

# **CURRICULUM & SYLLABUS**



**CHOICE BASED CREDIT SYSTEM (CBCS)**  
**FOR**  
**BACHELOR OF TECHNOLOGY (B.Tech.)**  
**(4 Year Undergraduate Degree Programme)**  
**IN**  
**BIOMEDICAL ENGINEERING**

**(In Alignment with National Education Policy, 2020)**

**[w. e. f. 2023-24]**

**FACULTY OF ENGINEERING AND TECHNOLOGY**  
**SRM UNIVERSITY DELHI-NCR, SONEPAT**  
**Plot No.39, Rajiv Gandhi Education City, P.S. Rai, Sonapat**  
**Haryana-131029**

## **SRM UNIVERISTY DELHI-NCR, SONEPAT FACULTY OF ENGINEERING AND TECHNOLOGY**

### **ENGINEERING GRADUATES EMPLOYABILITY ATTRIBUTES (EGEAs):**

#### **Sound Knowledge and Skills of Basic Sciences & Engineering Sciences:**

An Engineer should be able to apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

#### **Problem Formulation, Analysis & Solving:**

An Engineer should be able to identify, formulate, review research literature, and analyze complex Engineering problems reaching substantiated conclusions using principles of mathematics, natural sciences, and engineering sciences.

#### **Design and Development of a Solution:**

An Engineer must be able to design solutions for complex Engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

#### **Investigation:**

An Engineer should use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

#### **Modern Tools Usage:**

An Engineer should be able to create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

#### **The Engineer and the Society:**

An Engineer should be able to apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional Engineering practice.

**Effective Communication Skills:**

An Engineer should be able to communicate effectively on complex Engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

**Individual and Teamwork:**

An Engineer should be able to function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

**Lifelong Learning:**

An Engineer must recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

**Environment and Sustainability:**

An Engineer must understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

**Professional Ethics:**

An Engineer should be able to apply ethical principles and commit to professional ethics and responsibilities and norms of the Engineering practice.

**Project Management and Finance:**

An Engineer must demonstrate knowledge and understanding of the engineering and management principles and apply these to Engineering work environment, as a member and leader in a team, to manage projects and in multidisciplinary environments.

**SRM UNIVERISTY DELHI-NCR, SONEPAT**  
**FACULTY OF ENGINEERING AND TECHNOLOGY**

**ENGINEERING PROGRAM EDUCATIONAL OBJECTIVES (EPEOs):**

1. Advancement to a professional position by virtue of their knowledge, skills and attitude.
2. Recognition for solving engineering problems and developing design solutions that consider safety and sustainability.
3. Work as successful professionals in diverse engineering disciplines and enterprises.
4. Increasing responsibilities of technical and managerial leadership in their work organizations.
5. Professional development through a commitment to career-long learning.

**ENGINEERING PROGRAM LEARNING OUTCOMES (EPLOs):**

1. An ability to identify, formulate, and solve real time engineering & socio-economic problems by applying principles of engineering, science, mathematics, humanities and social sciences.
2. An ability to use the advanced skill enhancement techniques and modern engineering tools as per industry 4.0 necessary for engineering practice.
3. An ability to apply engineering design to produce solutions that meet specified needs with realistic considerations of environmental, ethical, health & safety and sustainability.
4. An ability to adapt and work with multidisciplinary teams and communicate effectively.
5. An ability to function effectively on a team whose members together provide leadership, to create a collaborative environment, to establish goals and to execute plan tasks.
6. An understanding of professional and ethical responsibility.
7. An ability to acquire and apply new knowledge using appropriate learning strategies with inner quest to learn, unlearn and relearn.

## MAPPING MATRIX OF ENGINEERING PROGRAM EDUCATIONAL OBJECTIVES AND ENGINEERING PROGRAM LEARNING OUTCOMES

ENGINEERING PROGRAM EDUCATIONAL OBJECTIVES	ENGINEERING PROGRAM LEARNING OUTCOMES
Advancement to a professional position by virtue of their knowledge, skills and attitude.	<ol style="list-style-type: none"> <li>1. An ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics.</li> <li>2. An ability to design and conduct experiments, as well as to analyze and interpret data.</li> <li>3. An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.</li> </ol>
Recognition for solving engineering problems and developing design solutions that consider safety and sustainability	<ol style="list-style-type: none"> <li>1. An ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics.</li> <li>2. An ability to design and conduct experiments, as well as to analyze and interpret data.</li> <li>3. An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.</li> <li>4. An ability to apply engineering design to produce solutions that meet specified needs with realistic considerations of economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability an ability to work with multidisciplinary teams and communicate effectively.</li> </ol>

