14	BM08T	Python Programming	2	-	-	2	3
15	BM08P	Python Programming Lab	-	2	-	1	3
16	BM09T	Diagnostic and Monitoring Equipment	2	-	-	2	5

Sr. No.	Course Code	Course Title	Hours Per Week			Credits	Preferred Semester
			Theory	Practical	Tutorial		
17	BM09P	Diagnostic and Monitoring Equipment Lab	-	2	-	1	5
18	BM10T	Microprocessors and Microcontrollers	2	-	-	2	5
19	BM10P	Microprocessors and Microcontrollers Lab	-	2	-	1	5
20	BM11T	Biomedical Digital Signal Processing	2	-	-	2	5
21	BM11P	Biomedical Digital Signal Processing Lab	-	2	-	1	5
22	BM12T	Medical Imaging Equipment	2	-	-	2	5
23	BM12P	Medical Imaging Equipment Lab	-	2	-	1	5
24	BM13T	Critical Care Equipment	2	-	-	2	6
25	BM13P	Critical Care Equipment Lab	-	2	-	1	6
26	BM14T	Digital Image Processing	2	-	-	2	6
27	BM14P	Digital Image Processing Lab	-	2	-	1	6
28	BM15T	Biomedical Microsystems	2	-	-	2	6
29	BM15P	Biomedical Microsystems Lab	-	2	-	1	6
30	BM16T	Hospital Management	2	-	-	2	6
31	BM16P	Hospital Management Lab	-	2	-	1	6

IV. Professional Elective Courses

Sr. No.	Course Code	Course Title	Hours Per Week			Credits	Preferred Semester
			Theory	Practical	Tutorial		
1	BM21T	Integrated Data Management	2	-	-	2	5
2	BM21P	Integrated Data Management Lab	-	2	-	1	5
3	BM22T	Modern Sensors for Internet of Things (IoT)	2	-	-	2	5
4	BM22P	Modern Sensors for Internet of Things (IoT) Lab	-	2	-	1	5
5	BM23T	Bio-Photonics	2	-	-	2	5
6	BM23P	Bio-Photonics Lab	-	2	-	1	5

Sr. No.	Course Code	Course Title	Hours Per Week			Credits	Preferred Semester
			Theory	Practical	Tutorial		
7	BM24T	Artificial Intelligence	2	-	-	2	6
8	BM24P	Artificial Intelligence Lab	-	2	-	1	6
9	BM25T	Principles of Internet of Things (IoT)	2	-	-	2	6
10	BM25P	Principles of Internet of Things (IoT) Lab	-	2	-	1	6
11	BM26T	Robotics in Medicine	2	-	-	2	6
12	BM26P	Robotics in Medicine Lab	-	2	-	1	6
13	BM27T	Machine Learning	2	-	-	2	6
14	BM27P	Machine Learning Lab	-	2	-	1	6
15	BM28T	Embedded System Design with Tiny Operating System (OS)	2	-	-	2	6
16	BM28P	Embedded System Design with Tiny Operating System (OS) Lab	-	2	-	1	6
17	BM29T	Point of Care Technology	2	-	-	2	6
18	BM29P	Point of Care Technology Lab	-	2	-	1	6
19	BM30T	Deep learning	2	-	-	2	7
20	BM30P	Deep learning Lab	-	2	-	1	7
21	BM31T	Internet of Things (IoT) and Edge Computing	2	-	-	2	7
22	BM31P	Internet of Things (IoT) and Edge Computing Lab	-	2	-	1	7
23	BM32T	Biomedical Equipment Safety	2	-	-	2	7
24	BM32P	Biomedical Equipment Safety Lab	-	2	-	1	7
25	BM33T	Data Analytics	2	-	-	2	7
26	BM33P	Data Analytics Lab	-	2	-	1	7
27	BM34T	Internet of Things (IoT) Security and Trust	2	-	-	2	7
28	BM34P	Internet of Things (IoT) Security and Trust Lab	-	2	-	1	7
29	BM35T	Medical Device Regulation	2	-	-	2	7
30	BM35P	Medical Device Regulation Lab	-	2	-	1	7
31	BM36T	Basics of Natural Language Processing	2	-	-	2	7
32	BM36P	Basics of Natural Language Processing Lab	-	2	-	1	7

Sr. No.	Course Code	Course Title	Hours Per Week			Credits	Preferred Semester
			Theory	Practical	Tutorial		
33	BM37T	Industrial Internet of Things (IIoT)	2	-	-	2	7
34	BM37P	Industrial Internet of Things (IIoT) Lab	-	2	-	1	7
35	BM38T	Installation & Maintenance of Medical Equipment	2	-	-	2	7
36	BM38P	Installation & Maintenance of Medical Equipment Lab	-	2	-	1	7

