

# **ACADEMIC CURRICULA**

## **UNDERGRADUATE DEGREE PROGRAMMES**

### **Bachelor of Technology**

**(B.Tech Biomedical Engineering)**

**(Choice Based Flexible Credit System)**

**Academic Year  
2018-2019**



**SRM**  
INSTITUTE OF SCIENCE & TECHNOLOGY  
(Deemed to be University u/s 3 of UGC Act, 1956)

**SRM INSTITUTE OF SCIENCE AND TECHNOLOGY**

**(Deemed to be University u/s 3 of UGC Act, 1956)**

**Kattankulathur, Kancheepuram District 603203, Tamil Nadu,  
India**

## B.Tech in Biomedical Engineering

### (a). Mission of the Department

Mission Stmt - 1	Build on a strong foundation in Basic science and Engineering and educate the students in diverse filed of Biomedical Engineering
Mission Stmt - 2	Work towards state of art Biomedical Engineering research and development through an interdisciplinary curriculum.
Mission Stmt - 3	Apply knowledge about design in development of enabling technologies for improvement of human health

### (b) Program Educational Objectives (PEO)

PEO - 1	Develop real world biomedical devices and prototype models and test with multi-disciplinary approach.
PEO - 2	Design technologically enabled equipments that open up new areas of medical research.
PEO - 3	To impose innovative ideas for commercialization of developed products.
PEO - 4	Lead and work in a team with varied expertise and meet the changing needs of the profession through life long learning.
PEO - 5	To promote entrepreneurship skills in creating jobs in health care domain.

### (c) Mission of the Department to Program Educational Objectives (PEO) Mapping

	Mission Stmt - 1	Mission Stmt - 2	Mission Stmt - 3
PEO - 1	H	M	H
PEO - 2	H	H	M
PEO - 3	H	M	H
PEO - 4	H	H	M
PEO - 5	H	H	M

H – High Correlation, M – Medium Correlation, L – Low Correlation

### (d) Mapping Program Educational Objectives (PEO) to Program Learning Outcomes (PLO)

	Program Learning Outcomes (PLO)												Program Specific Outcomes (PSO)		
	Graduate Attributes (GA)														
	Engineering Knowledge	Problem Analysis	Design & Development	Analysis, Design, Research	Modern Tool Usage	Society & Culture	Environment & Sustainability	Ethics	Individual & Team Work	Communication	Project Mgt. & Finance	Life Long Learning	PSO - 1	PSO - 2	PSO - 3
PEO - 1	H	H	H	H	M	H	H	M	H	M	H	M	H	H	H
PEO - 2	H	M	H	H	H	M	M	M	H	M	H	H	H	H	H
PEO - 3	H	H	H	H	M	H	H	H	M	H	H	M	M	H	H
PEO - 4	M	H	H	H	M	M	M	M	H	H	H	M	H	M	H
PEO - 5	H	M	M	H	M	M	M	M	M	M	M	H	H	M	M

H – High Correlation, M – Medium Correlation, L – Low Correlation, PSO – Program Specific Outcomes (PSO)

#### PSO – Program Specific Outcomes (PSO)

PSO - 1	Ability to apply engineering design to offer health care solutions with consideration of safety, welfare, social, cultural and environmental factors
PSO - 2	Ability to model and analyze biological systems with ethical and professional responsibilities in Engineering situations.
PSO - 3	Ability to initiate cross disciplinary and industry collaborative research.