Work as successful professionals in diverse engineering disciplines and enterprises	<ol style="list-style-type: none"> <li>1. An ability to apply engineering design to produce solutions that meet specified needs with realistic considerations of economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability an ability to work with multidisciplinary teams and communicate effectively.</li> <li>2. An ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives.</li> <li>3. An understanding of professional and ethical responsibility.</li> </ol>
Increasing responsibilities of technical and/or managerial leadership in their work organizations	<ol style="list-style-type: none"> <li>1. An ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives.</li> <li>2. An understanding of professional and ethical responsibility.</li> </ol>
Professional development through a commitment to career-long learning	<ol style="list-style-type: none"> <li>1. An understanding of professional and ethical responsibility.</li> <li>2. An ability to acquire and apply new knowledge as needed, using appropriate learning strategies.</li> </ol>

**TABLE 1: MAPPING MATRIX OF ENGINEERING PROGRAM EDUCATIONAL OBJECTIVES AND  
ENGINEERINGPROGRAM LEARNING OUTCOMES (TABULAR FORMAT)**

MAPPING MATRIX	EPLO1	EPLO2	EPLO3	EPLO4	EPLO5	EPLO6	EPLO7
EPEO1	X	X	X				
EPEO2	X	X	X	X			
EPEO3			X	X	X	X	
EPEO4					X	X	
EPEO5						X	X

**SRM UNIVERSITY, DELHI-NCR, SONEPAT**  
**DEPARTMENT OF BIOMEDICAL ENGINEERING**

**BIOMEDICAL ENGINEERING GRADUATE EMPLOYABILITY ATTRIBUTES (BMEGEAS):**

**EA1: A Sound knowledge & skills base for engineering:**

Demonstrated competence in university level mathematics, natural sciences, engineering fundamentals, and specialized engineering knowledge appropriate to the program.

**EA2: Application of Biological & Engineering knowledge to analyze the problem in healthcare:**

An ability to use appropriate knowledge and skills to identify, formulate, analyze, and solve complex engineering problems in order to reach substantiated conclusions.

**EA3: Design and modeling of biomedical instruments and analytical instruments:**

Ability to design solutions for complex, open-ended engineering problems and to design systems, components/processes that meet specified needs with appropriate attention to health and safety risks, applicable standards, and economic, environmental, cultural and societal considerations.

**EA4: Application of core subjects, inter disciplinary Subjects, programming and strong coding knowledge in real life situation/problem:**

An ability to create, select, apply, adapt, and extend appropriate techniques, resources, and modern engineering tools to a range of engineering activities, from simple to complex, with an understanding of the associated limitations in real life problems.



# **Department of Biomedical Engineering**

## **PROGRAM EDUCATIONAL OBJECTIVES (PEOs)**

**PEO1.** To apply broad-based knowledge of mathematics, engineering, physical sciences, and life sciences to solve biomedical engineering problems, including those associated with the interactions between living and non-living systems.

**PEO2.** To perform measurements on, interpret data from, both living and non-living systems.

**PEO3.** To apply critical reasoning as well as quantitative and design skills to identify and solve problems in biomedical engineering.

**PEO4.** To lead and manage biomedical engineering projects in industry, government, or academia that involve multidisciplinary team members.

**PEO5.** To enter into industry jobs in prominent companies as engineers who work in the areas of medical device design, manufacturing, quality control, marketing and so much more, as they work toward the advancement of medicine.

**PEO6.** To broaden the education by attending professional school in areas of imaging, sensing, therapeutics, biomechanics, cell and tissue engineering, and computational and systems biology.

## **PROGRAM LEARNING OUTCOMES (PLOs)**

**PLO1.** An ability to apply knowledge of mathematics (including multivariable calculus, differential equations, linear algebra, and statistics), science (including chemistry, calculus-based physics, and the life sciences), and engineering.