V. Open Elective Courses

Sr. No.	Course Code	Course Name	Hours Per Week			Credits	Preferred Semester
			Theory	Practical	Tutorial		
1	OE21	Cyber Law	3	-	-	3	7
2	OE22	Project Management	3	-	-	3	7
3	OE23	Product Lifecycle Management	3	-	-	3	7
4	OE24	Sustainability Management	3	-	-	3	7
5	OE25	Operation Research	3	-	-	3	7
6	OE26	IPR and Patenting	3	-	-	3	8
7	OE27	Research Methodology	3	-	-	3	8
8	OE28	Renewable Energy Management	3	-	-	3	8
9	OE29	Energy Audit and Management	3	-	-	3	8
10	OE30	Bioinformatics	3	-	-	3	8
11	OE31	Nanotechnology	3	-	-	3	8

VI. Project and Internship

Sr. No.	Course Code	Course Name	Hours Per Week			Credits	Preferred Semester
			Theory	Practical	Tutorial		
1	BM39P	Mini Project-1	-	4	-	2	5
2	BM40P	Mini Project-2	-	4	-	2	6
3	BM41	Industry Internship	-	150 (total)	-	5	Break after Sem. 6
4	BM42	Project-1 Synopsis	3	-	-	3	7

Sr. No.	Course Code	Course Name	Hours Per Week			Credits	Preferred Semester
			Theory	Practical	Tutorial		
5	BM43	Publication / Patent	-	-	-	2	8
6	BM44	Project 2 – Demonstration	1	6	-	4	8

VII. Humanities, Social Sciences and Management Courses

Sr. No.	Course Code	Course Title	Hours Per Week			Credits	Preferred Semester
			Theory	Practical	Tutorial		
1	HS01T*	Effective Communication	2	-	-	2	1
2	HS01P*	Effective Communication Lab	-	2	-	1	1
3	HS02T*	Professional Skills	2	-	-	2	2
4	HS02P*	Professional Skills lab	-	2	-	1	2
5	HS03	Technical and Business Writing	1	2	-	2	3
6	HS06	Principles of Economics and Management	2	-	1	3	4
7	HS04	Presentation Skills	-	2	-	1	5

*** Courses exempted for Direct Second Year (DSY) students who will secure admission through lateral entry from the A.Y. 2023-24.**

VIII. General Education

List of General Education Sub-Category

GE Sub-Category	GE Sub-Category Code
Arts	A
Social and Behavioural Science	SB
Creativity and Innovation	CI
Political Science	PS
Physical Education and Wellness	PEW
Finance	F
Natural Science	NS
Wonders of Infrastructure	WI

List of courses under General Education Category

Course Code	Course Name	Credits
GEA01	Voice Culture for Professional Speaking	2
GEA02	Various Dance Forms	2
GEA03	Exploring Indian Art	2
GESB01[#]	Social Service Internship/ Project	3
GESB02	Universal Human Values	2
GESB03	Indian Traditional Knowledge System	2
GESB04	Corporate and Social Etiquettes	2
GESB05	Global Citizenship Education	2
GESB06	Responsibility towards sustainable environment	2
GESB07	Psychology	2
GECI01T	Design Thinking	2
GECI01P	Design Thinking Lab	1
GECI02	Innovation and Entrepreneurship	2
GEPS01	Indian Constitution	2
GEPS02	Four Pillars of Democratic Nation	2
GEPEW01	Wellness – Body, Mind & Spirit	2
GEPEW02	IQ vs EQ	2
GEPEW03	Nutrition and Physical Wellness	2
GEF01	Basics of Finance & Legal aspects for Business	2
GEF02	Financial Management for beginners	2
GENS01	Facets of Astronomy	2
GENS02	Modern Farming	2
GEWI01	Railways - Wonders of Infrastructure	2
GE01[$]	Internship with other Institutes (Credit Transfer)	4

[#] **For GEB01- Social Service Internship/ Project:** 2 hours / week slot will be provided during the semester (in regular timetable). Additional work of 60 hours needs to be completed during the semester (besides regular timetable) or after the semester (during inter semester break).

[$] **GE01- Internship with other Institutes (Credit Transfer):** Internship with other reputed institutes equivalent to 4 credits is recommended to be done by learner during second year inter semester break (i.e. summer break between semester 4 and semester 5)

Note: 07 credits of required 14 credits, under GE category are exempted for Direct Second Year (DSY) students who will secure admission through lateral entry from the A.Y. 2023-24. Such students can opt for any courses from the above list to fulfil the required credits for the award of degree.