**(e) Program Structure for B.Tech in Biomedical Engineering**

Humanities & Social Sciences including Management Courses (H)						Basic Science Courses (B)									
Course	Course	Hours/ Week			C	Course	Course	Hours/ Week			C				
Code	Title	L	T	P		Code	Title	L	T	P					
18LEH101J	English	2	0	2	3	18PYB101J	Physics: Electromagnetic Theory, Quantum Mechanics, Waves and Optics	3	1	2	5				
18LEH102J	Chinese					18CYB101J	Chemistry	3	1	2					
18LEH103J	French					18MAB101T	Calculus and Linear Algebra	3	1	0					
18LEH104J	German	2	0	2		18MAB102T	Advanced Calculus and Complex Analysis	3	1	0					
18LEH105J	Japanese					18MAB201T	Transforms and Boundary Value Problems	3	1	0					
18LEH106J	Korean					18MAB202T	Numerical methods for Engineers	3	1	0	4				
18PDH101L	General Aptitude	0	0	2	18MAB301T	Probability and Statistics	3	1	0						
18PDH102T	Management Principles for Engineers	2	0	0	2	18BTB102T	Biology: Human Anatomy and Physiology	2	0	0		2			
18PDH103J	Social Engineering	1	0	2	2								32		
18PDH201L	Employability Skills & Practices	0	0	2	1										
	Total Learning Credits				12										
Engineering Science Courses (S)						Professional Core Courses (C)									
Course	Course	Hours/ Week			C	Course	Course Title	Hours/ Week			C				
Code	Title	L	T	P		Code		L	T	P					
18MES101L	Engineering Graphics and Design	1	0	4	3	18BTC205J	Pathology & Microbiology	3	0	2	4				
18EES101J	Basic Electrical and Electronics Engineering	3	1	2		5	18BMC201J	Biomedical Sensors	3	0		2	4		
18MES103L	Civil and Mechanical Engineering Workshop	1	0	4			18BMC202T	Biomedical Signals and Systems	3	0		0		3	
18CSS101J	Programming for Problem Solving	3	0	4			18BMC203J	Electric and Electronic Circuits	3	0		2			4
18PYS202I	Medical Physics	3	0	0		3	18BMC204	Principles of Medical Imaging	3	0		0			
	Total Learning Credits				19	18BMC205J	Linear and digital Integrated Circuit	3	0	2	4				
						18BMC206J	Biomaterials-Tissue interaction	3	0	2		4			
						18BMC301J	Medical Instrumentation	3	0	2			4		
						18BMC302T	Biomechanics	3	0	0				3	
						18BMC303J	Biomedical Signal Processing	3	0	2					4
						18BMC304J	Microcontrollers and its application in medicine	3	0	2	4				
						18BMC305T	Biocontrol Systems	3	0	0		3			
						18BMC306J	Medical Image Processing	3	0	2			4		
						18BMC401T	Biomedical Equipments for clinical applications	3	0	0				3	
						18BMC350T	Comprehension	0	1	0					1
											52				

List of Professional Elective Courses (E)					
Any 6 courses					
Course	Course	Hours/ Week			C
Code	Title	L	T	P	
18BME261T	Biophotonics and Bioimaging	3	0	0	3
18BME262T	Home Medicare Technology	3	0	0	3
18BME263T	Cellular and molecular biology	3	0	0	3
18BME264T	Biomedical Laser Instruments	3	0	0	3
18BME265T	Artificial Organs and Tissue engineering	3	0	0	3
18BME266T	Biomedical Nano Technology	3	0	0	3
18BME267T	Biometrics	3	0	0	3
18BME361T	BioMEMS	3	0	0	3
18BME362T	Biotransport Phenomenon	3	0	0	3
18BME363T	Human Electrophysiology	3	0	0	3
18BME364T	Biomedical device design Fundamentals	3	0	0	3
18BME365T	Innovation, Translation and Entrepreneurship	3	0	0	3
18BME366T	Biomedical microscopy and quantitative imaging	3	0	0	3
18BME367T	Hospital Management system	3	0	0	3
18BME368T	Soft Tissue and Biofluid mechanics	3	0	0	3
18BME369T	Trouble shooting of Medical Devices	3	0	0	3
18BME370T	Quality Assurance and regulatory aspects for medical devices	3	0	0	3
18BME371T	Neuroengineering	3	0	0	3
18BME372T	IOT and Telehealth Technology	3	0	0	3
18BME373T	Micro fluidics	3	0	0	3
18BME374T	Medical Ethics and Intellectual property rights	3	0	0	3
18BME375T	Virtual Instrumentation for Biomedical Engineers	3	0	0	3
18BME376T	Health care data analytics	3	0	0	3
18BME461T	Biomedical Informatics	3	0	0	3
18BME462T	Physiological Modeling	3	0	0	3
18BME463T	Biomimetics	3	0	0	3
18BME464T	Neural Networks and Genetic Algorithms	3	0	0	3
18BME465T	Wearable systems and mobile health care	3	0	0	3
18BME466T	Artificial Intelligence in Health care	3	0	0	3
18BME467T	Bio inspired Robotics	3	0	0	3
18BME468T	Computational tools in Bioengineering and Biomedicine	3	0	0	3
18BME469T	Neuro rehabilitation and Human machine interface	3	0	0	3
18BME470T	Assistive and Augmentative Technologies	3	0	0	3
18BME471T	Machine learning and Deep learning techniques in medicine	3	0	0	3
18BME472T	Virtual Reality in Health care	3	0	0	3
	Total credits				18