**PLO2.** An ability to design and conduct experiments, as well as to analyze and interpret data.

**PLO3.** An ability to design and realize a biomedical device, component, or process to meet desired needs.

**PLO4.** An ability to function on multi-disciplinary teams.

**PLO5.** Broaden the education necessary to understand the impact of engineering solutions in a global and societal context.

**PLO6.** An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice to find solution.

**TABLE 2: MAPPING MATRIX OF PROGRAM EDUCATIONAL OBJECTIVES (PEOs) AND PROGRAM LEARNING OUTCOMES (PLOs):**

Program Educational Objectives (PEOs)	Program Learning Outcomes (PLOs)					
	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6
PEO1	X	X				
PEO2		X	X			
PEO3			X	X		
PEO4				X	X	
PEO5				X	X	
PEO6					X	X

## **B. TECH (BIOMEDICAL ENGINEERING) PROGRAMME STRUCTURE**

The curriculum for Bachelor of Technology in Biomedical Engineering is tailor- made so that the graduate must have a strong foundation in the discipline and in-depth knowledge of the tools used to tackle both, conventional and new challenging problems. In order to earn a B.Tech. degree in Biomedical Engineering, a student should must earn a minimum of 188 credits in the course of their study. The credit requirements for their program of study is comprised of the following Programme Structure:

- **Basic Applied Sciences (BAS) and Engineering Science (ES):**

The purpose of Basic Applied Sciences in Engineering study is to lay a strong foundation of basic principles of various disciplines such as Mathematics, Physics, Chemistry in the mind of the learners, so that they proceed to rest of their years of study with up to date knowledge and training of basic engineering skills. The Engineering Sciences requirements support multiple objectives: first, the courses provide a strong foundation in the basic tools and methodologies common to all engineering disciplines; second, all students are exposed to basics of each discipline allowing for cross-disciplinary competencies; last, there is a multi-disciplinary project component where students from different engineering disciplines come together on a design project, allowing for practice in collaborative team work.

- **Professional Core Courses (PC):** The Professional core courses are aimed at providing the student with a solid foundation in their chosen field of study as per Industry 4.0 skills and knowledge.

- **Practical (P):**

The labs are fully furnished and well equipped with latest software's to conduct practical as per the requirement of the University Curriculum.

- **Professional Electives (PE) – Programme specific Specialization Electives:**

The Professional electives, on the other hand, provide the student with an option to gain exposure to different specializations within the discipline, or an opportunity to study one of the subfields in some depth.

- **Ability Enhancement Courses (AEC)**

Students are required to achieve competency in a Modern Indian Language (MIL) along with English language with special emphasis on language and communication skills. The courses aim at enabling the students to acquire and demonstrate the core linguistic skills, including critical reading and academic writing skills. The focus is on imparting students with necessary skills to articulate their arguments and present their thoughts clearly and coherently and recognize the importance of language as a mediator of knowledge and identity.

- **Skill Enhancement Courses (SEC) – Technical & Soft Skills:**

- **Technical Skills:** Under Technical Skills Broad categories of training to be imparted in Engineering Graduates of various disciplines with common nomenclature. The training is categorized into three categories: Elementary, Intermediate & Advanced keeping in view interdisciplinary approach. (One Credit Each from 3<sup>rd</sup> semester to 7<sup>th</sup> semester)
- **Soft Skills:** Under Soft skills training six soft skill courses with defined Nomenclature and course content common to all Engineering disciplines introduced to inculcate Group Dynamics, Team work & Leadership Traits by engaging students for interactive sessions through Role Play, Group Discussions and for improving presentation & Communication skills of engineering graduates. (One Credit Course from 2<sup>nd</sup> Semester to 7<sup>th</sup> semester).

- **Value Added Courses (VAC):**

Course components relating to skills, attitudes, and values required to take appropriate actions for mitigating the effects of environmental degradation, climate change, and pollution, effective waste management, conservation of biological diversity, management of biological resources, forest and wildlife conservation, and sustainable development and living health and wellness seek to promote an optimal state of physical, emotional, intellectual, social, spiritual, and environmental well-being of a person, the constitutional obligations with special emphasis on constitutional values and fundamental rights and duties.

- **Live Projects (LP) & Industrial Visits (IV) and Summer Internship (SI):**

- **Live Projects& Industrial Visits:**

- ❖ Live Projects is being introduced for all Engineering disciplines from 3<sup>rd</sup> semester onwards till 6<sup>th</sup> Semester to develop an ability in engineering graduates to apply skills and knowledge attained to solve real life complex problems (One Credit each semester).
- ❖ Apart from this, it will be mandatory to conduct at least 2 Industrial Visits each semester to provide students a proper industrial exposure.

