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

with Multidisciplinary Minor

Programme Structure (R-2023)

(As per NEP 2020, with effect from Academic Year 2023-24)

Preamble

The National Education Policy (NEP) framework aims to break the mould from teacher centric to student centric educational practices. It empowers the students with flexibility in terms of choosing courses across different faculties and mode of learning.
This multidisciplinary approach will encourage learners to follow their passion and inherent interests. The learner is free to learn at a pace that he is comfortable with and this enables lifelong learning. It also enhances the scope for holistic personality development.
This premise is truly reflected in preamble of the NEP document, "The future of nation is decided in the classrooms of the schools and colleges today".

Details of implementation:
NEP curriculum framework enables us to accelerate change, redesign systems with equity in mind, respond to feedback, encourage collaboration, catch and pollinate ideas and create a culture of research and development. It will allow us to offer the required academic flexibility which will focus on improving competency level of students with diverse strengths.
The curriculum planned by VIT has vertical **Program Courses** consisting of core courses (PCC) of branch of engineering positioned and sequenced to achieve sequential and integral learning of the entire breadth of the specific branch. This vertical also includes Programme Elective courses (PEC) which offer flexibility and diversity to learners to choose specialization from a basket of recent developments in their field of technology. The selection of unique Programme Elective courses based on industrial requirements and organizing them into tracks is a special feature of this curricula ensuring employability.

The vertical **Multidisciplinary Courses** consist of Open Elective (OE) courses and multidisciplinary minor (MD M) courses. Special vocational and skill development courses are included as a part of **Skill courses** vertical that make students capable to work in industrial environment.

The student is expected to demonstrate their ability through course in **Experiential Learning Courses** vertical like internships/On Job Training, Community Engagement Project, Real Industry Project/ research problem. Our curriculum also introduces Social Service Internship and Internship with institutes abroad along with courses like Design Thinking. This will lead to creation of products and/ or patents through this program.

For holistic development of students, apart from technical courses, Ability Enhancement Courses, Entrepreneurship/Economics/Management Courses, Indian Knowledge System and Value Education courses from vertical **Humanities and Social Science and Management** develop the required soft-skills and attitude amongst learners.
In **Liberal Learning** vertical. courses like Various Dance Forms, Global citizenship Education, Facets of Astronomy etc. aim to create balance in brain hemispheres and hence improve learners' clarity in thoughts and responses.
In addition, our framework offers Honors/ Honours by Research/ Double Minor (Multidisciplinary Minor and Specialization Minor) degree in each UG programme of engineering. It includes specialized courses along with field/ domain study that make students capable of working on industry relevant problems.

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

Chairman, Academic Council
Vidyalankar Institute of Technology

VERTICAL BASED CREDIT ALLOTMENT

Sr. No.	Verticals	Baskets	Credits
I	BSC/ESC	Basic Science Course	15
		Engineering Science Courses	12
II	Program Courses	Program Core Courses (PCC)	46
		Program Elective Courses (PEC)	18
III	Multidisciplinary Courses	Multidisciplinary Minor (MD M)	14
		Open Elective (OE) Other than a particular Program	8
IV	Skill Courses	Vocational and Skill Enhancement course (VSEC)	9
V	Humanities, Social Sciences and Management (HSSM)	Ability Enhancement Course (AEC -01, AEC-02)	6
		Entrepreneurship/Economics/ Management Courses	3
		Indian Knowledge System (IKS)	2
		Value Education Course (VEC)	3
VI	Experiential Learning Courses	Research Methodology	3
		Comm. Engagement. Project (CEP)/Field Project (FP)	2
		Project	7
		Internship/ OJT	12
VII	Liberal Learning Courses	Co-curricular Courses (CC)	4
		Total	**164**

Learner is expected to complete requirement of 164 credits (with minimum credits under each vertical and/or bucket as mentioned above) for B.Tech. degree in Biomedical Engineering with Multidisciplinary Minor.

Additionally, learners can choose to avail i) B.Tech. in Biomedical Engineering – Honors and Multidisciplinary Minor or ii) B.Tech. in Biomedical Engineering - Honours with Research and Multidisciplinary Minor or iii) B.Tech. in Biomedical Engineering with Double Minors (Multidisciplinary and Specialization Minor) Degree by completing requirements of 18 credits, which will be over and above the 164 credits required for B.Tech. with Multidisciplinary Minor degree.