Course Structure and Assessment Guidelines

for

Bachelor of Technology

in

Biomedical Engineering

First Year B. Tech. Biomedical Engineering **Semester: I**

Course Structure and Assessment guidelines

Course		Head of Learning	Credits	Assessment guidelines (Marks)			Total marks (Passing@40% of total marks)
Code	Name			ISA	MSE	ESE	
HS01T	Effective Communication	Theory	2	15	20	40	075
HS01P	Effective Communication Lab	Practical	1	25	-	25	050
BS02	Engineering Mathematics-I	Theory	3	20	30	50	100
BS20T	Physics for Biomedical Engineering	Theory	2	15	20	40	075
BS20P	Physics for Biomedical Engineering Lab	Practical	1	25	-	25	050
ES04T	Structured Programming	Theory	2	15	20	40	075
ES04P	Structured Programming Lab	Practical	1	25	-	25	050
ES08T	Basic Electrical Engineering	Theory	2	15	20	40	075
ES08P	Basic Electrical Engineering Lab	Practical	1	25	-	25	050
ES02T	Engineering Mechanics	Theory	2	15	20	40	075
ES02P	Engineering Mechanics Lab	Practical	1	25	-	25	050
GEXX*	Any GE course from the below list	As per course	2	As per course			
		Total	**20**				

ISA=In Semester Assessment, MSE= Mid Semester Examination, ESE= End Semester Examination
*Selection based on the subset of GE courses made available by the Institute for the semester.

The assessment guidelines for the courses of different credits are mentioned above. Notwithstanding the above, each course faculty shall have the choice to propose her/his assessment methodology based on the nature of the course. However, the proposed assessment methodology shall be approved by a panel constituted at Institute level and published to the learners before the commencement of the semester.

List of General Education Elective Courses (GEXX)

Course		Head of Learning	Credits	Assessment Guidelines (Marks)			Total marks (Passing@40% of total marks)
Code	Name			ISA	MSE	ESE	
GEA01	Voice Culture for Professional Speaking	Theory	2	25	-	50	075
GEA02	Various Dance Forms	Theory	2	25	-	50	075
GEA03	Exploring Indian Art	Theory	2	25	-	50	075
GESB02	Universal Human Values	Theory	2	25	-	50	075
GESB03	Indian Traditional Knowledge System	Theory	2	25	-	50	075
GESB04	Corporate and Social Etiquettes	Theory	2	25	-	50	075
GESB05	Global Citizenship Education	Theory	2	25	-	50	075
GESB06	Responsibility towards sustainable environment	Theory	2	25	-	50	075
GESB07	Psychology	Theory	2	25	-	50	075
GECI02	Innovation and Entrepreneurship	Theory	2	25	-	50	075
GEPS01	Indian Constitution	Theory	2	25	-	50	075
GEPS02	Four Pillars of Democratic Nation	Theory	2	25	-	50	075
GEPEW01	Wellness – Body, Mind & Spirit	Theory	2	25	-	50	075
GEPEW02	IQ vs EQ	Theory	2	25	-	50	075
GEPEW03	Nutrition and Physical Wellness	Theory	2	25	-	50	075
GEF01	Basics of Finance & Legal aspects for Business	Theory	2	25	-	50	075
GEF02	Financial Management for beginners	Theory	2	25	-	50	075
GENS01	Facets of Astronomy	Theory	2	25	-	50	075
GENS02	Modern Farming	Theory	2	25	-	50	075
GEWI01	Railways - Wonders of Infrastructure	Theory	2	25	-	50	075

First Year B. Tech. Biomedical Engineering **Semester: II**

Course Structure and Assessment guidelines

Course		Head of Learning	Credits	Assessment guidelines (Marks)			Total marks (Passing@40% of total marks)
Code	Name			ISA	MSE	ESE	
HS02T	Professional Skills	Theory	2	15	20	40	075
HS02P	Professional Skills Lab	Practical	1	25	-	25	050
BS04	Engineering Mathematics-II	Theory	3	20	30	50	100
BS16T	Engineering Chemistry	Theory	2	15	20	40	075
BS16P	Engineering Chemistry Lab	Practical	1	25	-	25	050
ES01T	Engineering Graphics	Theory	2	15	20	40	075
ES01P	Engineering Graphics Lab	Practical	1	25	-	25	050
ES05T	Object-Oriented Programming	Theory	2	15	20	40	075
ES05P	Object-Oriented Programming Lab	Practical	1	25	-	25	050
GECI01T	Design Thinking	Theory	2	15	20	40	075
GECI01P	Design thinking Lab	Practical	1	50	-	-	050
GEXX*	Any GE courses from the below list	As per course	2	As per course			
		Total	**20**				

ISA=In Semester Assessment, MSE= Mid Semester Examination, ESA= End Semester Examination
*Selection based on the subset of GE courses made available by the Institute for the semester.