- **Summer Internship (SI):**

- ❖ Student will be monitored on periodic basis, both by the Faculty Mentor from the Industry and the Faculty In-charge from the department. The Faculty Mentor from the Industry will submit the Mid-Term and End-Term Evaluation report. However, the faculty In-charge from the department will take periodic presentation to keep a check on the progress of Student.
- ❖ Students are provided with the internship related document which helps them to prepare, report. In addition to this, it provides a detail to students about internship/project evaluation parameters.

- **Multidisciplinary (Humanities and Social Sciences Courses) Courses (MDC)**

The open elective subject courses provide the student with wide latitude to pursue their interests, be it in humanities, management, arts or their own chosen field of study in order to have multidisciplinary approach.

**TABLE 3: PROGRAM STRUCTURE FOR BACHELOR OF  
TECHNOLOGY (BIOMEDICAL ENGINEERING) DEGREE COURSE**

SL. No.	Course Category	Course Code	Number of Courses
1	Basic Applied Sciences	BAS	8
2	Engineering Sciences	ES	7
3	Professional Core	PC	9
4	Professional Electives -Program Specific/Specialized Elective Courses	PE	11
5	Ability Enhancement Courses	AEC	2
6	Skill Enhancement courses (Technical and Soft skills)	SEC	10
7	Value Added Courses	VAC	3
8	Practical / Workshop	P/W	20
9	Live Project & Industrial Visit and Summer Internship	LP/SI	6
10	Multidisciplinary (Humanities and Social Sciences Courses) Courses (MDC)	MDC	3
TOTAL NUMBER OF COURSES			79

## SRM UNIVERSITY DELHI-NCR, SONEPAT

**TABLE 4: PROGRAM CREDIT STRUCTURE SEMESTERWISE FOR BACHELOR OF TECHNOLOGY (BIOMEDICAL ENGINEERING)DEGREE COURSE**

SL. No	Course Category	Course Code	Credits Per Semester								Total Credits	% AGE
			I	II	III	IV	V	VI	VII	VIII		
1	Basic Applied Sciences	BAS	8	8	3	3	4	-	-	-	26	14.36
2	Engineering Sciences	ES	6	6	2	6	-	-	-	-	20	11.05
3	Professional Core	PC	-	-	9	4	4	8	6	-	31	17.13
4	Professional Electives -Program Specific Specialized Elective Courses	PE	-	-	3	3	9	9	9	-	33	18.23
5	Ability Enhancement Courses	AEC	3	3	-	-	-	-	-	-	6	3.31
6	Skill Enhancement courses (Technical and Soft skills)	SEC	-	-	2	2	2	2	2	-	10	5.52
7	Value Added Courses	VAC	2	2	2	-	-	-	-	-	6	3.31
8	Practical / Workshop	P/W	4	4	3	3	2	2	2	-	20	11.05
9	Live Project & Industrial Visit and Summer Internship	LP/SI	-	-	-	1	1	1	5	12	20	11.05
10	Multidisciplinary (Humanities and Social Sciences Courses) Courses (MDC)	MDC	-	-	-	3	3	3	-	-	9	4.97
<b>TOTAL</b>			<b>23</b>	<b>23</b>	<b>24</b>	<b>25</b>	<b>25</b>	<b>25</b>	<b>24</b>	<b>12</b>	<b>181</b>	<b>100</b>

**BACHELOR OF TECHNOLOGY (BIOMEDICAL  
ENGINEERING) DEGREE COURSE**  
**TABLE 5: PROGRAM COURSE'S CREDIT STRUCTURE**  
**SEMESTER WISE**  
**Semester-I**