For details of add-on Honours/ Minor Degree refer to Honours/Minor Degree document of B.Tech. Biomedical Engineering Programme applicable for R-2023 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 Baskets

I. Basic Science Courses

Sr. No.	Course Code	Course Title	Hours Per Week			Credits	Preferred Semester
			Theory	Practical	Tutorial		
1	BSC02*	Engineering Mathematics-I	3	-	-	3	1
2	BSC04*	Engineering Mathematics-II	3	-	-	3	2
3	BSC06	Engineering Mathematics - III	3	-	-	3	3
4	BSC08	Engineering Mathematics - IV	3	-	-	3	4
5	BSC11T*	Engineering Chemistry	2		-	2	2
6	BSC11P*	Engineering Chemistry Lab	-	2	-	1	2

*** Courses exempted for Direct Second Year (DSY) students who will secure admission through lateral entry from the A.Y. 2024-25 onwards.**

II. Engineering Science Courses

Sr. No.	Course Code	Course Title	Hours Per Week			Credits	Preferred Semester
			Theory	Practical	Tutorial		
1	ESC01T*	Engineering Graphics	2	-	-	2	2
2	ESC01P*	Engineering Graphics Lab	-	2	-	1	2
3	ESC02T*	Engineering Mechanics	2	-	-	2	1
4	ESC02P*	Engineering Mechanics Lab	-	2	-	1	1
5	ESC06T*	Basic Electrical & Electronics Engineering	2	-	-	2	1
6	ESC06P*	Basic Electrical & Electronics Engineering Lab	-	2	-	1	1
7	ESC10T	Electronic Devices and Circuits	2	-	-	2	3
8	ESC10P	Electronic Devices and Circuits	-	2	-	1	3

*** Courses exempted for Direct Second Year (DSY) students who will secure admission through lateral entry from the A.Y. 2024-25 onwards.**

III. Program Core Courses

Sr. No.	Course Code	Course Title	Hours Per Week			Credits	Preferred Semester
			Theory	Practical	Tutorial		
1	PCBM01T*	Physics for Biomedical Engineering	2	-	-	2	1
2	PCBM01P*	Physics for Biomedical Engineering Lab	-	2	-	1	1
3	PCBM02T	Biomedical Transducers and Control Systems	2	-	-	2	3
4	PCBM02P	Biomedical Transducers and Control Systems Lab	-	2	-	1	3
5	PCBM03T	Human Anatomy & Physiology	2	-	-	2	3
6	PCBM03P	Human Anatomy & Physiology Lab	-	2	-	1	3
7	PCBM04T	Digital logic design and analysis	2	-	-	2	4
8	PCBM04P	Digital logic design and analysis Lab	-	2	-	1	4
9	PCBM05	Biomechanics Prosthetics and Orthotics	2	-	1	3	4
10	PCBM06T	Analytical and Clinical Equipment	2	-	-	2	4
11	PCBM06P	Analytical and Clinical Equipment Lab	-	2	-	1	4
12	PCBM07T	Linear Integrated Circuits	2	-	-	2	4
13	PCBM07P	Linear Integrated Circuits Lab	-	2	-	1	4
14	PCBM08T	Biological Modelling and Simulation	2	-	-	2	4

Sr. No.	Course Code	Course Title	Hours Per Week			Credits	Preferred Semester
			Theory	Practical	Tutorial		
15	PCBM08P	Biological Modelling and Simulation Lab	-	2	-	1	4
16	PCBM09T	Diagnostic and Monitoring Equipment	2	-	-	2	5
17	PCBM09P	Diagnostic and Monitoring Equipment Lab	-	2	-	1	5
18	PCBM10T	Microprocessors and Microcontrollers	2	-	-	2	5
19	PCBM10P	Microprocessors and Microcontrollers Lab	-	2	-	1	5
20	PCBM11T	Biomedical Digital Signal Processing	2	-	-	2	5
21	PCBM11P	Biomedical Digital Signal Processing Lab	-	2	-	1	5
22	PCBM12T	Medical Imaging Equipment	2	-	-	2	5
23	PCBM12P	Medical Imaging Equipment Lab	-	2	-	1	5
24	PCBM13T	Critical Care Equipment	2	-	-	2	6
25	PCBM13P	Critical Care Equipment Lab	-	2	-	1	6
26	PCBM14T	Digital Image Processing	2	-	-	2	6
27	PCBM14P	Digital Image Processing Lab	-	2	-	1	6
28	PCBM15	Biomedical Microsystems	2	-	-	2	6
29	PCBM16	Hospital Management	2	-	-	2	6

*** Courses exempted for Direct Second Year (DSY) students who will secure admission through lateral entry from the A.Y. 2024-25 onwards.**