**(f) Program Articulation: B.Tech in Biomedical Engineering**

Course Code	Course Name	Program Learning Outcomes (PLO)														
		Graduate Attributes												PSO		
		Engineering Knowledge	Problem Analysis	Design & Development	Analysis, Design, Research	Modern Tool Usage	Society & Culture	Environment & Sustainability	Ethics	Individual & Team Work	Communication	Project Mgt. & Finance	Life Long Learning	PSO - 1	PSO - 2	PSO - 3
18BMC201J	Biomedical Sensors	H	M	M	M	L	M	M	M	M	M	L	M	M	M	M
18BMC202T	Biomedical Signals and Systems	H	M	L	L	M	M	M	M	M	L	L	M	M	M	M
18BMC203J	Electric and Electronic Circuits	H	H	M	H	M	L	L	L	M	L	L	L	M	H	M
18BMC204T	Principles of Medical Imaging	H	M	M	M	M	H	M	M	M	L	L	M	H	M	M
18BMC205J	Linear and digital Integrated Circuit	H	M	M	M	M	M	M	M	H	M	L	M	M	M	M
18BMC206J	Biomaterials-Tissue interaction	H	M	L	L	L	M	M	M	M	M	M	M	H	M	H
18BMC301J	Medical Instrumentation	H	L	H	H	H	H	H	M	H	M	M	M	H	M	H
18BMC302T	Biomechanics	H	H	M	H	H	M	M	M	M	M	M	M	M	M	H
18BMC303J	Biomedical Signal Processing	H	H	M	M	M	M	M	M	M	M	M	M	M	M	H
18BMC304J	Microcontrollers and its application in medicine	H	M	M	M	M	M	M	M	M	M	M	M	M	M	H
18BMC305T	Bio control Systems	H	M	M	M	M	M	M	M	M	M	M	M	M	M	M
18BMC306J	Medical Image Processing	H	M	H	H	H	H	M	M	H	M	M	M	H	M	H
18BMC401T	Biomedical Equipments for clinical applications	H	L	H	H	H	H	H	M	H	M	M	M	H	M	H
18BMC350T	Comprehension	H	H	H	H	H	M	M	M	M	M	M	M	M	H	H
18BME261T	Biophotonics and Bioimaging	H	M	L	L	L	M	M	M	M	M	M	M	M	H	M
18BME262T	Home Medicare Technology	H	L	M	M	M	L	M	M	M	M	M	M	H	M	H
18BME263T	Cellular and molecular biology	H	L	L	L	L	M	M	M	M	M	M	M	M	M	M
18BME264T	Biomedical Laser Instruments	H	L	L	L	L	M	M	M	M	M	M	M	M	M	L
18BME265T	Artificial Organs and Tissue engineering	H	L	L	L	L	M	M	M	M	M	M	M	M	M	M
18BME266T	Biomedical Nano Technology	H	L	L	L	M	M	M	M	M	M	M	M	H	M	M
18BME267T	Biometrics	H	L	M	M	M	M	M	M	M	M	M	M	M	H	M
18BME361T	BioMEMS	H	M	M	M	M	M	M	M	M	M	M	M	M	H	H
18BME362T	Biotransport Phenomenon	H	L	L	L	L	M	M	M	M	M	M	M	M	M	M
18BME363T	Human Electrophysiology	H	L	L	L	L	M	M	M	M	M	M	M	H	M	H
18BME364T	Biomedical device design Fundamentals	H	H	H	H	H	H	H	H	H	M	M	M	H	H	H
18BME365T	Innovation, Translation and Entrepreneurship	H	M	M	M	M	M	M	M	M	M	M	M	H	M	H
18BME366T	Biomedical microscopy and quantitative imaging	H	M	H	H	H	H	M	M	H	M	M	M	H	M	H
18BME367T	Hospital Management system	H	L	L	L	L	M	M	M	M	M	M	M	H	M	M
18BME368T	Soft Tissue and Biofluid mechanics	H	L	L	L	L	M	M	M	M	M	M	M	H	M	M
