Ph.D. programme
(major: Biomedical Devices and Technology)

A collaborative effort by
Indian Institute of Technology Madras (IITM)
Sree Chitra Tirunal Inst. for Medical Sciences & Tech., Trivandrum (SCTIMST)
and Christian Medical College, Vellore (CMC)

Introduction

Over the past five decades, healthcare delivery has increasingly become technology driven – be it development of new drugs, vaccines or medical devices. Innovative solutions to healthcare can be developed only with a cross-disciplinary approach with systematic training. This program aims to develop capable doctoral level people, who will go further to make significant contributions as researchers/entrepreneurs/ academicians/ etc., in the area of Biomedical Devices and Technology. It is a unique undertaking and will exploit the innate strengths and facilities of the three institutes – SCTIMST, IITM and CMC. These organizations together hold strong backgrounds in technology, biomedical engineering and medical sciences.

The training would enable the graduates

- To be leaders in research and development
- To be innovators and entrepreneurs in biomedical technology

Curriculum

The students will undergo an orientation programme for three to four weeks during the month of July before their first semester, at SCTIMST/CMC as given below:

Venue	Course Name
SCTIMST/CMC	Introduction & Preliminary Clinical Attachment

The following aspects will be covered in this orientation programme.

- Introduction to hospitals and medical devices, visit to the hospital and BMT Wing, and visit to medical device industries. The purpose of these activities would be to make students realize the importance and relevance the course.

- The faculty from the three organisations will also meet in SCTIMST/CMC to interact with the new students, to review the courses and their contents, discuss possible modifications and plan joint research programs. Also relevant introductory sessions on Biomaterials and Medical Device Technology will be given to appropriately orient the students for effective study.

Then, the students need to take courses as suggested by the Doctoral Committee (DC). Nevertheless, all students need to take the following compulsory courses to provide them with the necessary background and ease in terminology in aspects that will be useful to them in their future efforts in the medical technology area. Thus the needed courses are:

Introduction to Research (ID 602, compulsory, IITM, 2 credits)

Molecular and Cell Biology (BT 654, compulsory, IITM, 3 credits)

Functional Anatomy and Physiology – theory and lab (compulsory, CMC, 4+2=6 credits)

Two (elective) courses from the list of courses suggested by the DC (6 credits)

Clinical Attachment (one semester, compulsory, details given in the next section, 3 credits)

Total No. of course credits: **20**

The thesis topics will be allotted in the first semester based on student choice and their position on the incoming merit list, and the DC will oversee their progress. Each topic will be floated by two faculty members, one from IITM and the other from SCTIMST or CMC. If the student is interested in proposing his/her topic, he/she needs to find two faculty members as above, who will guide the thesis. The students can complete their course work preferably in two semesters. The students can take the comprehensive exam at the end of 2 semesters, and need to complete it by the end of their 3rd semester. Further, the MCE students who have an orientation to do in-depth research can upgrade to a Ph.D. at the end of the II year; the up-gradation would be governed by relevant guidelines similar to the existing guidelines for M.S./M.Tech. to Ph.D. upgrade at IIT Madras. The exit options from the Ph.D. programme will also be similar to those in force at IIT Madras.

Clinical Attachment: The purpose of this clinical attachment would be to

- Expose students to the clinical environment and to provide general awareness of routine activities of a hospital.
- Understand basic methods and logical processes used by clinicians to investigate and diagnose a clinical problem.
- Learn the language of clinicians and learn to interact with them effectively
- Undertake an exercise aimed at identifying 25 problems faced in a typical clinical environment and propose innovative/novel solutions to these problems.

One or more clinicians would be assigned to the students as mentors, who would meet them on a regular basis to discuss and analyse their experiences. The mentors would also carry out continuous assessment. The students would focus on identification of problems typical to clinical engineering practice such as equipment management, safety evaluation and preventive maintenance and come up with possible solutions.

List of electives currently suggested:

Venue	Course No.	Course Name	L	T	P	C
SCTIMST		Tissue Engineering and Regenerative Medicine	2	0	3	3
SCTIMST		Introduction to Epidemiology	2	0	3	3
SCTIMST		Advanced Polymer Science and Technology	2	0	3	3
SCTIMST		Analytical instrumentation and medical laboratory equipment	2	0	3	3
CMC		Introduction to Digital Signal and Image processing	2	0	3	3
CMC		Physiological Systems Modeling	2	0	3	3
CMC		Rehabilitation Engineering	2	0	3	3
IITM	BT 622	Introduction to Computational Neuroscience	2	1	0	3
IITM	AM 519	Haptics in Biomedical Engineering	3	0	0	3
IITM	BT 520	Principles of Neuroscience	3	0	0	3
IITM	BT 518	Biological Vision	3	0	0	3
IITM	BT 676	Drug Design and Medicinal Chemistry	3	0	0	3
IITM	BT 655	Medical Informatics and Bioinformatics	3	0	0	3
IITM	BT 673	Ergonomics	3	0	0	3
IITM		Bio-fluid Mechanics	2	1	0	3
IITM	MS 693	Management and Entrepreneurship	3	0	0	3
IITM	BT 653	Biostatistics	2	1	0	3
IITM	BT 652	Clinical Biochemistry	3	0	0	3