IV. Program Elective Courses

Sr. No.	Course Code	Course Title	Hours Per Week			Credits	Preferred Semester
			Theory	Practical	Tutorial		
1	PEBM01T	Integrated Data Management	2	-	-	2	5
2	PEBM01P	Integrated Data Management Lab	-	2	-	1	5
3	PEBM02T	Modern Sensors for Internet of Things (IoT)	2	-	-	2	5
4	PEBM02P	Modern Sensors for Internet of Things (IoT) Lab	-	2	-	1	5
5	PEBM03T	Bio-Photonics	2	-	-	2	5
6	PEBM03P	Bio-Photonics Lab	-	2	-	1	5
7	PEBM04T	Artificial Intelligence	2	-	-	2	6
8	PEBM04P	Artificial Intelligence Lab	-	2	-	1	6
9	PEBM05T	Principles of Internet of Things (IoT)	2	-	-	2	6
10	PEBM05P	Principles of Internet of Things (IoT) Lab	-	2	-	1	6
11	PEBM06T	Robotics in Medicine	2	-	-	2	6
12	PEBM06P	Robotics in Medicine Lab	-	2	-	1	6
13	PEBM07T	Machine Learning	2	-	-	2	6
14	PEBM07P	Machine Learning Lab	-	2	-	1	6
15	PEBM08T	Embedded System Design with Tiny Operating System (OS)	2	-	-	2	6
16	PEBM08P	Embedded System Design with Tiny Operating System (OS) Lab	-	2	-	1	6
17	PEBM09T	Point of Care Technology	2	-	-	2	6
18	PEBM09P	Point of Care Technology Lab	-	2	-	1	6
19	PEBM10T	Deep learning	2	-	-	2	7
20	PEBM10P	Deep learning Lab	-	2	-	1	7

Sr. No.	Course Code	Course Title	Hours Per Week			Credits	Preferred Semester
			Theory	Practical	Tutorial		
21	PEBM11T	Internet of Things (IoT) and Edge Computing	2	-	-	2	7
22	PEBM11P	Internet of Things (IoT) and Edge Computing Lab	-	2	-	1	7
23	PEBM12T	Biomedical Equipment Safety	2	-	-	2	7
24	PEBM12P	Biomedical Equipment Safety Lab	-	2	-	1	7
25	PEBM13T	Data Analytics	2	-	-	2	7
26	PEBM13P	Data Analytics Lab	-	2	-	1	7
27	PEBM14T	Internet of Things (IoT) Security and Trust	2	-	-	2	7
28	PEBM14P	Internet of Things (IoT) Security and Trust Lab	-	2	-	1	7
29	PEBM15T	Medical Device Regulation	2	-	-	2	7
30	PEBM15P	Medical Device Regulation Lab	-	2	-	1	7
31	PEBM16T	Basics of Natural Language Processing	2	-	-	2	7
32	PEBM16P	Basics of Natural Language Processing Lab	-	2	-	1	7
33	PEBM17T	Industrial Internet of Things (IIoT)	2	-	-	2	7
34	PEBM17P	Industrial Internet of Things (IIoT) Lab	-	2	-	1	7
35	PEBM18T	Installation & Maintenance of Medical Equipment	2	-	-	2	7
36	PEBM18P	Installation & Maintenance of Medical Equipment Lab	-	2	-	1	7

V. Multidisciplinary Minor Courses

Sr. No.	MDM Title	Course Code	Course Name	Hours Per Week			Credits	Preferred Semester
				Theory	Practical	Tutorial		
1	For all MDM	MDM01	Seminar	2	-	-	2	8
2	Bioinformatics	MDMBI01	Introduction to Bioinformatics	3	-	1	4	5
3		MDMBI02	Algorithms and Data Structures in Bioinformatics	3	-	1	4	6
4		MDMBI03	Machine Learning Applications in Bioinformatics	3	-	1	4	7
5	Innovation, Entrepreneurial and Venture Development	MDMIE01	Foundations of Innovation and Entrepreneurship	3	-	1	4	5
6		MDMIE02	Startup Planning and Development	3	-	1	4	6
7		MDMIE03	Innovation Management and Scaling Startups	3	-	1	4	7
8	Business Development, Marketing and Finance	MDMBD01	Introduction to Business Development and Marketing Principles	3	-	1	4	5
9		MDMBD02	Financial Basics for Engineers and Technopreneurs	3	-	1	4	6
10		MDMBD03	Strategic Marketing and Business Planning	3	-	1	4	7
11	Computer Science*	MDMCS01	Computational Logic and Data Structures	3	2	-	4	5
12		MDMCS02	Operating Systems and Computer Networks	3	2	-	4	6
13		MDMCS03	Database Systems and Introduction to Data Mining	3	2	-	4	7

VI. Open Elective Courses

Sr. No.	Course Code	Course Name	Hours Per Week			Credits	Preferred Semester
			Theory	Practical	Tutorial		
1	OEC01	Collaborative Inter-Institute Studies[$]	-	8	-	4	4
2	OEC02	Cyber Law	2	-	-	2	8
3	OEC03	Project Management	2	-	-	2	8
4	OEC04	Product Lifecycle Management	2	-	-	2	8
5	OEC05	Sustainability Management	2	-	-	2	8
6	OEC06	Renewable Energy Management	2	-	-	2	8

$ Collaborative Inter-Institute Studies: Collaborative studies with other reputed institutes equivalent to 4 credits is recommended to be done by learners during second year inter semester break (i.e. summer break between semester 4 and semester 5)