SL.No	Code	Category	Course Name	Hours per week				Credits
				L	T	P	Total Hours	
Theory								
1	23AS104/23AS105	(BAS)	* Elementary Mathematics / * Elementary Biology	3	1	0	4	4
2	23AS102/23AS103	(BAS)	Engineering Physics/Engineering Chemistry	3	1	0	4	4
3	23EE101/23EC101	(ES)	Basic Electrical Engineering /Basic Electronics Engineering	3	0	0	3	3
4	23ME101/23CS101	(ES)	Engineering Mechanics / Fundamentals of Computer & C Programming	3	0	0	3	3
5	23AEC101/23AEC102	(AEC)	Professional English	2	0	0	2	2
			Hindi	3	0	0	3	3
6	23VAC101/23VAC102	(VAC)	Environmental Bioengineering/ Indian Constitution and Polity	2	0	0	2	2
Total Credits (Theory)				16/17	2	0	18/19	18/19
Practical								
7	23AS152/23AS153	(BAS)	Engineering Physics Lab/Engineering Chemistry Lab	0	0	2	2	1
8	23EE151/23EC151	(ES)	Basic Electrical Engineering Lab /Basic Electronics Engineering Lab	0	0	2	2	1
9	23ME151/23CS151	(ES)	Basic Mechanical Engineering Lab/ C Programming Lab	0	0	2	2	1
10	23ME152/23ME153	(ES)	Mechanical Workshop Lab/Engineering Graphics & Design Lab	0	0	2	2	1
11	23AEC151*	(AEC)	Communication English Lab	0	0	2*	2*	1*
Total Credits (Practical)				0	0	10/8	10/8	5/4
	Total Credits (Theory + Practical)			16/17	2	10/8	28/27	23

[L= Lecture, T = Tutorials, P = Practical's & C = Credits]

\*Students with PCM study Elementary Biology, and with PCB study Elementary Mathematics  
# 3 Week long Induction Programme right at the start of the 1<sup>st</sup> Semester. Normal class start only after the induction programme is over.



## Semester-II

SL.No	Code	Category	Course Name	Hours per week				Credits
				L	T	P	Total Hours	
Theory								
1	23AS0206	(BAS)	Biostatistics	3	1	0	4	4
2	23AS0202/23AS0203	(BAS)	Engineering Physics/Engineering Chemistry	3	1	0	4	4
3	23EE0201/23EC0201	(ES)	Basic Electrical Engineering /Basic Electronics Engineering	3	0	0	3	3
4	23ME0201/23CS0201	(ES)	Engineering mechanics / Fundamentals of Computer & C Programming	3	0	0	3	3
5	23AEC0201	(AEC)	Professional English	2	0	0	2	2
	23AEC 202		Hindi	3	0	0	3	3
6	23VAC201/23VAC 202	(VAC)	Environmental Bioengineering/ Indian Constitution and Polity	2	0	0	2	2
Total Credits (Theory)				16/17	2	0	18/19	18/19
Practical								
7	23AS0252/23AS0253	(BAS)	Engineering Physics Lab/Engineering Chemistry Lab	0	0	2	2	
8	23EE0251/23EC0251	(ES)	Basic Electrical Engineering Lab /Basic Electronics Engineering Lab	0	0	2	2	
9	23ME251/23CS251	(ES)	Basic Mechanical Engineering Lab/ C Programming Language Lab	0	0	2	2	
10	23ME0251/21ME0252	(ES)	Mechanical Workshop Lab/Engineering Graphics & Design Lab	0	0	2	2	
11	23AEC151*	(AEC)	Communication English Lab	0	0	2*	2*	
Total Credits (Practical)				0	0	10/8	10/8	5/4
Total Credits (Theory + Practical)				16/ 17	2	10/8	28/27	23

[L= Lecture, T = Tutorials, P = Practical's & C = Credits]

## Semester-III

SL.No	Code	Category	Course	Hours per week				Credits
				L	T	P	Total Hours	
Theory								
1	23MA301	(BAS)	Application of Mathematics in BME	3	0	0	3	3
2	23BM302	(PC)	Transducers and Biosensors	3	0	0	3	3
3	23BM305	(PC)	Human Anatomy and Physiology	3	0	0	3	3
4	23BMPXX X	(PE)	Professional Elective-I	3	0	0	3	3
5	23BM303	(ES)	Introduction to MATLAB	2	0	0	2	2
6	23BM304	(PC)	Biochemistry	3	0	0	3	3
Total Credits (Theory)				17	0	0	17	17
Practical								
7	23BM352	(P)	Transducers and Biosensor Lab	0	0	2	2	1
8	23BM353	(P)	MATLAB Lab	0	0	2	2	1
9	23BM354	(P)	Biochemistry Lab	0	0	2	2	1
10	23VACXXX	(VAC)	Sports, Yoga & Fitness	1	0	2	3	2
Total Credits (Practical)				1	0	8	9	5
Skill Enhancement								
11	23CS0201	(SEC)	Essentials of Blockchain and Internet of Things	0	0	2	2	1
12	23S251	(SEC)	Effective Communication Skills	0	0	2	2	1
Total Credits (Skill Enhancement)				0	0	4	4	2
Total Credits (Theory + Practical + Skill Enhancement)				18	0	12	30	24

