



Vidyalankar Institute of Technology

An Autonomous Institute affiliated to University of Mumbai

Bachelor of Technology

in

Biomedical Engineering

Programme Structure

(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. Autonomy 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)**. 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 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 learner capable to work in 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. In addition to this, the curriculum is augmented with Life Enrichment audit courses for knowledge inspiring experience.

Additionally, curriculum provides add-on minor/honours degree that involves field/ domain study. Learner can avail this degree by completing requirement of additional 15 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
IX		Life Enrichment	Audit
		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 15 credits, which will be over and above the 164 credits required for B.Tech. degree.

Structure of Honour/Minor Degree Programme

Sr. No.	Category	Credits
1	Course Work	9
2	Industry Interaction	1
3	Survey Paper	1
4	Seminar	1
5	Specialized Project	3
Total		15

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
			Lecture	Practical	Tutorial		
1	BS15	Engineering Physics	2	2	-	3	1
2	BS02	Engineering Mathematics-I	3	-	-	3	1
3	BS16	Engineering Chemistry	2	2	-	3	2
4	BS04	Engineering Mathematics-II	3	-	-	3	2
5	BS06	Engineering Mathematics - III	3	-	-	3	3
6	BS18	Human Anatomy & Physiology	2	2	-	3	3
7	BS08	Engineering Mathematics-IV	3	-	-	3	4
8	BS13	Physics of CMOS Devices	2	-	1	3	5

II. Engineering Science Courses:

Sr. No.	Course Code	Course Title	Hours Per Week			Credits	Preferred Semester
			Lecture	Practical	Tutorial		
1	ES02	Engineering Mechanics	2	2	-	3	1
2	ES04	Structured Programming	2	2	-	3	1
3	ES08	Basic Electrical & Electronics Engineering	2	4	-	3	1
4	ES01	Engineering Graphics	2	2	-	3	2
5	ES05	Object Oriented Programming	2	2	-	3	2

III. Core Courses

Sr. No.	Course Code	Course Title	Hours Per Week			Credits	Preferred Semester
			Lecture	Practical	Tutorial		
1	BM01	Digital logics design and analysis	2	2	-	3	3
2	BM02	Biomechanics Prosthetics and Orthotics	2	-	1	3	3
3	BM03	Electronics Circuits and Devices	2	2	-	3	3
4	BM04	Biosensors	2	2	-	3	4
5	BM05	Analytical and Clinical Equipment	2	2	-	3	4
6	BM06	Linear Integrated Circuits	2	2	-	3	4
7	BM07	Biological Modelling and Simulation	2	2	-	3	4
8	BM08	Python Programming	2	2	-	3	4
9	BM09	Diagnostic and Monitoring Equipment	2	2	-	3	5
10	BM10	Microprocessors and Microcontrollers	2	2	-	3	5
11	BM11	Biomedical Digital Signal Processing	2	2	-	3	5
12	BM12	Medical Imaging Equipment	2	2	-	3	5
13	BM13	Critical Care Equipment	2	2	-	3	6
14	BM14	Digital Image Processing	2	2	-	3	6
15	BM15	Biomedical Microsystems	2	2	-	3	6
16	BM16	Hospital Management	2	2	-	3	6

IV. Professional Elective Courses

Sr. No.	Course Code	Course Title	Hours Per Week			Credits	Preferred Semester
			Lecture	Practical	Tutorial		
1	BM21	Statistical Methods in Biomedical Engineering	2	2	-	3	5
2	BM22	Embedded Systems	2	2	-	3	5
3	BM23	Bio photonics	2	2	-	3	5
4	BM24	Healthcare Database Management	2	2	-	3	6
5	BM25	Advance Controllers	2	2	-	3	6
6	BM26	Robotics in Medicine	2	2	-	3	6
7	BM27	Artificial Intelligence and Machine Learning	2	2	-	3	6
8	BM28	Smart Sensors	2	2	-	3	6
9	BM29	Point of Care Technology/Wearable Devices	2	2	-	3	6
10	BM30	Data Science (R Programming)	2	2	-	3	7
11	BM31	Telemedicine	2	2	-	3	7
12	BM32	Biomedical Equipment Safety	2	2	-	3	7
13	BM33	Deep Learning	2	2	-	3	7
14	BM34	Cyber Security in Medical Devices	2	2	-	3	7
15	BM35	Medical Device Regulations	2	2	-	3	7
16	BM36	Blockchain in healthcare	2	2	-	3	7
17	BM37	Networking & Information in Medical System	2	2	-	3	7
18	BM38	Installation & maintenance of Medical Equipment	2	2	-	3	7