VII. Vocational and Skill Enhancement Courses (VSEC)

Sr. No.	Course Code	Course Name	Hours Per Week			Credits	Preferred Semester
			Theory	Practical	Tutorial		
1	VSEC01T	Structured Programming	2	-	-	2	1
2	VSEC01P	Structured Programming Lab	-	2	-	1	1
3	VSEC02T	Object Oriented Programming	2	-	-	2	2
4	VSEC02P	Object Oriented Programming Lab	-	2	-	1	2
5	VSEC04T	Python Programming	-	2	-	2	3
6	VSEC04P	Python Programming Lab	2	-	-	1	3

VIII. Ability Enhancement Courses

Sr. No.	Course Code	Course Title	Hours Per Week			Credits	Preferred Semester
			Theory	Practical	Tutorial		
1	AEC01T	Effective Communication	2	-	-	2	1

Sr. No.	Course Code	Course Title	Hours Per Week			Credits	Preferred Semester
			Theory	Practical	Tutorial		
2	AEC01P	Effective Communication Lab	-	2	-	1	1
3	AEC02	Technical and Business Writing	1	2	-	2	3
4	AEC03	Presentations Skills	--	2	--	1	4

IX. Entrepreneurship/Economics/ Management Courses

Sr. No.	Course Code	Course Title	Hours Per Week			Credits	Preferred Semester
			Theory	Practical	Tutorial		
1	EEMC01	Design Thinking	2	2	-	3	2
2	EEMC02	Principles of Economics and Management	2	-	-	3	4

X. Indian Knowledge System Courses

Sr. No.	Course Code	Course Title	Hours Per Week			Credits	Preferred Semester
			Theory	Practical	Tutorial		
1	IKS01	Indian Traditional Knowledge System	2	-	-	2	Any
2	IKS02	Indian Constitution	2	-	-	2	Any
3	IKS03	Exploring Indian Art	2	-	-	2	Any

XI. Value Education Courses

Sr. No.	Course Code	Course Title	Hours Per Week			Credits	Preferred Semester
			Theory	Practical	Tutorial		
1	VEC01T	Professional skills	2	-	-	2	Any
2	VEC01P	Professional skills Lab		2	-	1	Any
3	VEC03	Universal Human Values	2	-	-	2	Any
4	VEC04	Responsibility towards sustainable environment	2	-	-	2	Any
5	VEC05	Four Pillars of Democratic Nation	2	-	-	2	Any

XII. Research Methodology Courses

Sr. No.	Course Code	Course Name	Hours Per Week			Credits	Preferred Semester
			Theory	Practical	Tutorial		
1	RM01	Research Methodology	3	-	-	3	8

XIII. Community Engagement Project /Field Project

Sr. No.	Course Code	Course Name	Hours Per Week			Credits	Preferred Semester
			Theory	Practical	Tutorial		
1	CEP01*	Social Service Internship/ Project	-	4	-	2	3/ Break of Sem III&IV

*** For CEP01- Social Service Internship/ Project:** 2 hours / week slot will be provided during the semester (in regular timetable). Additional work of 30 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 results of courses completed in inter-semester break will appear in the marksheet of the next semester.

XIV. Project

Sr. No.	Course Code	Course Name	Hours Per Week			Credits	Preferred Semester
			Theory	Practical	Tutorial		
1	PRJBM01	Mini Project		4		2	5
2	PRJBM02	Project Synopsis	2	-	-	2	6
3	PRJBM03	Project	1	2	-	3	7

XV. Internship/On Job Training

Sr. No.	Course Code	Course Name	Hours Per Week			Credits	Preferred Semester
			Theory	Practical	Tutorial		
1	OJT01	Industry Internship-1	Minimum 150 hours			5	Break of Sem VI&VII
2	OJT02	Industry Internship-2	Minimum 210 hours			7	8

XVI. Liberal Learning Courses/Co-curricular Courses (LLC-CC)

Sr. No.	Course Code	Course Name	Hours Per Week			Credits	Preferred Semester
			Theory	Practical	Tutorial		
1	CC01	Various Dance Forms	2	-	-	2	Any

Sr. No.	Course Code	Course Name	Hours Per Week			Credits	Preferred Semester
			Theory	Practical	Tutorial		
2	CC02	Corporate and Social Etiquettes	2	-	-	2	1/2
3	CC03	Global Citizenship Education	2	-	-	2	1/2
4	CC04	Wellness – Body, Mind & Spirit	2	-	-	2	1/2
5	CC05	IQ vs EQ	2	-	-	2	1/2
6	CC06	Nutrition and Physical Wellness	2	-	-	2	1/2
7	CC07	Facets of Astronomy	2	-	-	2	1/2
8	CC08	Railways - Wonders of Infrastructure	2	-	-	2	1/2
9	CC09	Financial Literacy for Engineers	2	-	-	2	1/2
10	CC10	Mastering Advanced Excel	2	-	-	2	1/2
11	CC11	Personal Grooming Essentials	2	-	-	2	1/2
12	CC12	Various Music Forms	2	-	-	2	1/2