The assessment guidelines for the courses of different credits are mentioned above. Notwithstanding the above, each course faculty shall have the choice to propose her/his assessment methodology based on the nature of the course. However, the proposed assessment methodology shall be approved by a panel constituted at Institute level and published to the learners before the commencement of the semester.

List of General Education Elective Courses (GEXX)

Course		Head of Learning	Credits	Assessment Guidelines (Marks)			Total marks (Passing@40% of total marks)
Code	Name			ISA	MSE	ESE	
GEA01	Voice Culture for Professional Speaking	Theory	2	25	-	50	075
GEA02	Various Dance Forms	Theory	2	25	-	50	075
GEA03	Exploring Indian Art	Theory	2	25	-	50	075
GESB02	Universal Human Values	Theory	2	25	-	50	075
GESB03	Indian Traditional Knowledge System	Theory	2	25	-	50	075
GESB04	Corporate and Social Etiquettes	Theory	2	25	-	50	075
GESB05	Global Citizenship Education	Theory	2	25	-	50	075
GESB06	Responsibility towards sustainable environment	Theory	2	25	-	50	075
GESB07	Psychology	Theory	2	25	-	50	075
GECI02	Innovation and Entrepreneurship	Theory	2	25	-	50	075
GEPS01	Indian Constitution	Theory	2	25	-	50	075
GEPS02	Four Pillars of Democratic Nation	Theory	2	25	-	50	075
GEPEW01	Wellness – Body, Mind & Spirit	Theory	2	25	-	50	075
GEPEW02	IQ vs EQ	Theory	2	25	-	50	075
GEPEW03	Nutrition and Physical Wellness	Theory	2	25	-	50	075
GEF01	Basics of Finance & Legal aspects for Business	Theory	2	25	-	50	075
GEF02	Financial Management for beginners	Theory	2	25	-	50	075
GENS01	Facets of Astronomy	Theory	2	25	-	50	075
GENS02	Modern Farming	Theory	2	25	-	50	075
GEWI01	Railways - Wonders of Infrastructure	Theory	2	25	-	50	075

Second Year B. Tech. Biomedical Engineering **Semester: III**

Course Structure and Assessment guidelines

Course		Head of Learning	Credits	Assessment guidelines (Marks)			Total marks (Passing@40% of total marks)
Code	Name			ISA	MSE	ESE	
HS03	Technical and Business Writing	Theory +Practical	2	75	-	-	075
BS06	Engineering Mathematics - III	Theory	3	20	30	50	100
BS18T	Human Anatomy & Physiology	Theory	2	15	20	40	075
BS18P	Human Anatomy & Physiology Lab	Practical	1	25	-	25	050
BM04T	Biomedical Transducers and Control Systems	Theory	2	15	20	40	075
BM04P	Biomedical Transducers and Control Systems Lab	Practical	1	25	-	25	050
BM03T	Electronic Devices and Circuits	Theory	2	15	20	40	75
BM03P	Electronic Devices and Circuits Lab	Practical	1	25	-	25	50
BM08T	Python Programming	Theory	2	15	20	40	075
BM08P	Python Programming Lab	Practical	1	25	-	25	050
GESB01#	Social Service Internship	Practical	3	As per course			
		Total	**20**				

ISA=In Semester Assessment, MSE= Mid Semester Examination, ESE= End Semester Examination

 # For GESB01- Social Service Internship/ Project: 2 hours / week slot will be provided during the semester (in regular timetable). Additional work of 60 hours needs to be completed during the semester (besides regular timetable) or after the semester (during inter semester break).

NOTE: As per Institute guidelines, the result of courses completed in inter-semester break will appear in the marksheet of the next semester.

The assessment guidelines for the courses of different credits are mentioned above. Notwithstanding the above, each course faculty shall have the choice to propose her/his assessment methodology based on the nature of the course. However, the proposed assessment methodology shall be approved by a panel constituted at Institute level and published to the learners before the commencement of the semester.