V. Open Elective Courses

Sr. No.	Course Code	Course Title	Hours Per Week			Credits	Preferred Semester
			Lecture	Practical	Tutorial		
1	OE01	Cyber Law	3	-	-	3	7
2	OE02	Project Management	3	-	-	3	7
3	OE03	Product Lifecycle Management	3	-	-	3	7
4	OE04	Sustainability Management	3	-	-	3	7
5	OE05	Operation Research	3	-	-	3	7
6	OE06	IPR and Patenting	3	-	-	3	8
7	OE07	Research Methodology	3	-	-	3	8
8	OE08	Renewable Energy Management	3	-	-	3	8
9	OE09	Energy Audit and Management	3	-	-	3	8
10	OE10	E-Farming	3	-	-	3	8
11	OE11	Bioinformatics	3	-	-	3	8
12	OE12	Nanotechnology	3	-	-	3	8

VI. Project and Internship

Sr. No.	Course Code	Course Title	Hours Per Week			Credits	Preferred Semester
			Lecture	Practical	Tutorial		
1	BM39	Mini Project-1	-	4	-	2	5
2	BM40	Mini Project-2	-	4	-	2	6
3	BM41	Industry Internship	-	-	-	5	TE Summer Break
4	BM42	Project-1 Synopsis	3	-	-	3	7
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
			Lecture	Practical	Tutorial		
1	HS01	Effective Communication	2	2	-	3	1

Programme Structure (2022) for Bachelor of Technology (B.Tech.) – Biomedical Engineering

Sr. No.	Course Code	Course Title	Hours Per Week			Credits	Preferred Semester
			Lecture	Practical	Tutorial		
2	HS02	Professional Skills	2	2	-	3	2
3	HS03	Technical and Business Writing	-	4*	-	2	3
4	HS06	Principles of Economics and Management	2	-	1	3	4
5	HS04	Presentation Skills	-	-	1	1	5

*2 hrs. practical class-wise+2 hrs. of practical batch-wise

VIII. General Education

Sr. No.	Course Code	Course Title	Hours Per Week			Credits	Preferred Semester
			Lecture	Practical	Tutorial		
1	GE01	Design Thinking	2	-	1	3	2
2	GE02	Social Service Internship/ Project	-	6	-	3	3
3	GE03	Internship with other Institutes (Credit Transfer)	2	4	-	4	SE Break
4	GE04	Wellness – Body, Mind & Spirit	1	2	-	2	Any
5	GE05	Basics of Finance & Legal aspects for Business	2	-	-	2	Any
6	GE06	Indian Constitution	2	-	-	2	Any
7	GE07	Universal Human Values	2	-	-	2	Any
8	GE08	Indian Traditional Knowledge System	2	-	-	2	Any
9	GE09	Corporate and Social Etiquettes	2	-	-	2	Any
10	GE10	Global Citizenship Education	2	-	-	2	Any

IX. Life Enrichment Courses

Sr. No.	Course Code	Course Title	Hours Per Week	Credits	Preferred Semester
			(Lecture/Practical/Tutorial)		
1	LE01	Photography	2	-	-
2	LE02	Indian Folk Dances	2	-	-

Sr. No.	Course Code	Course Title	Hours Per Week			Credits	Preferred Semester
			Lecture	Practical	Tutorial		
3	LE03	Understanding Indian Classical Music	2	-	-	-	-
4	LE04	Wildlife and Conservation	2	-	-	-	-
5	LE05	Indian ancient education system	2	-	-	-	-
6	LE06	Indian sports	2	-	-	-	-
7	LE07	Indian ancient medicinal therapies	2	-	-	-	-
8	LE08	Indian Post: Connecting people	2	-	-	-	-
9	LE09	Great entrepreneurs	2	-	-	-	-
10	LE10	Success stories of Indian space mission	2	-	-	-	-
11	LE11	Weather and environment	2	-	-	-	-
12	LE12	Unconventional energy	2	-	-	-	-