Illustrative Semester wise
Credit Distribution Structure and Assessment Guidelines
(Based on NEP 2020 Guidelines)
for
Bachelor of Technology
in
Biomedical Engineering with Multidsciplinary Minor

Semester			I	II	III	IV	V	VI	VII	VIII	Credits /Audit
Sr. No	**Sub-Category**	**Verticals**									
I	Basic Science Course	BSC/ESC	3	6	3	3					15
	Engineering Science Courses		6	3	3						12
II	Program Core Courses (PCC)	Program Courses	3		6	15	12	10			46
	Program Elective Courses (PEC)						3	6	9		18
III	Multidisciplinary Minor (MD M)	Multidisciplinary Courses					4	4	4	2	14
	Open Elective (OE) Other than a particular Program					4				4	8
IV	Vocational and Skill Enhancement course (VSEC)	Skill Courses	3	3	3						9
V	Ability Enhancement Course (AEC -01, AEC-02)	Humanities, Social Sciences and Management (HSSM)	3		2	1					6
	Entrepreneurship/Economics/ Management Courses			3							3
	Indian Knowledge System (IKS)					2					2
	Value Education Course (VEC)			3							3
VI	Research Methodology	Experiential Learning Courses								3	3
	Comm. Engagement. Project (CEP)/Field Project (FP)				2						2
	Project						2	2	3		7
	Internship/ OJT							5		7	12
VII	Co-curricular Courses (CC)	Liberal Learning Courses	2	2							4
	Total		20	20	19	25	21	27	16	16	**164**

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

Course Structure and Assessment guidelines

Vertical_ Subvertical	Course		Head of Learning	Credits	Assessment guidelines (Marks)			Total marks (Passing@40% of total marks)
	Code	Name			ISA	MSE	ESE	
BESC_BSC	BSC02	Engineering Mathematics-I	Theory	3	20	30	50	100
BESC _ESC	ESC02T	Engineering Mechanics	Theory	2	15	20	40	075
BESC _ESC	ESC02P	Engineering Mechanics Lab	Practical	1	25	-	25	050
BESC _ESC	ESC06T	Basic Electrical Engineering	Theory	2	15	20	40	075
BESC _ESC	ESC06P	Basic Electrical Engineering Lab	Practical	1	25	-	25	050
PC_PCC	PCBM01T	Physics for Biomedical Engineering	Theory	2	15	20	40	075
PC_PCC	PCBM01P	Physics for Biomedical Engineering Lab	Practical	1	25	-	25	050
HSSM_AEC	AEC01T	Effective Communication	Theory	2	15	20	40	075
HSSM_AEC	AEC01P	Effective Communication Lab	Practical	1	25	-	25	050
SC_VSEC	VSEC01T	Structured Programming	Theory	2	15	20	40	075
SC_VSEC	VSEC01P	Structured Programming Lab	Practical	1	25	-	25	050
LLC_CC	CCXX*	Any LLC_CC course from the list	As per course	2	25		50	075
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.

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

Course Structure and Assessment guidelines

Vertical_ Subvertical	Course		Head of Learning	Credits	Assessment guidelines (Marks)			Total marks (Passing@40% of total marks)
	Code	Name			ISA	MSE	ESE	
BESC_BSC	BSC04	Engineering Mathematics-II	Theory	3	20	30	50	100
BESC_BSC	BSC11T	Engineering Chemistry	Theory	2	15	20	40	075
BESC_BSC	BSC11P	Engineering Chemistry Lab	Practical	1	25	-	25	050
BESC_ESC	ESC01T	Engineering Graphics	Theory	2	15	20	40	075
BESC_ESC	ESC01P	Engineering Graphics Lab	Practical	1	25	-	25	050
HSSM_VEC	VEC01T	Professional Skills	Theory	2	15	20	40	075
HSSM_VEC	VEC01P	Professional Skills Lab	Practical	1	25	-	25	050
SC_VSEC	VSEC02T	Object-Oriented Programming	Theory	2	15	20	40	075
SC_VSEC	VSEC02P	Object-Oriented Programming Lab	Practical	1	25	-	25	050
HSSM_EEMC	EEMC01	Design thinking	Theory+ Practical	3			125	125
LLC_CC	CCXX*	Any LLC_CC course from the list	As per course	2	25	-	50	075
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.