18BME369T	Trouble shooting of Medical Devices	H	M	M	M	M	M	M	M	M	M	M	M	H	M	H
18BME370T	Quality Assurance and regulatory aspects for medical devices	H	L	L	L	L	M	M	M	M	M	M	M	M	M	M
18BME371T	Neuroengineering	H	L	L	L	L	M	M	M	M	M	M	M	H	M	H
18BME372T	IOT and Telehealth Technology	H	H	H	H	H	M	M	M	M	M	M	M	H	H	H
18BME373T	Micro fluidics	H	M	M	M	M	M	M	M	M	M	M	M	H	M	M
18BME374T	Medical Ethics and Intellectual property rights	H	L	L	L	L	M	M	M	M	M	M	M	H	M	M
18BME375T	Virtual Instrumentation for Biomedical Engineers	H	M	M	M	M	M	M	M	M	M	M	M	M	M	M
18BME376T	Health care data analytics	H	M	M	M	M	M	M	M	M	M	M	M	M	M	M
18BME461T	Biomedical Informatics	H	M	L	L	L	M	M	M	M	M	M	M	M	M	M
18BME462T	Physiological Modeling	H	M	L	L	L	M	M	M	M	M	M	M	M	M	M
18BME463T	Biomimetics	H	L	L	L	L	M	M	M	M	M	M	M	M	M	M
18BME464T	Neural Networks and Genetic Algorithms	H	H	L	L	L	M	M	M	M	M	M	M	H	M	H
18BME465T	Wearable systems and mobile health care	H	H	M	M	M	M	M	M	M	M	M	M	H	M	H
18BME466T	Artificial Intelligence in Health care	H	M	M	M	M	M	M	M	M	M	M	M	H	M	M
18BME467T	Bio inspired Robotics	H	M	M	M	M	M	M	M	M	M	M	M	H	M	M
18BME468T	Computational tools in Bioengineering and Biomedicine	H	H	M	M	M	M	M	M	M	M	M	M	H	H	H
18BME469T	Neurorehabilitation and Human machine interface	H	M	M	M	M	M	M	M	M	M	M	M	H	M	H
18BME470T	Assistive and Augmentative Technologies	H	M	M	M	M	M	M	M	M	M	M	M	H	M	H
18BME471T	Machine learning and Deep learning techniques in medicine	H	M	M	M	M	M	M	M	M	M	M	M	H	L	H
18BME472T	Virtual Reality in Health care	H	M	M	M	M	M	M	M	M	M	M	M	H	M	H
18BMO121T	Fundamentals of Biomedical Engineering	H	M	M	M	M	M	M	M	M	M	M	M	H	M	H
18BMO122T	Health Information Systems	H	M	M	M	M	M	M	M	M	M	M	M	H	M	H
18BMO123T	Basics of Medical Imaging	H	M	M	M	M	M	M	M	M	M	M	M	H	M	H
18BMO124T	Rehabilitation Engineering	H	M	M	M	M	M	M	M	M	M	M	M	H	M	H
18BMO125T	Quality control for biomedical devices	H	M	M	M	M	M	M	M	M	M	M	M	H	M	H
18BMO126T	Biomechanics of Human Movement	H	M	M	M	M	M	M	M	M	M	M	M	H	M	H
18BMP101L	Massive Open Online Course-I	H					M	L			H		H		M	
18BMP102L	Industrial Training-I	H					M	L			H		H		M	
18BMP103L	Seminar - I	H					M	L			H		H		M	
18BMP104L	Massive Open Online Course-II	H					M	L			H		H		M	
18BMP105L	Industrial Training-II	H					M	L			H		H		M	
18BMP106L	Seminar - II	H					M	L			H		H		M	
18BMP107L	Project (Phase-I)	H	M	H	H	M	H	H	L	H	H	H	H	H	H	M
18BMP108L	Internship (4-6 weeks)	H	M	H	H	M	H	H	L	H	H	H	H	H	H	M
18BMP109L	Project (Phase-II)	H	M	H	H	M	H	H	L	H	H	H	H	H	H	M
18BMP110L	Semester Internship	H	M	H	H	M	H	H	L	H	H	H	H	H	H	M