[L= Lecture, T = Tutorials, P = Practical's & C = Credits]

## Semester-IV

SL.No	Code	Category	Course	Hours per week				Credits
				L	T	P	Total Hours	
Theory								
1	23MDC401	(MDC)	Multidisciplinary Elective-I	3	0	0	3	3
2	23BM401	(BAS)	Microbiology	3	0	0	3	3
3	23BM402	(PC)	Biomedical Instrumentation	3	1	0	4	4
4	23BM403	(ES)	Linear Integrated Circuits	3	0	0	3	3
5	23BM404	(ES)	Numerical Methods in BME	3	0	0	3	3
6	*23BMPX XX	(PE)	Professional Elective - II	3	0	0	3	3
Total Credits (Theory)				18	1	0	19	19
Practical								
7	23BM452	(P)	Biomedical Instrumentations Lab	0	0	2	2	1
8	23BM453	(P)	Linear Integrated Circuits Lab	0	0	2	2	1
9	23BM454	(P)	Microbiology Lab	0	0	2	2	1
10	23BM461	(LP/SI)	#Live Project-I & Industrial Visits	0	0	1	1	1
Total Credits (Practical)				0	0	7	7	4
Skill Enhancement								
11	23SS351	(SEC)	Teamwork & Interpersonal Skills	0	0	2	2	1
12	23CS0202	(SEC)	Artificial Intelligence and Machine Learning	0	0	2	2	1
	Total Credits (Skill Enhancement)			0	0	4	4	2
Total Credits (Theory + Practical + Skill Enhancement)				18	1	11	30	25

[L= Lecture, T = Tutorials, P = Practical's & C = Credits]

**#To be carried out after 3<sup>rd</sup> Semester during semester break. Evaluation to be carried out in 4<sup>th</sup> Semeste**

## Semester – V

SL.No	Code	Category	Course Name	Hours per week				Credits
				L	T	P	Total Hours	
Theory								
1	23MDC501	(MDC)	Multidisciplinary Elective-II	3	0	0	3	3
2	23MA501	(BAS)	Analytical and Clinical Instrumentation	3	1	0	4	4
3	23BM501	(PC)	Biomaterials and Artificial organs	3	1	0	4	4
4	*23BMPX XX	(PE)	Professional Elective – III	2	0	0	2	2
5	*23BMPX XX	(PE)	Professional Elective – IV	3	0	0	3	3
6	*23BMPX XX	(PE)	Professional Elective-V	3	0	0	3	3
Total Credits (Theory)				17	2	0	19	19
Practical								
7	23BM551	(P)	Biomaterial & Simulations Lab	0	0	2	2	1
8	23BM552	(P)	Analytical and Clinical Instrumentation Lab	0	0	2	2	1
9	23BM555	(P)	Professional Elective-III lab	0	0	2	2	1
10	23BM561	(LP/SI)	#Live Project II &Industrial Visit	0	0	1	1	1
Total Credits (Practical)				0	0	7	7	4
Skill Enhancement								
11	23SS451	(SEC)	Presentation Skills	0	0	2	2	1
12	23CS0301	(SEC)	Design Thinking and Augmented VirtualReality/	0	0	2	2	1
Total Credits (Skill Enhancement)				0	0	4	4	2
Total Credits (Theory + Practical + Skill Enhancement)				17	2	11	30	25

[L= Lecture, T = Tutorials, P = Practical's & C = Credits]

**\*The XXX part of the course code will depend upon the elective chosen by the student**  
**#To be carried out after 4<sup>th</sup> semester during semester break. Evaluation to be carried out in 5<sup>th</sup> Semester.**