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

Course Structure and Assessment guidelines

Vertical_ Subvertical	Course		Head of Learning	Credits	Assessment guidelines (Marks)			Total marks (Passing@40% of total marks)
	Code	Name			ISA	MSE	ESE	
BESC_BSC	BSC06	Engineering Mathematics - III	Theory	3	20	30	50	100
BESC_ESC	ESC10T	Electronic Devices and Circuits	Theory	2	15	20	40	075
BESC_ESC	ESC10P	Electronic Devices and Circuits Lab	Practical	1	25	-	25	050
PC_PCC	PCBM02T	Biomedical Transducers and Control Systems	Theory	2	15	20	40	075
PC_PCC	PCBM02P	Biomedical Transducers and Control Systems Lab	Practical	1	25	-	25	050
PC_PCC	PCBM03T	Human Anatomy & Physiology	Theory	2	15	20	40	075
PC_PCC	PCBM03P	Human Anatomy & Physiology Lab	Practical	1	25	-	25	050
SC_VSEC	VSEC04T	Python Programming	Theory	2	15	20	40	075
SC_VSEC	VSEC04P	Python Programming Lab	Practical	1	25	-	25	050
HSSM_AEC	AEC02	Technical and Business Writing	Theory +Practical	2	75	-	-	075
CEP/FP	CEP01	Social Service Internship/ Project	Practical	2	-	-	75	075
Total				**19**				

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

*Selection based on the subset of courses made available by the Institute for the semester.

#For CEP01- Social Service Internship/ Project: 2 hours / week slot will be provided during the semester (in regular timetable). Additional work of 30 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 results 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 **Preferred Semester: IV**

Course Structure and Assessment guidelines

Vertical_ Subvertical	Course		Head of Learning	Credits	Assessment guidelines (Marks)			Total marks (Passing@40% of total marks)
	Code	Name			ISA	MSE	ESE	
BESC_BSC	BSC08	Engineering Mathematics-IV	Theory	3	20	30	50	100
PC_PCC	PCBM04T	Digital logic design and analysis	Theory	2	15	20	40	075
PC_PCC	PCBM04P	Digital logic design and analysis Lab	Practical	1	25	-	25	050
PC_PCC	PCBM05T	Biomechanics, Prosthetic and Orthotics	Theory	2	15	20	40	075
PC_PCC	PCBM05P	Biomechanics, Prosthetic and Orthotics	Practical	1	25	-	25	050
PC_PCC	PCBM06T	Analytical and Clinical Equipment	Theory	2	15	20	40	075
PC_PCC	PCBM06P	Analytical and Clinical Equipment Lab	Practical	1	25	-	25	050
PC_PCC	PCBM07T	Linear Integrated Circuits	Theory	2	15	20	40	075
PC_PCC	PCBM07P	Linear Integrated Circuits Lab	Practical	1	25	-	25	050
PC_PCC	PCBM08T	Biological Modelling and Simulation	Theory	2	15	20	40	075
PC_PCC	PCBM08P	Biological Modelling and Simulation Lab	Practical	1	25	-	25	050
HSSM_AEC	AEC03	Presentation Skills	Practical	1	50	-	-	050
HSSM_IKS	IKSXX	Any HSSM_IKS course from Basket	As per course	2	25	-	50	075
Total				**21**				
Course credits completed during the previous inter-semester break will appear in this semester marksheet								
CEP/FP	CEP01	Social Service Internship/ Project	Practical	2	-	-	75	75

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	
OEC01[$]	Collaborative Inter-Institute Studies	As per course	4	125	-	-	125

[$] **For Collaborative Inter-Institute Studies:** Collaboration 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 **Preferred Semester: V**

Course Structure and Assessment guidelines

Vertical_ Subvertical	Course		Head of Learning	Credits	Assessment guidelines (Marks)			Total marks (Passing@40% of total marks)
	Code	Name			ISA	MSE	ESE	
PC_PCC	PCBM09T	Diagnostic and Monitoring Equipment	Theory	2	15	20	40	075
PC_PCC	PCBM09P	Diagnostic and Monitoring Equipment Lab	Practical	1	25	-	25	050
PC_PCC	PCBM10T	Microprocessors and Microcontrollers	Theory	2	15	20	40	075
PC_PCC	PCBM10P	Microprocessors and Microcontrollers Lab	Practical	1	25	-	25	050
PC_PCC	PCBM11T	Biomedical Digital Signal Processing	Theory	2	15	20	40	075
PC_PCC	PCBM11P	Biomedical Digital Signal Processing Lab	Practical	1	25	-	25	050
PC_PCC	PCBM12T	Medical Imaging Equipment	Theory	2	15	20	40	075
PC_PCC	PCBM12P	Medical Imaging Equipment Lab	Practical	1	25	-	25	050
PC_PEC	PEBMXXT	Programme Elective 1	Theory	2	15	20	40	075
PC_PEC	PEBMXXP	Programme Elective 1 Lab	Practical	1	25	-	25	050
MDC_MDM	MDMXX	Multidisciplinary Minor Course-1	Theory	4	45	30	50	125
ELC_PRJ	PRJBM01	Mini Project	Practical	2	25	-	50	075
	Total			**21**				
Course credits completed during the previous inter-semester break will appear in this semester marksheet								
MDC-OE	OEC01	Collaborative Inter-Institute Studies (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 Programme Elective Courses and Specialization Certificate – Refer Appendix-A

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

Guidelines for Multidisciplinary Elective Courses and Minor Degree – Refer Appendix-B

Learners are required to go through the Appendix-B carefully before selecting the Multidisciplinary Elective courses. Detailed guidelines regarding Multidisciplinary Elective courses, Minor Degree Titles and courses relevant to each MDM Title are given in Appendix-B.