X. Honours / Minor Degree Courses

Sr. No.	Course Code	Course Title	Hours Per Week			Credits	Preferred Semester
			Lecture	Practical	Tutorial		
1	BM51	Industry Interaction	15 (total)	-	-	1	TE Winter Break
2	BM52	Survey Paper	15 (total)	-	-	1	6
3	BM55	AI for Medical Diagnosis	2	2	-	3	6
4	BM58	IOT Sensors & Device	2	2	-	3	6
5	BM61	Structural Imaging Technology	2	2	-	3	6
6	BM53	Seminar	15 (total)	-	-	1	7
	BM56	AI for Medical Prognosis	2	2	-	3	7
7	BM62	Functional Imaging Techniques	2	2	-	3	7
8	BM59	IoT Programming	2	2	-	3	7
9	BM54	Specialized Project	-	6	-	3	8

Programme Structure (2022) for Bachelor of Technology (B.Tech.) – Biomedical Engineering

Sr. No.	Course Code	Course Title	Hours Per Week			Credits	Preferred Semester
			Lecture	Practical	Tutorial		
10	BM57	AI for Medical Treatment	2	2	-	3	8
11	BM60	IoT System Design	2	2	-	3	8
12	BM63	Nuclear Imaging Techniques	2	2	-	3	8

Course Structure and Evaluation Scheme
for
Bachelor of Technology
in
Biomedical Engineering

**First Year B. Tech. Biomedical Engineering
Course Structure and Evaluation Scheme**

Semester: I

Sr. No.	Course			Head of Learning	Credits	Evaluation Scheme (Marks)			Total marks (Passing@40% of total marks)
	Code	Nature	Name			ISA	MSE	ESE	
1	HS01	C	Effective Communication	Theory	02	15	20	40	075
		T	Effective Communication	Practical	1	25	-	25	050
2	BS02	C	Engineering Mathematics-I	Theory	3	20	30	50	100
3	BS15	C	Engineering Physics	Theory	2	15	20	40	075
		T	Engineering Physics	Practical	1	25	-	25	050
4	ES04	C	Structured Programming	Theory	2	15	20	40	075
		T	Structured Programming	Practical	1	25	-	25	050
5	ES08	C	Basic Electrical & Electronics Engineering	Theory	2	15	20	40	075
		T	Basic Electrical & Electronics Engineering	Practical	1	25	-	25	050
6	ES02	C	Engineering Mechanics	Theory	2	15	20	40	075
		T	Engineering Mechanics	Practical	1	25	-	25	050
7	GEXX	E	Any GE course from GE04 onwards	As per course	2	25	-	50	075
Total Credits					20	-	-	-	-

ISA=In Semester Assessment, MSE= Mid Semester Examination, ESE= End Semester Examination
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**First Year B. Tech. Biomedical Engineering
Course Structure and Evaluation Scheme**

Semester: II

Sr. No.	Course			Head of Learning	Credits	Evaluation Scheme (Marks)			Total marks (Passing@40% of total marks)
	Code	Nature	Name			ISA	MSE	ESE	
1	HS02	C	Professional Skills	Theory	2	15	20	40	075
		T	Professional Skills	Practical	1	25	-	25	050
2	BS04	C	Engineering Mathematics-II	Theory	3	20	30	50	100
3	BS16	C	Engineering Chemistry	Theory	2	15	20	40	075
		T	Engineering Chemistry	Practical	1	25	-	25	050
4	ES01	C	Engineering Graphics	Theory	2	15	20	40	075
		T	Engineering Graphics	Practical	1	25	-	25	050
5	ES05	C	Object-Oriented Programming	Theory	2	15	20	40	075
		T	Object-Oriented Programming	Practical	1	25	-	25	050
6	GE01	C	Design Thinking	Theory	2	15	20	40	075
		T	Design Thinking	Tutorial	1	50	-	-	050
7	GEXX	E	Any GE course from GE04 onwards	As per course	2	25	-	50	075
Total Credits					20	-	-	-	-

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**Second Year B. Tech. Biomedical Engineering
Course Structure and Evaluation Scheme**