Second Year B. Tech. Biomedical Engineering **Semester: IV**

Course Structure and Assessment guidelines

Course		Head of Learning	Credits	Assessment guidelines (Marks)			Total marks (Passing@40% of total marks)
Code	Name			ISA	MSE	ESE	
HS06	Principles of Economics and Management	Theory+ Tutorial	3	40	20	40	100
BS08	Engineering Mathematics-IV	Theory	3	20	30	50	100
BM02	Biomechanics Prosthetics and Orthotics	Theory+ Tutorial	3	40	20	40	100
BM05T	Analytical and Clinical Equipment	Theory	2	15	20	40	075
BM05P	Analytical and Clinical Equipment Lab	Practical	1	25	-	25	050
BM06T	Linear Integrated Circuits	Theory	2	15	20	40	075
BM06P	Linear Integrated Circuits Lab	Practical	1	25	-	25	050
BM07T	Biological Modelling and Simulation	Theory	2	15	20	40	075
BM07P	Biological Modelling and Simulation Lab	Practical	1	25	-	25	050
BM01T	Digital logic design and analysis	Theory	2	15	20	40	075
BM01P	Digital logic design and analysis Lab	Practical	1	25	-	25	050
		Total	**21**				
Course credits completed during the previous inter-semester break will appear in this semester marksheet							
GESB01	Social Service Internship/ Project	Practical	3	-	-	100	100

ISA=In Semester Assessment, MSE= Mid Semester Examination, ESE= End Semester Examination

The assessment guidelines for the courses of different credits are mentioned above. Notwithstanding the above, each course faculty shall have the choice to propose her/his assessment methodology based on the nature of the course. However, the proposed assessment methodology shall be approved by a panel constituted at Institute level and published to the learners before the commencement of the semester.

Second Year B. Tech. Biomedical Engineering - Summer Break

Course		Head of Learning	Credits	Assessment Guidelines (Marks)			Total marks (Passing@40% of total marks)
Code	Name			ISA	MSE	ESE	
GE01[$]	Internship with other Institutes (Credit Transfer)	As per course	4	125	-	-	125

[$] **For GE01- Internship with other Institutes (Credit Transfer):** Internship with other reputed institutes equivalent to 4 credits is recommended to be done by learner during second year inter semester break (i.e. summer break between semester 4 and semester 5).
NOTE: As per Institute guidelines, the result of courses completed in inter-semester break will appear in the marksheet of the next semester.

Third Year B. Tech. Biomedical Engineering **Semester: V**

Course Structure and Assessment guidelines

Course		Head of Learning	Credits	Assessment guidelines (Marks)			Total marks (Passing@40% of total marks)
Code	Name			ISA	MSE	ESE	
HS04	Presentation Skills	Practical	1	50	-	-	050
BS13T	Basics of VLSI	Theory	2	15	20	40	075
BS13P	Basics of VLSI Lab	Practical	1	25	-	25	050
BM09T	Diagnostic and Monitoring Equipment	Theory	2	15	20	40	075
BM09P	Diagnostic and Monitoring Equipment Lab	Practical	1	25	-	25	050
BM10T	Microprocessors and Microcontrollers	Theory	2	15	20	40	075
BM10P	Microprocessors and Microcontrollers Lab	Practical	1	25	-	25	050
BM11T	Biomedical Digital Signal Processing	Theory	2	15	20	40	075
BM11P	Biomedical Digital Signal Processing Lab	Practical	1	25	-	25	050
BM12T	Medical Imaging Equipment	Theory	2	15	20	40	075
BM12P	Medical Imaging Equipment Lab	Practical	1	25	-	25	050
BMXXT	Prof. Elective 1	Theory	2	15	20	40	75
BMXXP	Prof. Elective 1 Lab	Practical	1	25	-	25	50
BM39P	Mini Project-1	Practical	2	25		50	75
		Total	**21**				
Course credits completed during the previous inter-semester break will appear in this semester marksheet							
GE01	Internship with other Institutes (Credit Transfer)	As per course	4	125	-	-	125

ISA=In Semester Assessment, MSE= Mid Semester Examination, ESE= End Semester Examination

The assessment guidelines for the courses of different credits are mentioned above. Notwithstanding the above, each course faculty shall have the choice to propose her/his assessment methodology based on the nature of the course. However, the proposed assessment methodology shall be approved by a panel constituted at Institute level and published to the learners before the commencement of the semester.

Guidelines for Professional Elective Courses and Specialization Certificate – Refer Appendix-A

Learners are required to go through the Appendix-A carefully before selecting the Professional Elective courses. Detailed guidelines regarding Professional Elective courses, specialization tracks and courses relevant to each track are given in Appendix-A.