Guidelines for Award of Honours/ Honours by Research / Double Minor (Multidisciplinary and Specialization) Degree

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

Third Year B. Tech. Biomedical Engineering **Preferred Semester: VI**

Course Structure and Assessment guidelines

Vertical_ Subvertical	Course		Head of Learning	Credits	Assessment guidelines (Marks)			Total marks (Passing@40% of total marks)
	Code	Name			ISA	MSE	ESE	
PC_PCC	PCBM13T	Critical Care Equipment	Theory	2	15	20	40	075
PC_PCC	PCBM13P	Critical Care Equipment Lab	Practical	1	25	-	25	050
PC_PCC	PCBM14T	Digital Image Processing	Theory	2	15	20	40	075
PC_PCC	PCBM14P	Digital Image Processing Lab	Practical	1	25	-	25	050
PC_PCC	PCBM15	Biomedical Microsystems	Theory	2	15	20	40	075
PC_PCC	PCBM16	Hospital Management	Theory	2	15	20	40	075
PC_PEC	PEBMXXT	Programme Elective 2	Theory	2	15	20	40	075
PC_PEC	PEBMXXP	Programme Elective 2 Lab	Practical	1	25	-	25	050
PC_PEC	PEBMXXT	Programme Elective 3	Theory	2	15	20	40	075
PC_PEC	PEBMXXP	Programme Elective 3 Lab	Practical	1	25	-	25	050
MDC_MDM	MDMXX	Multidisciplinary Minor-2	Theory	4	45	30	50	125
ELC_PRJ	PRJBM02	Project Synopsis	Theory	2	25	-	50	075
	Total			**22**				

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

*Selection based on the subset of courses made available by the Institute for the semester.

#Selection based on the MD M Title chosen by the student.

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 Programme Elective Courses and Specialization Certificate – Refer Appendix-A

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

Guidelines for Multidisciplinary Elective Courses and Minor Degree – Refer Appendix-B

Learners are required to go through the Appendix-B carefully before selecting the Multidisciplinary Elective courses. Detailed guidelines regarding Multidisciplinary Elective courses, Minor Degree Titles and courses relevant to each MDM Title are given in Appendix-B.

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	
OJT01	Industry Internship-1	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 **Preferred Semester: VII**

Course Structure and Assessment guidelines

Vertical_ Subvertical	Course		Head of Learning	Credits	Assessment guidelines (Marks)			Total marks (Passing@40% of total marks)
	Code	Name			ISA	MSE	ESE	
PC_PEC	PEBMXXT	Programme Elective 4	Theory	2	15	20	40	075
PC_PEC	PEBMXXP	Programme Elective 4 Lab	Practical	1	25	-	25	050
PC_PEC	PEBMXXT	Programme Elective 5	Theory	2	15	20	40	075
PC_PEC	PEBMXXP	Programme Elective 5 Lab	Practical	1	25	-	25	050
PC_PEC	PEBMXXT	Programme Elective 6	Theory	2	15	20	40	075
PC_PEC	PEBMXXP	Programme Elective 6 Lab	Practical	1	25	-	25	050
MDC_MDM	MDMXX	Multidisciplinary Minor-3	Theory	4	45	30	50	125
ELC_PRJ	PRJBM03	Project	Theory+ Practical	3	50	-	50	100
	Total			**17**				
Course credits completed during the previous inter-semester break will appear in this semester marksheet								
INT/OJT	OJT01	Industry Internship-1	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.

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

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

Guidelines for Multidisciplinary Elective Courses and Minor Degree – Refer Appendix-B

Learners are required to go through the Appendix-B carefully before selecting the Multidisciplinary Elective courses. Detailed guidelines regarding Multidisciplinary Elective courses, Minor Degree Titles and courses relevant to each MDM Title are given in Appendix-B.