Semester: III

Sr. No	Course			Head of Learning	Credits	Evaluation Scheme (Marks)			Total marks (Passing@40% of total marks)
	Code	Nature	Name			ISA	MSE	ESE	
1	HS03	C	Technical and Business Writing	Theory	1	10	15	25	050
		T	Technical and Business Writing	Tutorial	1	25	-	25	050
2	BS06	C	Engineering Mathematics - III	Theory	3	20	30	50	100
3	BS18	C	Human Anatomy & Physiology	Theory	2	15	20	40	075
		T	Human Anatomy & Physiology	Practical	1	25	-	25	050
4	BM01	C	Digital logics design and analysis	Theory	2	15	20	40	075
		T	Digital logics design and analysis	Practical	1	25	-	25	050
5	GE02	C	Social Service - Project / Internship		3#	75			75
6	BM02	C	Biomechanics Prosthetics and Orthotics	Theory	2	15	20	40	075
		T	Biomechanics Prosthetics and Orthotics	Practical	1	25	-	25	050
7	BM03	C	Electronics Circuits and Devices	Theory	2	15	20	40	75
		T	Electronics Circuits and Devices	Practical	1	25	-	25	50
Total Credits					20	-	-	-	-

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#For 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).

**Second Year B. Tech. Biomedical Engineering
Course Structure and Evaluation Scheme**

Semester: IV

Sr. No.	Course			Head of Learning	Credits	Evaluation Scheme (Marks)			Total marks (Passing@40% of total marks)
	Code	Nature	Name			ISA	MSE	ESE	
1	HS06	C	Principles of Economics and Management	Theory	2	15	20	40	075
		T	Principles of Economics and Management	Tutorial	1	25	-	25	050
2	BS08	C	Engineering Mathematics-IV	Theory	3	20	20	60	100
3	BM04	C	Biosensors	Theory	2	15	20	40	075
		T	Biosensors	Practical	1	25	-	25	050
4	BM05	C	Analytical and Clinical Equipment	Theory	2	15	20	40	075
		T	Analytical and Clinical Equipment	Practical	1	25	-	25	050
5	BM06	C	Linear Integrated Circuits	Theory	2	15	20	40	075
		T	Linear Integrated Circuits	Practical	1	25	-	25	050
6	BM07	C	Biological Modelling and Simulation	Theory	2	15	20	40	075
		T	Biological Modelling and Simulation	Practical	1	25	-	25	050
7	BM08	C	Python Programming	Theory	2	15	20	40	075
		T	Python Programming	Practical	1	25	-	25	050
Total Credits					21	-	-	-	-

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Second Year B. Tech. Biomedical Engineering-Summer Break

Sr. No	Course			Head of Learning	Credits	Evaluation Scheme (Marks)		Total marks (Passing@40% of total marks)
	Code	Nature	Name			Internal	External	
1	GE03	C	Internship with other Institute (Credit Transfer)	Theory	2	25	25	50
		T	Internship with other Institute (Credit Transfer)	Practical	2	25	25	50
Total Credits					4	-	-	-

**Third Year B. Tech. Biomedical Engineering
Course Structure and Evaluation Scheme**

Semester: V

Sr. No.	Course			Head of Learning	Credits	Evaluation Scheme (Marks)			Total marks (Passing@40% of total marks)
	Code	Nature	Name			ISA	MSE	ESE	
1	HS04	C	Presentation Skills	Tutorial	1	25	-	25	050
2	BS13	C	Physics of CMOS Devices	Theory	2	15	20	40	075
		T	Physics of CMOS Devices	Practical	1	25	-	25	050
3	BM09	C	Diagnostic and Monitoring Equipment	Theory	2	15	20	40	075
		T	Diagnostic and Monitoring Equipment	Practical	1	25	-	25	050
4	BM10	C	Microprocessors and Microcontrollers	Theory	2	15	20	40	075
		T	Microprocessors and Microcontrollers	Practical	1	25	-	25	050
5	BM11	C	Biomedical Digital Signal Processing	Theory	2	15	20	40	075
		T	Biomedical Digital Signal Processing	Practical	1	25	-	25	050
6	BM12	C	Medical Imaging Equipment	Theory	2	15	20	40	075
		T	Medical Imaging Equipment	Practical	1	25	-	25	050
7	BMXX	E	Prof. Elective 1	Theory	2	15	20	40	75
		T	Prof. Elective 1	Practical	1	25	-	25	50
8	BM39	C	Mini Project-1	Practical	2	25	-	50	75
Total Credits					21	-	-	-	-

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#For Details of Specialization Certificate, Refer Appendix-A

Important Note 1: 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)