Professional Elective -1 Courses (BMXX)

Specialization Track Name[#]	Course		Head of Learning	Credits	Assessment guidelines (Marks)			Total marks (Passing@40% of total marks)
	Code	Name			ISA	MSE	ESE	
Artificial Intelligence-Machine Learning (AIML)	BM21T	Integrated Data Management	Theory	2	15	20	40	075
	BM21P	Integrated Data Management Lab	Practical	1	25	-	25	050
Internet of Things (IoT)	BM22T	Modern Sensors for Internet of Things (IoT)	Theory	2	15	20	40	075
	BM22P	Modern Sensors for Internet of Things (IoT) Lab	Practical	1	25	-	25	050
Biomedical Technology and Innovation (BTI)	BM23T	Bio-Photonics	Theory	2	15	20	40	075
	BM23P	Bio-Photonics Lab	Practical	1	25	-	25	050

[#]For details of Specialization Certificate, refer Appendix-A

Guidelines for Award of Honours/Minor Degree

Before the end of Semester 5, learners are required to go through the Honours/ Minor Degree Programme document carefully to opt for Honours/ Minor Degree Programme. Learners willing to opt for Honours/ Minor degree programme are required to satisfy the eligibility criteria stated in the document.

Third Year B. Tech. Biomedical Engineering **Semester: VI**
Course Structure and Assessment guidelines

Course		Head of Learning	Credits	Assessment guidelines (Marks)			Total marks (Passing@40% of total marks)
Code	Name			ISA	MSE	ESE	
BM13T	Critical Care Equipment	Theory	2	15	20	40	075
BM13P	Critical Care Equipment Lab	Practical	1	25	-	25	050
BM14T	Digital Image Processing	Theory	2	15	20	40	075
BM14P	Digital Image Processing Lab	Practical	1	25	-	25	050
BM15T	Biomedical Microsystems	Theory	2	15	20	40	075
BM15P	Biomedical Microsystems Lab	Practical	1	25	-	25	050
BM16T	Hospital Management	Theory	2	15	20	40	075
BM16P	Hospital Management Lab	Practical	1	25	-	25	050
BMXXT	Prof. Elective 2	Theory	2	15	20	40	075
BMXXP	Prof. Elective 2 Lab	Practical	1	25	-	25	050
BMXXT	Prof. Elective 3	Theory	2	15	20	40	075
BMXXP	Prof. Elective 3 Lab	Practical	1	25	-	25	050
BM40P	Mini Project-2	Practical	2	25	-	50	075
		Total	**20**				

ISA=In Semester Assessment, MSE= Mid Semester Examination, ESA= End Semester Examination

The assessment guidelines for the courses of different credits are mentioned above. Notwithstanding the above, each course faculty shall have the choice to propose her/his assessment methodology based on the nature of the course. However, the proposed assessment methodology shall be approved by a panel constituted at Institute level and published to the learners before the commencement of the semester.

Professional Elective- 2 Courses (BMXX)

Specialization Track Name#	Course		Head of Learning	Credits	Assessment guidelines (Marks)			Total marks (Passing@40 % of total marks)
	Code	Name			ISA	MSE	ESE	
Artificial Intelligence-Machine Learning (AIML)	BM24T	Artificial Intelligence	Theory	2	15	20	40	075
	BM24P	Artificial Intelligence Lab	Practical	1	25	-	25	050
Internet of Things (IoT)	BM25T	Principles of Internet of Things (IoT)	Theory	2	15	20	40	075
	BM25P	Principles of Internet of Things (IoT) Lab	Practical	1	25	-	25	050
Biomedical Technology and Innovation (BTI)	BM26T	Robotics in Medicine	Theory	2	15	20	40	075
	BM26P	Robotics in Medicine Lab	Practical	1	25	-	25	050

#For details of Specialization Certificate, refer Appendix-A

Professional Elective-3 Courses (BMXX)

Specialization Track Name#	Course		Head of Learning	Credits	Assessment guidelines (Marks)			Total marks (Passing@40% of total marks)
	Code	Name			ISA	MSE	ESE	
Artificial Intelligence-Machine Learning (AIML)	BM27T	Machine Learning	Theory	2	15	20	40	075
	BM27P	Machine Learning Lab	Practical	1	25	-	25	050
Internet of Things (IoT)	BM28T	Embedded System Design with Tiny Operating System (OS)	Theory	2	15	20	40	075
	BM28P	Embedded System	Practical	1	25	-	25	050

Specialization Track Name[#]	Course		Head of Learning	Credits	Assessment guidelines (Marks)			Total marks (Passing@40% of total marks)
	Code	Name			ISA	MSE	ESE	
		Design with Tiny Operating System (OS) Lab						
Biomedical Technology and Innovation (BTI)	BM29T	Point of Care Technology	Theory	2	15	20	40	075
	BM29P	Point of Care Technology Lab	Practical	1	25	-	25	050

[#]For details of Specialization Certificate, refer Appendix-A

Third Year B. Tech. Biomedical Engineering - Summer Break

Course		Head of Learning	Credits	Assessment Guidelines (Marks)			Total marks (Passing@40% of total marks)
Code	Name			ISA	MSE	ESE	
BM41[*]	Industry Internship	Practical	5	75	-	75	150

[*]150+ hours of industry internship to be done during inter semester break between semester 6 and semester 7.