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

Course Structure and Assessment guidelines

Vertical_ Subvertical	Course		Head of Learning	Credits	Assessment guidelines (Marks)			Total marks (Passing@40% of total marks)
	Code	Name			ISA	MSE	ESE	
MDC_MDM	MDM01	Seminar	Theory	2	25		50	075
MDC_OE	OECXX*	Any 2 Open Elective courses from the list offered.	Theory	2	15	20	40	075
MDC_OE	OECXX*		Theory	2	15	20	40	075
ELC_RM	RM01	Research Methodology	Theory	3	20	30	50	100
INT/OJT	OJT02	Industry Internship-2	Practical	7	100		100	200
	Total Credits			**16**				

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 Programme Elective Courses and Specialization Certificate

Programme Elective courses are designed to meet industrial requirements. All learners must opt for 6 Programme 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 Programme Elective courses from the same chosen track, they will be eligible to receive a Specialization Certificate from the institute.**

Learners who choose Programme 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 and Machine Learning

Semester	Course Code	Course Name
V	PEBM21T	Integrated Data Management
V	PEBM21P	Integrated Data Management Lab
VI	PEBM24T	Artificial Intelligence
VI	PEBM24P	Artificial Intelligence Lab
VI	PEBM27T	Machine Learning
VI	PEBM27P	Machine Learning lab
VII	PEBM30T	Deep learning
VII	PEBM30P	Deep learning Lab
VII	PEBM33T	Data Analytics
VII	PEBM33P	Data Analytics Lab
VII	PEBM36T	Basics of Natural Language Processing
VII	PEBM36P	Basics of Natural Language Processing

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

Semester	Course Code	Course Name
V	PEBM22T	Modern Sensors for Internet of Things (IoT)
V	PEBM22P	Modern Sensors for Internet of Things (IoT) Lab
VI	PEBM25T	Principles of Internet of Things (IoT)
VI	PEBM25P	Principles of Internet of Things (IoT) Lab

VI	PEBM28T	Embedded System Design with Tiny Operating System (OS)
VI	PEBM28P	Embedded System Design with Tiny Operating System (OS) Lab
VII	PEBM31T	Internet of Things (IoT) and Edge Computing
VII	PEBM31P	Internet of Things (IoT) and Edge Computing Lab
VII	PEBM34T	Internet of Things (IoT) Security and Trust
VII	PEBM34P	Internet of Things (IoT) Security and Trust Lab
VII	PEBM37T	Industrial Internet of Things (IIoT)
VII	PEBM37P	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	PEBM23T	Bio-Photonics
V	PEBM23P	Bio-Photonics Lab
VI	PEBM26T	Robotics in Medicine
VI	PEBM26P	Robotics in Medicine Lab
VI	PEBM29T	Point of Care Technology
VI	PEBM29P	Point of Care Technology Lab
VII	PEBM32T	Biomedical Equipment Safety
VII	PEBM32P	Biomedical Equipment Safety Lab
VII	PEBM35T	Medical Device Regulation
VII	PEBM35P	Medical Device Regulation Lab
VII	PEBM38T	Installation & Maintenance of Medical Equipment
VII	PEBM38P	Installation & Maintenance of Medical Equipment Lab

Appendix-B
Guidelines for Multidisciplinary Elective Courses and Minor Degree

In alignment with the NEP objectives and the evolving demands of the engineering profession, the introduction of a Multidisciplinary Minor Degree within the Undergraduate Engineering Programme aims to foster academic breadth, innovation, and cross-domain competence. These guidelines are formulated to support the structured integration of multidisciplinary elective courses, enabling students to pursue focused study in areas beyond their core engineering discipline.

The Department of Biomedical Engineering offers the following Multidisciplinary Minor Degree Titles for B.Tech. Biomedical Engineering students:

1. Bioinformatics (BI)
2. Innovation, Entrepreneurial and Venture Development (IE)
3. Business Development, Marketing and Finance (BD)
4. Computer Science (CS)

It should be noted that it is mandatory to choose one Multidisciplinary Minor (MD M) Degree Programme as a part of B.Tech. Biomedical Engineering degree.

Bioinformatics (BI): Courses to be completed successfully for MD M in Bioinformatic.

Semester	Course Code	Course Name
V	MDMBI01	Introduction to Bioinformatics
VI	MDMBI02	Algorithms and Data Structures in Bioinformatics
VII	MDMBI03	Machine Learning Applications in Bioinformatics

Innovation, Entrepreneurial and Venture Development (IE): Courses to be completed successfully for MD M in Innovation, Entrepreneurial and Venture Development.

Semester	Course Code	Course Name
V	MDMIE01	Foundations of Innovation and Entrepreneurship
VI	MDMIE02	Startup Planning and Development
VII	MDMIE03	Innovation Management and Scaling Startups

Business Development, Marketing and Finance (BD): Courses to be completed successfully for MD M in Business Development, Marketing and Finance.

Semester	Course Code	Course Name
V	MDMBD01	Introduction to Business Development and Marketing Principles
VI	MDMBD02	Financial Basics for Engineers and Technopreneurs
VII	MDMBD03	Strategic Marketing and Business Planning

Computer Science (CS): Courses to be completed successfully for MD M in Computer Science (CS).

Semester	Course Code	Course Name
V	MDMCS01	Computational Logic and Data Structures
VI	MDMCS02	Operating Systems and Computer Networks
VII	MDMCS03	Database Systems and Introduction to Data Mining