Code	Course Name	Specialization Track Name#
BM-21	Statistical Methods in Biomedical Engineering	AI/ML& Data Science
BM-22	Embedded Systems	IoT/IoE
BM-23	Bio-photonics	Medical Equipment Management

Guidelines for Award of Honours/ Minor Degree – Refer Appendix-B

Important Note 2: Before the end of Semester 5, learners are required to go through the Appendix-B carefully to opt for Honours/ Minor Degree Programme. The Honours/ Minor degree programme will span from the end of semester 5 to the end of Semester 8. Learners willing to opt for Honours/ Minor degree programme are required to satisfactorily complete the course titled “Industry Interaction” of 1 credit during the break of the semester 5 and semester 6 which will facilitate them to select Honours/ Minor degree programme of their choice. Detailed guidelines regarding the Honours/ Minor degree programmes of all the departments, Eligibility criterion and Credit requirements are given in Appendix-B. Courses relevant to Honours/ Minor Degree Programmes offered by Department of Biomedical Engineering are given in Appendix-C.

**Third Year B. Tech. Biomedical Engineering
Course Structure and Evaluation Scheme**

Semester: VI

Sr. No	Course			Head of Learning	Credits	Evaluation Scheme (Marks)			Total marks (Passing@40% of total marks)
	Code	Nature	Name			ISA	MSE	ESE	
1	BM13	C	Critical Care Equipment	Theory	2	15	20	40	075
		T	Critical Care Equipment	Practical	1	25	-	25	050
2	BM14	C	Digital Image Processing	Theory	2	15	20	40	075
		T	Digital Image Processing	Practical	1	25	-	25	050
3	BM15	C	Biomedical Microsystems	Theory	2	15	20	40	075
		T	Biomedical Microsystems	Practical	1	25	-	25	050
4	BM16	C	Hospital Management	Theory	2	15	20	40	075
		T	Hospital Management	Practical	1	25	-	25	050
5	BMXX	E	Prof. Elective 2	Theory	2	15	20	40	075
		T	Prof. Elective 2	Practical	1	25	-	25	050
6	BMXX	E	Prof. Elective 3	Theory	2	15	20	40	075
		T	Prof. Elective 3	Practical	1	25	-	25	050
7	BM40	C	Mini Project-2	Practical	2	25	-	50	075
Total Credits					20	-	-	-	-

Professional Elective- 2 Courses (BMXX)

Code	Name	Specialization Track Name#
BM24	Healthcare Database Management	AI/ML& Data Science
BM25	Advance Controllers	IoT/IoE
BM26	Robotics in Medicine	Medical Equipment Management

#For details of Specialization Certificate, refer Appendix-A

Professional Elective-3 Courses (BMXX)

Code	Name	Specialization Track Name#
BM27	Artificial Intelligence and Machine Learning	AI/ML& Data Science
BM28	Smart Sensors	IoT/IoE
BM29	Point of Care Technology/Wearable Devices	Medical Equipment Management

#For details of Specialization Certificate, refer Appendix-A

ISA=In Semester Assessment, MSE= Mid Semester Examination, ESA= End Semester Examination
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TE Summer Break

Sr. No			Course	Head of Learning	Credits	Evaluation Scheme (Marks)		Total marks (Passing@40% of total marks)
	Code	Nature	Name			Internal	External	
1	BM41	C	Industry Internship	Practical	5	50	75	125
Total					5	-	-	-

**Final Year B. Tech. Biomedical Engineering
Course Structure and Evaluation Scheme**

Semester: VII

Sr. No	Course			Head of Learning	Credits	Evaluation Scheme (Marks)			Total marks (Passing@40% of total marks)
	Code	Nature	Name			ISA	MSE	ESE	
1	BMXX	E	Prof. Elective 4	Theory	2	15	20	40	075
		T	Prof. Elective 4	Practical	1	25	-	25	050
2	BMXX	E	Prof. Elective 5	Theory	2	15	20	40	075
		T	Prof. Elective 5	Practical	1	25	-	25	050
3	BMXX	E	Prof. Elective 6	Theory	2	15	20	40	075
		T	Prof. Elective 6	Practical	1	25	-	25	050
4	OEXX	E	Any 2 from the offered Open Elective courses	As per course	3	20	30	50	100
5	OEXX	E		As per course	3	20	30	50	100
6	BM42	C	Project-1 Synopsis	Theory	3	50	-	50	100
Total Credits					18	-	-	-	-