NOTE: As per Institute guidelines, the results of courses completed in inter-semester break will appear in the marksheet of the next semester.

Final Year B. Tech. Biomedical Engineering **Semester: VII**

Course Structure and Assessment guidelines

Course		Head of Learning	Credits	Assessment guidelines (Marks)			Total marks (Passing@40% of total marks)
Code	Name			ISA	MSE	ESE	
BMXXT	Prof. Elective 4	Theory	2	15	20	40	075
BMXXP	Prof. Elective 4 Lab	Practical	1	25	-	25	050
BMXXT	Prof. Elective 5	Theory	2	15	20	40	075
BMXXP	Prof. Elective 5 Lab	Practical	1	25	-	25	050
BMXXT	Prof. Elective 6	Theory	2	15	20	40	075
BMXXP	Prof. Elective 6 Lab	Practical	1	25	-	25	050
OEXX*	Any 2 from the offered Open Elective courses	Theory	3	20	30	50	100
OEXX*		Theory	3	20	30	50	100
BM42	Project-1 Synopsis	Theory	3	50	-	50	100
		Total	**18**				
Course credits completed during the previous inter-semester break will appear in this semester marksheet							
BM41	Industry Internship	Practical	5	75	-	75	150

ISA=In Semester Assessment, MSE= Mid Semester Examination, ESA= End Semester Examination
*Selection based on the subset of OE courses made available by the Institute for the semester.

The assessment guidelines for the courses of different credits are mentioned above. Notwithstanding the above, each course faculty shall have the choice to propose her/his assessment methodology based on the nature of the course. However, the proposed assessment methodology shall be approved by a panel constituted at Institute level and published to the learners before the commencement of the semester.

Professional Elective -4 Courses (BMXX)

Specialization Track Name#	Course		Head of Learning	Credits	Assessment guidelines (Marks)			Total marks (Passing@40 % of total marks)
	Code	Name			ISA	MSE	ESE	
Artificial Intelligence-Machine Learning (AIML)	BM30T	Deep learning	Theory	2	15	20	40	075
	BM30P	Deep learning Lab	Practical	1	25	-	25	050
Internet of Things (IoT)	BM31T	Internet of Things (IoT) and Edge Computing	Theory	2	15	20	40	075
	BM31P	Internet of Things (IoT) and Edge	Practical	1	25	-	25	050

Specialization Track Name#	Course		Head of Learning	Credits	Assessment guidelines (Marks)			Total marks (Passing@40 % of total marks)
	Code	Name			ISA	MSE	ESE	
		Computing Lab						
Biomedical Technology and Innovation (BTI)	BM32T	Biomedical Equipment Safety	Theory	2	15	20	40	075
	BM32P	Biomedical Equipment Safety Lab	Practical	1	25	-	25	050

#For details of Specialization Certificate, refer Appendix-A

Professional Elective -5 Courses (BMXX)

Specialization Track Name#	Course		Head of Learning	Credits	Assessment guidelines (Marks)			Total marks (Passing@40 % of total marks)
	Code	Name			ISA	MSE	ESE	
Artificial Intelligence-Machine Learning (AIML)	BM33T	Data Analytics	Theory	2	15	20	40	075
	BM33P	Data Analytics Lab	Practical	1	25	-	25	050
Internet of Things (IoT)	BM34T	Internet of Things (IoT) Security and Trust	Theory	2	15	20	40	075
	BM34P	Internet of Things (IoT) Security and Trust Lab	Practical	1	25	-	25	050
Biomedical Technology and Innovation (BTI)	BM35T	Medical Device Regulation	Theory	2	15	20	40	075
	BM35P	Medical Device Regulation Lab	Practical	1	25	-	25	050

#For details of Specialization Certificate, refer Appendix-A

Professional Elective -6 Courses (BMXX)

Specialization Track Name#	Course		Head of Learning	Credits	Assessment guidelines (Marks)			Total marks (Passing@40% of total marks)
	Code	Name			ISA	MSE	ESE	
Artificial Intelligence-Machine Learning (AIML)	BM36T	Basics of Natural Language Processing	Theory	2	15	20	40	075
	BM36P	Basics of Natural Language Processing Lab	Practical	1	25	-	25	050
Internet of Things (IoT)	BM37T	Industrial Internet of Things (IIoT)	Theory	2	15	20	40	075
	BM37P	Industrial Internet of Things (IIoT) Lab	Practical	1	25	-	25	050
Biomedical Technology and Innovation (BTI)	BM38T	Installation & Maintenance of Medical Equipment	Theory	2	15	20	40	075
	BM38P	Installation & Maintenance of Medical Equipment Lab	Practical	1	25	-	25	050