## Semester – VI

SL.No	Code	Category	Course	Hours per week				Credits
				L	T	P	Total Hours	
Theory								
1	23MDCXXX	(MDC)	Multidisciplinary Elective-III	3	0	0	3	3
2	23BM602	(PC)	Medical Imaging and its Applications	3	1	0	4	4
3	23BM603	(PC)	Bioinformatics for BME	3	1	0	4	4
4	*23BMPXXX	(PE)	Professional Elective-VI	3	0	0	3	3
5	*23BMPXX X	(PE)	Professional Elective-VII	3	0	0	3	3
6	*23BMPXX X	(PE)	Professional Elective-VIII	3	0	0	3	3
Total Credits (Theory)				18	2	0	20	20
Practical								
7	23BM652	(P)	Medical Imaging Lab	0	0	2	2	1
8	23BM653	(P)	Bioinformatics Lab	0	0	2	2	1
9	23BM659	(LP/SI)	#Live Project III & Industrial Visit	0	0	1	1	1
Total Credits (Practical)				0	0	5	5	3
Skill Enhancement								
10	23SS551A	(SEC)	Professional Skills	0	0	2	2	1
11	23CS0302	(SEC)	Big Data Analytics, Tools and Techniques	0	0	2	2	1
Total Credits (Skill Enhancement)				0	0	4	4	2
Total Credits (Theory + Practical + Skill Enhancement)				18	2	9	29	25

[L= Lecture, T = Tutorials, P = Practical's & C = Credits]

**\*The XXX part of the course code will depend upon the elective chosen by the student#To be carried out after 5<sup>th</sup> semester during semester break. Evaluation to be carriedout in 6<sup>th</sup> Semester.**

## Semester – VII

SL.No	Code	Category	Course	Hours per week				Credits
				L	T	P	Total Hours	
Theory								
1	*23BMPXXX	(PE)	Professional Elective -IX	3	0	0	3	3
2	*23BMPXXX	(PE)	Professional Elective -X	3	0	0	3	3
3	*23BMPXX X	(PE)	Professional Elective -XI	3	0	0	3	3
4	23BM701	(PC)	Hospital Safety and Management	3	0	0	3	3
5	23BM702	(PC)	Bioethics, Biosafety and IPR	3	0	0	3	3
Total Credits (Theory)				15	0	0	15	15
Practical								
6	23BM751	(P)	PE 1X Lab	0	0	2	2	1
7	23BM752	(P)	PE X lab	0	0	2	2	1
8	23BM757	(LP)	**Minor Project	0	0	8(4) **	4	4
9	23BM759	(LP/SI)	#Live Project-IV & Industrial Visits	0	0	1	1	1
Total Credits (Practical)				0	0	9	9	7
Skill Enhancement								
10	23SS651	(SEC)	Aptitude & Reasoning	0	0	2	2	1
11	23CS0401	(SEC)	Data Structure and Algorithms using C++	0	0	2	2	1
Total Credits (Skill Enhancement)				0	0	4	4	2
Total Credits (Theory + Practical + Skill Enhancement)				15	0	13	28	24

[L= Lecture, T = Tutorials, P = Practical's & C = Credits]

**\*The XXX parts of the course code will depend upon the elective chosen by the student.**

**\*\*To be monitored at the Institute Level. Teaching Load for ERP**

**#To be carried out after 6<sup>th</sup> semester during semester break. Evaluation to be carried out in 7<sup>th</sup> Semester.**

## Semester – VIII

SL.No	Code	Category	Course	Hours per week				Credits
				L	T	P	Total Hours	
Practical								
1	23BM857	(LP/SI)	*Major Project (Industrial Internship)	0	0	24	24(6) **	12
Total Credits (Practical)				0	0	24	24(6) **	12