Professional Elective -4 Courses (BMXX)

Code	Name	Specialization Track Name#
BM30	Data Science(R Programming)	AI/ML& Data Science
BM31	Telemedicine	IoT/IoE
BM32	Biomedical Equipment Safety	Medical Equipment Management

#For details of Specialization Certificate, refer Appendix-A

Professional Elective -5 Courses (BMXX)

Code	Name	Specialization Track Name#
BM33	Deep Learning	AI/ML& Data Science
BM34	Cyber Security in Medical Devices	IoT/IoE
BM35	Medical Device Regulations	Medical Equipment Management

#For details of Specialization Certificate, refer Appendix-A

Professional Elective -6 Courses (BMXX)

Code	Name	Specialization Track Name#
BM36	Blockchain in healthcare	AI/ML& Data Science
BM37	Networking & Information in Medical System	IoT/IoE
BM38	Installation & maintenance of Medical Equipment	Medical Equipment Management

#For details of Specialization Certificate, refer Appendix-A

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**Final Year B. Tech. Biomedical Engineering
Course Structure and Evaluation Scheme**

Semester: VIII

Sr. No	Course			Head of Learning	Credits	Evaluation Scheme (Marks)			Total marks (Passing@40% of total marks)
	Code	Nature	Name			ISA	MSE	ESE	
1	OEXX	E	Any 3 Open Elective courses from the list offered.	As per course	3	20	30	50	100
2	OEXX	E		As per course	3	20	30	50	100
3	OEXX	E		As per course	3	20	30	50	100
4	BM43	C	Publication / Patent	Practical	2	25		50	075
5	BM44	C	Project 2 - Demonstration	Theory	1	25	-	-	25
		T	Project 2 - Demonstration	Practical	3	50		50	100
Total Credits					15	-	-	-	-

ISA=In Semester Assessment, MSE= Mid Semester Examination, ESA= End Semester Examination
C=Compulsory, T=Tandem, E=Elective, A=Audit

Open Electives:

Sr.No	Code	Course Name
1	OE01	Cyber Law
2	OE02	Project Management
3	OE03	Product Lifecycle Management
4	OE04	Sustainability Management
5	OE05	Operation Research
6	OE06	IPR and Patenting
7	OE07	Research Methodology
8	OE08	Renewable Energy Management
9	OE09	Energy Audit and Management
10	OE10	E-Farming
11	OE11	Bioinformatics
12	OE12	Nanotechnology

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 (1 course in Semester 5, 2 courses in Semester 6 and 3 courses in Semester 7) 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 and Machine Learning (AIML)
2. Internet of Things (IoT/IoE)
3. Biomedical Equipment Management (BEM)

From semester 5 to semester 7, learners can take courses from any track. **However, if learners complete all professional elective courses from the same chosen track from semester 5 to semester 7, they will be eligible to receive a Specialization Certificate from the institute.**

Learners who choose professional elective courses from different specialization tracks from semester 5 to semester 7 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	BM21	Statistical Methods in Biomedical Engineering
VI	BM24	Healthcare Database management
VI	BM27	Artificial Intelligence and Machine Learning
VII	BM30	Data Science (R Programming)
VII	BM33	Deep Learning
VII	BM36	Blockchain in Healthcare

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

Semester	Course Code	Course Name
V	BM22	Embedded Systems
VI	BM25	Advance Controllers
VI	BM28	Smart Sensors
VII	BM31	Telemedicine
VII	BM34	Cyber Security in Medical Devices
VII	BM37	Networking and Information in Medical Systems

BEM track: Courses to be chosen for specialization in Biomedical Equipment Management

Semester	Course Code	Course Name
V	BM23	Biophotonics
VI	BM26	Robotics in Medicine (RIM)

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VI	BM29	Point of Care Technology/Wearable Devices
VII	BM32	Biomedical equipment Safety
VII	BM35	Medical Device Regulations
VII	BM38	Installation & Maintenance of Medical Equipment

Appendix-B Guidelines for Award of Honours/ Minor Degree Programme

Honours and Minor Degree programme is introduced in order to facilitate learners to enhance the depth of knowledge, diversity, breadth and skills in emerging fields. An Honours or Minor degree typically refers to a higher level of academic achievement either for research orientation or for improving employability. learners can select any Honours or Minor degree programme as per his/her choice.