H – High Correlation, M – Medium Correlation, L – Low Correlation

(g) Implementation Plan: B.Tech in Biomedical Engineering

Semester - I					
Code	Course Title	Hours/ Week			C
		L	T	P	
18LEH102J-18LEH106J	Chinese / French / German / Japanese/ Korean	2	0	2	3
18MAB101T	Calculus and Linear Algebra	3	1	0	4
18CYB101J	Chemistry	3	1	2	5
18CSS101J	Programming for Problem Solving	3	0	4	5
18MES103L	Civil and Mechanical Engineering Workshop	1	0	4	3
18PDM101L	Professional Skills and Practices	0	0	2	0
18LEM102J	Value Education	1	0	1	0
18GNM102L	NSS	0	0	2	0
18GNM103L	NCC	0	0	2	0
18GNM104L	NSO	0	0	2	0
Total Learning Credits					20

Semester - II					
Code	Course Title	Hours/ Week			C
		L	T	P	
18LEH101J	English	2	0	2	3
18MAB102T	Advanced Calculus and Complex Analysis	3	1	0	4
18PYB101J	Physics: Electromagnetic Theory, Quantum Mechanics, Waves and Optics	3	1	2	5
18MES101L	Engineering Graphics and Design	1	0	4	3
18EES101J	Basic Electrical and Electronics Engineering	3	1	2	5
18PDH101T	General Aptitude	0	0	2	1
18LEM101T	Constitution of India	1	0	0	0
18GNM101L	Physical and Mental Health using Yoga	0	0	2	0
Total Learning Credits					21

Semester - III					
Code	Course Title	Hours/ Week			C
		L	T	P	
18MAB201T	Transforms and Boundary Value Problems	3	1	0	4
18PYS202T	Medical Physics	3	0	0	3
18BTC205J	Pathology & Microbiology	3	0	2	4
18BMC201J	Biomedical Sensors	3	0	2	4
18BMC202T	Biomedical Signals and Systems	3	0	0	3
18BMC203J	Electric and Electronic Circuits	3	0	2	4
18PDH103T	Social Engineering	2	0	0	2
18PDM201L	Competencies in Social Skills	0	0	2	0
18PDM203L	Entrepreneurial Skill Development				
18CYM101T	Environmental Science	1	0	0	0
Total Learning Credits					24

Semester - IV					
Code	Course Title	Hours/ Week			C
		L	T	P	
18MAB202T	Numerical methods for Engineers	3	1	0	4
18BTB102T	Biology: Human Anatomy and Physiology	2	0	0	2
18BMC204T	Principles of Medical Imaging	3	0	0	3
18BMC205J	Linear and digital Integrated Circuit	3	0	2	4
18BMC206J	Biomaterials - Tissue interaction	3	0	2	4
	Professional Elective – 1	3	0	0	3
18PDH102T	Management Principles for Engineers	2	0	0	2
18PDM202L	Critical and Creative Thinking Skills	0	0	2	0
18PDM204L	Business Basics for Entrepreneurs				
Total Learning Credits					22

Semester - V					
Code	Course Title	Hours/ Week			C
		L	T	P	
18MAB301T	Probability and Statistics	3	1	0	4
18BMC301J	Medical Instrumentation	3	0	2	4
18BMC302T	Biomechanics	3	0	0	3
18BMC303J	Biomedical Signal Processing	3	0	2	4
	Professional Elective – 2	3	0	0	3
	Open Elective – 1	3	0	0	3
18BMP101L	Massive Open Online Course-I	0	0	2	1
18BMP102L	Industrial Training-I				
18BMP103L	Seminar - I				
18PDM301L	Analytical and Logical Thinking Skills	0	0	2	0
19PDM302L	Entrepreneurship Management				
18LEM110L	Indian Art Form	0	0	2	0
Total Learning Credits					22

Semester - VI					
Code	Course Title	Hours/ Week			C
		L	T	P	
18BMC304J	Microcontrollers and its application in medicine	3	0	2	4
18BMC305T	Biocontrol Systems	3	0	0	3
18BMC306J	Medical Image Processing	3	0	2	4
18BMC350T	Comprehension	0	1	0	1
	Professional Elective – 3	3	0	0	3
	Professional Elective – 4	3	0	0	3
	Open Elective – 2	3	0	0	3
18BMP104L	Massive Open Online Course-II	0	0	2	1
18BMP105L	Industrial Training-II				
18BMP106L	Seminar - II				
18PDH201T	Employability Skills and Practices	0	0	2	1
18LEM109T	Indian Traditional Knowledge	1	0	0	0
18CSC308L	Competitive Professional skills	0	0	2	1
Total Learning Credits					24

Semester - VII					
Code	Course Title	Hours/ Week			C
		L	T	P	
18BMC401T	Biomedical Equipments for clinical applications	3	0	0	3
	Professional Elective – 5	3	0	0	3
	Professional Elective – 6	3	0	0	3
	Open Elective – 3	3	0	0	3
	Open Elective – 4	3	0	0	3
18BMP107L	Minor Project	0	0	6	3
18BMP108L	/ Internship (4-6 weeks)				
Total Learning Credits					18

Semester - VIII					
Code	Course Title	Hours/ Week			C
		L	T	P	
18BMP109L	Project	0	0	20	10
18BMP110L	Semester Internship				
Total Learning Credits					10