\* To Be Monitored at The Institute Level

\*\* Teaching Load

# Department Elective Courses of Specialization in Major Degree of Biomedical Engineering

## 1. Specialization in Biomedical Instrumentation

S.No.	Code	Category	Course	L	T	P	C
1.	23BMPXXX	(PE)	Molecular Biology	3	0	0	3
2.	23BMPXXX	(PE)	Perl Programming and Bioperl	3	0	0	3
3.	23BMPXXX	(PE)	Digital Electronics	3	0	0	3
4.	23BMPXXX	(PE)	Immunology	3	0	0	3
5.	23BMPXXX	(PE)	Programming in Python	3	0	0	3
6.	23BMPXXX	(PE)	Signals and Systems	3	0	0	3
7.	23BMPXXX	(PE)	Biomedical Laser Instrumentation	3	0	0	3
8.	23BMPXXX	(PE)	Artificial Intelligence and Machine Learning	3	0	0	3
9.	23BMPXXX	(PE)	Therapeutic and Assist devices	3	0	0	3
10.	23BMPXXX	(PE)	Bio signal Processing and Its Applications	3	0	0	3
11.	23BMPXXX	(PE)	Biomechanics of Soft and Hard Tissues	3	0	0	3
12.	23BMPXXX	(PE)	Neural Network	3	0	0	3
13.	23BMPXXX	(PE)	Rehabilitation Engineering	3	0	0	3
14.	23BMPXXX	(PE)	Designing Concept, Maintenance, and Troubleshooting of Bioinstrumentation	3	0	0	3
15.	23BMPXXX	(PE)	Tissue Engineering	3	0	0	3
16.	23BMPXXX	(PE)	Biological Control System	3	0	0	3
17.	23BMPXXX	(PE)	Elements of Biotechnology and Lab	3	0	0	3
18.	23BMPXXX	(PE)	Medical Image Processing and lab	3	0	0	3



19.	23BMPXXX	(PE)	Nanotechnology and Clinical Science and lab	3	0	0	3
20.	23BMPXXX	(PE)	Microprocessor and Microcontroller and Lab	3	0	0	3
21.	23BMPXXX	(PE)	Omics for BME	3	0	0	3
22.	23BMPXXX	(PE)	Robotics, Automation and Telemedicine	3	0	0	3

### Ability Enhancement Courses

S. No.	Code	Category	Course	L	T	P	C
1.	23AECXXX	(AEC)	Professional English	2	0	2	3
2.	23AECXXX	(AEC)	Hindi	3	0	0	3

### List of Skill Enhancement Courses

S. No.	Code	Course	Category	L	T	P	Credits
	Technical Training						
1.	23CS0201	Essentials of Blockchain andIoT	SEC	0	0	2	1
2.	23CS0202	Artificial Intelligence andMachine Learning	SEC	0	0	2	1
3.	23CS0301	Design Thinking and Augmented Virtual Reality -Level	SEC	0	0	2	1
4.	23CS0302	Big Data Analytics, Tools andTechniques	SEC	0	0	2	1
5.	23CS0401	Data Structure and Algorithmsusing C++	SEC	0	0	2	1
	Soft Skill						
1.	23SS251	Effective Communication Skills	SEC	0	0	2	1
2.	23SS351	Teamwork & InterpersonalSkills	SEC	0	0	2	1

3.	23SS451	Presentation Skills	SEC	0	0	2	1
4.	23SS551A	Professional Skills	SEC	0	0	2	1
5.	23SS651A	Aptitude & Reasoning	SEC	0	0	2	1

### Value Added Courses

S. No.	Code	Category	Course	L	T	P	C
1.	23VACXX	(VAC)	Environmental Protection, Sustainable Development & Living	2	0	0	2
2.	23VACXX	(VAC)	Indian Constitution and Polity	2	0	0	2
3.	23VACXX	(VAC)	Sports, Yoga and Fitness	1	0	2	2

### Multidisciplinary (Humanities and Social Sciences Courses) Courses (MDC)

S. No.	Code	Category	Course	L	T	P	C
1.	23MDCXXX/ 23MDCXX/ 23MDCXXX/ 23MDCXXX/ 23MDCXXX	<b>(MDC-I)</b>	Statistical Methods	3	0	0	3
			Environmental Geosciences & Disaster Management	3	0	0	3
			IPR in Business	3	0	0	3
			Library Information Sciences & Media Literacy	3	0	0	3
			Management Process & Organizational Behaviour	3	0	0	3
2.	23MDCXXX/ 23MDCXXX/ 23MDCXXX/ 23MDCXXX/ 23MDCXXX	<b>(MDC-II)</b>	Photonics	3	0	0	3
			Chemistry & Society	3	0	0	3
			Psychology and Emotional Intelligence	3	0	0	3
			Indian Economy	3	0	0	3
			Creating an Entrepreneurial Mind	3	0	0	3
3.	23MDCXXX/ 23MDCXXX/ 23MDCXXX/ 23MDCXXX	<b>(MDC-III)</b>	Life Sciences & Public Health	3	0	0	3
			Electoral Literacy in India	3	0	0	3
			Personal Financial Planning	3	0	0	3
			Interior Design	3	0	0	3