In our curriculum, learners can choose to avail Honours/Minor Degree programme by completing requirements of 15 credits, which will be over and above the credits required for B.Tech. degree. Learner shall opt for Honours or Minor specialisations during the break of Semester 5 and Semester 6. **Learner may complete the B.Tech. degree programme without opting for Honours or Minor degree programme** i.e. opting for Honours/Minor Degree programme is not mandatory as a part of B.Tech. degree programme.

For Honours degree, learner shall select Honour programme offered by his/her own department. Alternatively, for Minor degree, learner shall select Honour programme offered by any other department.

Eligibility Criteria

- Learner should have no backlog in Semester 1,2,3 and 4.
- The CGPI (based on Semester 1,2,3 and 4) of the learner must be 6.75 and above.
- Learner can opt for only one Honours/ Minor degree programme.
- Learners cannot opt for those Honours/ Minor degree programmes which include courses that he/she has already chosen under Professional Elective Courses and /or under any other Category of courses.
- Honours/ Minor degree programme can only be opted by a learner during their regular engineering studies.
- Learner must complete the Honours/ Minor degree programme in the stipulated time of 3 semesters only i.e. from end of Semester 5 to end of Semester 8.

Syllabus Scheme Template

Sr. No.	Course			Head of Learning	Sem	Credits	Evaluation Scheme (Marks)			Total marks (Passing@ 40% of total marks)
	Code	Nature	Name				ISA	MSE	ESE	
1	BM51	C	Industry Interaction	Theory	Break of Sem5 and Sem6	1	25	-	-	025
2	XXXX	E	Honours / Minor Degree Course 1	Theory	6	2	15	20	40	075

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Sr. No.	Course			Head of Learning	Sem	Credits	Evaluation Scheme (Marks)			Total marks (Passing@ 40% of total marks)
	Code	Nature	Name				ISA	MSE	ESE	
		T	Honours / Minor Degree Course 1	Practical	6	1	25	-	25	050
3	BM52	C	Survey Paper	Theory	Break of Sem6 and Sem7	1	25	-	-	025
4	XXXX	E	Honours / Minor Degree Course 2	Theory	7	2	15	20	40	075
		T	Honours / Minor Degree Course 2	Practical	7	1	25	-	25	050
5	BM53	C	Seminar	Theory	Break of Sem7 and Sem8	1	25	-	-	025
6	XXXX	E	Honours / Minor Degree Course 3	Theory	8	2	15	20	40	075
		T	Honours / Minor Degree Course 3	Practical	8	1	25	-	25	050
7	BM54	C	Specialized Project	Practical	8	3	50	-	50	100
Total Credits						15	-	-	-	-

Honours/ Minor Degree Programmes offered by all departments

Sr. No.	Honors/ Minor Degree Programme	Department offering Honors	Department offering Minor
1	Data Analytics	Information Technology	<ul style="list-style-type: none"> • Computer Engineering • Electronics and Computer Science • Electronics and Telecommunication • Biomedical
2	Social Media Insights	Information Technology	<ul style="list-style-type: none"> • Computer Engineering • Electronics and Computer Science • Electronics and Telecommunication • Biomedical
3	Advanced IoT	Information Technology	<ul style="list-style-type: none"> • Computer Engineering • Electronics and Computer Science • Electronics and Telecommunication • Biomedical
4	Advanced Cyber Security	Information Technology	<ul style="list-style-type: none"> • Computer Engineering • Electronics and Computer Science • Electronics and Telecommunication • Biomedical
5	Intelligent Game Development	Computer Engineering	<ul style="list-style-type: none"> • Information Technology • Electronics and Computer Science • Electronics and Telecommunication • Biomedical
6	Data Science and Machine Learning	Computer Engineering	<ul style="list-style-type: none"> • Information Technology • Electronics and Computer Science • Electronics and Telecommunication • Biomedical
7	Artificial Intelligence and Data Analysis	Computer Engineering	<ul style="list-style-type: none"> • Information Technology • Electronics and Computer Science • Electronics and Telecommunication • Biomedical
8	Data Science and Forecasting	Computer Engineering	<ul style="list-style-type: none"> • Information Technology • Electronics and Computer Science • Electronics and Telecommunication • Biomedical

