Department of Biosciences and Bioengineering

M. Tech. in Biomedical Engineering (BME)

Introduction

Biomedical Engineering (BME), an interdisciplinary field, has made tremendous progress in the last several decades. In the field of Biomedical Engineering, researchers with expertise in diverse areas of engineering, physical sciences, life sciences, and medicine work towards the goal of creating new knowledge, products, and techniques for better healthcare. The backgrounds of faculty in BME at IIT Bombay reflects the wide spectrum of expertise required to make better and more affordable healthcare a reality. Further, students admitted to the program have backgrounds in engineering, physical sciences, life sciences, and health sciences, making it one of the unique programs in the country to offer M. Tech. admission to such a varied mix of candidates. The creation of a heterogeneous class composition promotes interaction between students and faculty of different backgrounds and provides opportunities for research in exciting interdisciplinary areas.

Course work & project

Over the first two semesters, M. Tech. students are required to do a substantial amount of course work to complement their undergraduate or masters level education. The third semester is devoted mostly to the M. Tech. project although some courses may be taken during that period. The fourth semester is fully devoted to completion of the project. The curriculum has been designed to provide all students with a general background in Biomedical Engineering followed by more specific knowledge in the area of their choice. The former is achieved through core (for everyone) and compulsory/soft core (for students with a particular background) courses in the first semester. Electives taken during the second and third semester can provide specialized knowledge in the areas of individual interest.

In the first semester, students with backgrounds in life sciences and medicine are required to take a compulsory course in mathematics. Students with backgrounds in physical sciences and engineering take courses in physiology. There are other core and elective courses to be taken as well.

In the second semester, all students have to go through a core course on Biostatistics. Further, everyone is required to take a credit seminar course and present a seminar on a topic related to Biomedical Engineering under the guidance of a faculty. The rest of the courses are electives, which the students choose and may consult with the faculty adviser.

Electives are offered in bioelectricity, medical sensors, signals and systems, medical imaging physics, biomaterials, drug delivery, nanobiotechnology, cellular & tissue engineering, microfluidics, computational modeling, biomechanics, biomedical optics, movement neuroscience, neural engineering, surgical reconstruction, etc. All students are also required to take a course designated as an Institute Elective offered by an academic unit other than Biosciences and Bioengineering. In special cases, courses other than the Institute Elective may be taken after obtaining necessary permission from the Department Post Graduate Committee (DPGC).

Research areas

Currently curiosity-driven and translational research are conducted in a range of interdisciplinary domains and students may choose to do projects in any of these domains. The details about the different research areas and labs can be found on the department website, given below:

https://www.bio.iitb.ac.in/research/research-areas/

Semester-wise distribution of credits in coursework and project

For the academic year (AY) 2023-24, courses that will be offered are indicated in the last column

First semester (28-34 credits)

Core courses (4 Credits)

Code	Subject name	L	T	P	C	For AY 2023-24
BB 899	Communication skills (PP/NP (*Credits over and above the required minimum of 160)	1	2	0	4*	Offered
BB 653	Experimental techniques in biomedical engineering	1	0	2	4	Offered

Soft Core Courses (Compulsory courses based on background) (6 credits)

Code	Subject name	L	T	P	C	For AY 2023-24
For Bio. background students						
BB 619	Mathematics for biologists	2	0	1	6	Offered
For Engg. background students						
BB 603	Physiology for engineers	3	0	0	6	Offered

Department Electives (18-24 credits to be completed over the first semester: extra credits may be tagged as additional learning)

FH: runs in First Half of the semester, SH: runs in Second Half of the semester

Note: M. Tech. students can take 3-4 half-semester courses in FH (9-12 credits) and 3-4 half-semester courses in SH (9-12 credits).

Code	Subject name	L	T	P	C	For AY 2023-24	Proposed instructor
BB 633 (FH)	Movement neuroscience	3	0	0	3	Offered	NK
BB 663 (FH)	Medical imaging physics	3	0	0	3	Offered	DPaul
BB 665 (FH)	Biomaterials	3	0	0	3	Offered	PT
BB 669 (FH)	Signals & systems in biomedical engineering	3	0	0	3	Offered	AKun
BB 601 (SH)	Introduction to bio-nanotechnology	3	0	0	3	Offered	RS
BB 627 (SH)	Medical imaging methods	3	0	0	3	Offered	HV
BB 673 (SH)	Medical sensors	3	0	0	3	Offered	SM
BB 679 (SH)	Drug delivery	3	0	0	3	Offered	PT

Second Semester (34-28 credits)

Core Courses (10 Credits)

Code	Subject name	L	T	P	C	For AY 2023-24	Proposed instructor
BB 694	Credit seminar	0	0	0	4	Offered	BSBE faculty
BB 621	Biostatistics	3	0	0	6	Offered	SSen

Department Electives (24-18 credits to be completed over the second semester: extra credits may be tagged as additional learning)

FH: runs in First Half of the semester, SH: runs in Second Half of the semester

Code	Subject Name	L	T	P	C	For AY 2023-24	Proposed instructor
BB 606	Cellular electricity: physics & modeling	3	0	0	6	Offered	RM
BB 610	Biomedical microsystems	3	0	0	6	Offered	RS
BB 616	Cellular and tissue engineering	3	0	0	6	Offered	PT
BB 612	Cell mechanics and mechanobiology	3	0	0	6	Offered	SSen
BB 625	Motor control in health and disease	3	0	0	6	Offered	NK
BB 655	Introduction to biomedical optics	3	0	0	6	Offered	HV
BB 668	Engineering Principles in Surgical Reconstruction	1	0	4	6	Offered	VPS
BB 626	Modeling Biological Systems and Processes	3	0	0	6	Offered	DA

Third Semester (50 credits)

Institute Elective (6 credits)

Code	Subject name	L	T	P	C
	Institute elective (to be taken in the 3rd semester)	3	0	0	6

MTP Stage 1- Contact hours: 0; Credits: 44

Code	Subject Name	L	T	P	C
BB 797	Project Stage I	0	0	0	44

Fourth semester (48 credits)
MTP Stage 2- Contact hours: 0; Credits: 48

Code	Subject name	L	T	P	C
BB 798	Project Stage II	0	0	0	48

Course work and credit structure:

Course work and Credits	Sem. 1	Sem. 2	Sem. 3	Sem. 4	Total
Core course (BB653: Experimental Techniques in Biomedical Engineering; Lab course)	4	-	-	-	4
Core course (BB621: Biostatistics + BB694: Credit Seminar)		10	-	-	10
Soft core courses (One compulsory course based on background)	6	0	-	-	6
Department electives	18-24	24-18	-	-	42
Institute elective	-	-	6	-	6
Communication (P/NP) (*Credits over and above the required minimum of 160)	4*	-	-	-	4*
Total course credits (A)					68
M. Tech. project credits (B)	-	-	44	48	92
Total credits for the program (A+B)					160

Note : Other than the courses listed above (i.e. Core course, Soft core, Department Elective and Institute Elective), any other course (within or outside department) can be taken as Additional Learning.

Course syllabus:

The syllabi for courses offered by the BSBE department can be found at:

https://www.bio.iitb.ac.in/academics/mtech-program/mtech-course-curriculum-new/

Note: In addition to the above, the course instructor may be contacted for any further details.