#For details of Specialization Certificate, refer Appendix-A

Final Year B. Tech. Biomedical Engineering **Semester: VIII**

Course Structure and Assessment guidelines

Course		Head of Learning	Credits	Assessment guidelines (Marks)			Total marks (Passing@40% of total marks)
Code	Name			ISA	MSE	ESE	
OEXX*	Any 3 Open Elective courses from the list offered.	Theory	3	20	30	50	100
OEXX*		Theory	3	20	30	50	100
OEXX*		Theory	3	20	30	50	100
BM43	Publication / Patent	Practical	2	25		50	075
BM44	Project 2 - Demonstration	Theory+ Practical	4	75	-	50	125
		Total	**15**				

ISA=In Semester Assessment, MSE= Mid Semester Examination, ESA= End Semester Examination
*Selection based on the subset of OE courses made available by the Institute for the semester.

The assessment guidelines for the courses of different credits are mentioned above. Notwithstanding the above, each course faculty shall have the choice to propose her/his assessment methodology based on the nature of the course. However, the proposed assessment methodology shall be approved by a panel constituted at Institute level and published to the learners before the commencement of the semester.

Appendix-A
Guidelines for Professional Elective Courses and Specialization Certificate

Professional Elective courses are designed to meet industrial requirements. All learners must opt for 6 professional elective courses (both Theory and Practical component) as a part of requirement for B.Tech. degree.

Specialization Certificate is introduced in order to build competency of learners in the chosen domain. Department of Biomedical Engineering offers the following specialization tracks:

1. Artificial Intelligence-Machine Learning (AIML)
2. Internet of Things (IoT)
3. Biomedical Technology and Innovation

Learners can take courses from any track. **However, if learners complete all professional elective courses from the same chosen track, they will be eligible to receive a Specialization Certificate from the institute.**

Learners who choose professional elective courses from different specialization tracks from semester are not eligible for a Specialization Certificate.

It should be noted that there are no additional credit requirements for these specializations.

AIML Track: Courses to be chosen for specialization in Artificial Intelligence-Machine Learning

Semester	Course Code	Course Name
V	BM21T	Integrated Data Management
V	BM21P	Integrated Data Management Lab
VI	BM24T	Artificial Intelligence
VI	BM24P	Artificial Intelligence Lab
VI	BM27T	Machine Learning
VI	BM27P	Machine Learning lab
VII	BM30T	Deep learning
VII	BM30P	Deep learning Lab
VII	BM33T	Data Analytics
VII	BM33P	Data Analytics Lab
VII	BM36T	Basics of Natural Language Processing
VII	BM36P	Basics of Natural Language Processing

IoT Track: Courses to be chosen for specialization in Internet of Things

Semester	Course Code	Course Name
V	BM22T	Modern Sensors for Internet of Things (IoT)
V	BM22P	Modern Sensors for Internet of Things (IoT) Lab
VI	BM25T	Principles of Internet of Things (IoT)
VI	BM25P	Principles of Internet of Things (IoT) Lab
VI	BM28T	Embedded System Design with Tiny Operating System (OS)

Semester	Course Code	Course Name
VI	BM28P	Embedded System Design with Tiny Operating System (OS) Lab
VII	BM31T	Internet of Things (IoT) and Edge Computing
VII	BM31P	Internet of Things (IoT) and Edge Computing Lab
VII	BM34T	Internet of Things (IoT) Security and Trust
VII	BM34P	Internet of Things (IoT) Security and Trust Lab
VII	BM37T	Industrial Internet of Things (IIoT)
VII	BM37P	Industrial Internet of Things (IIoT) Lab

BTI Track: Courses to be chosen for specialization in Biomedical Technology and Innovation

Semester	Course Code	Course Name
V	BM23T	Bio-Photonics
V	BM23P	Bio-Photonics Lab
VI	BM26T	Robotics in Medicine
VI	BM26P	Robotics in Medicine Lab
VI	BM29T	Point of Care Technology
VI	BM29P	Point of Care Technology Lab
VII	BM32T	Biomedical Equipment Safety
VII	BM32P	Biomedical Equipment Safety Lab
VII	BM35T	Medical Device Regulation
VII	BM35P	Medical Device Regulation Lab
VII	BM38T	Installation & Maintenance of Medical Equipment
VII	BM38P	Installation & Maintenance of Medical Equipment Lab