Sr. No.	Honors/ Minor Degree Programme	Department offering Honors	Department offering Minor
9	Smart City Management	Computer Engineering	<ul style="list-style-type: none"> • Information Technology • Electronics and Computer Science • Electronics and Telecommunication • Biomedical
10	Cyber Forensic and Penetration	Computer Engineering	<ul style="list-style-type: none"> • Information Technology • Electronics and Computer Science • Electronics and Telecommunication • Biomedical
11	Crypto Currency	Computer Engineering	<ul style="list-style-type: none"> • Information Technology • Electronics and Computer Science • Electronics and Telecommunication • Biomedical
12	Intelligent Game Development	Electronics and Computer Science	<ul style="list-style-type: none"> • Information Technology • Computer Engineering • Electronics and Telecommunication • Biomedical
13	Data Engineering	Electronics and Computer Science	<ul style="list-style-type: none"> • Information Technology • Computer Engineering • Electronics and Telecommunication • Biomedical
14	Smart City-Design and Development	Electronics and Computer Science	<ul style="list-style-type: none"> • Information Technology • Computer Engineering • Electronics and Telecommunication • Biomedical
15	Electronic Product Development	Electronics and Computer Science	<ul style="list-style-type: none"> • Information Technology • Computer Engineering • Electronics and Telecommunication • Biomedical
16	Advanced Embedded System	Electronics and Telecommunication	<ul style="list-style-type: none"> • Information Technology • Computer Engineering • Electronics and Computer Science • Biomedical
17	Intelligent Game Development	Electronics and Telecommunication	<ul style="list-style-type: none"> • Information Technology • Computer Engineering • Electronics and Computer Science • Biomedical

Sr. No.	Honors/ Minor Degree Programme	Department offering Honors	Department offering Minor
18	Sentiment Analytics and Data Forecasting	Electronics and Telecommunication	<ul style="list-style-type: none"> • Information Technology • Computer Engineering • Electronics and Computer Science • Biomedical
19	Advanced Communication Technology	Electronics and Telecommunication	<ul style="list-style-type: none"> • Information Technology • Computer Engineering • Electronics and Computer Science • Biomedical
20	Advanced VLSI Technology	Electronics and Telecommunication	<ul style="list-style-type: none"> • Information Technology • Computer Engineering • Electronics and Computer Science • Biomedical
21	AI in Healthcare	Biomedical	<ul style="list-style-type: none"> • Information Technology • Computer Engineering • Electronics and Computer Science • Electronics and Telecommunication
22	Medical IoT	Biomedical	<ul style="list-style-type: none"> • Information Technology • Computer Engineering • Electronics and Computer Science • Electronics and Telecommunication
23	Medical Imaging Technology	Biomedical	<ul style="list-style-type: none"> • Information Technology • Computer Engineering • Electronics and Computer Science • Electronics and Telecommunication

Detailed list of courses under each Honours/ Minor Degree Programme:

- Biomedical Department learners can refer to the list of Honours Degree Programme and their corresponding courses in the Appendix-C.
- learners of Biomedical Department who wish to opt for Minor Degree Programme offered by other department can obtain details of these programmes from Appendix-C of the respective department.

Appendix-C

Honours / Minor Degree Programmes offered by Department of Biomedical Engineering

Department of Biomedical Engineering offers the below listed Honours degree programme for learners of Biomedical Engineering these programmes can be availed as Minor degree programme by learners of other departments.

1. AI in Healthcare
2. Medical IOT
3. Medical Imaging Technology

Courses to be successfully completed as a part of Honours / Minor Degree Programme

1. AI in Healthcare

Semester	Course Code	Course Name
VI	BM55	AI for Medical Diagnosis
VII	BM56	AI for Medical Prognosis
VIII	BM57	AI for Medical Treatment

2. Medical IOT

Semester	Course Code	Course Name
VI	BM58	IOT Sensors and Devices
VII	BM59	IOT Programming
VIII	BM60	IOT System Design

3. Medical Imaging Technology

Semester	Course Code	Course Name
VI	BM61	Structural Imaging Technology
VII	BM62	Functional Imaging Technology
VIII	BM63	Nuclear Imaging Techniques

(Draft copy of Programme Scheme (R-2022), Subject to approval of Academic Council, Vidyalankar Institute of Technology)