

M.Tech in Clinical Engineering

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

Introduction

In a typical hospital, which delivers modern medical care, an extensive use of variety of equipment and technologies is involved. It is essential that the equipment be efficiently and safely managed by well trained engineers. 'Clinical Engineering' is a specialty of 'Biomedical Engineering'. The American College of Clinical Engineers defines a Clinical Engineer as "A professional who supports and advances patient care by applying engineering and managerial skills to healthcare technology."

Thus, the primary role of a clinical engineer is to carry out activities related to equipment management such as review of equipment specifications before purchase, installation and testing of new equipment, routine safety testing as well as preventive and break down maintenance and many other related activities. Furthermore, since clinical engineers are directly placed in the clinical environment, they get to know the technological problems faced in clinical situations, and hence can also have an important role in initiating the development of new medical technologies and evaluating them.

Objective

The aim of this program is to train engineers to manage and ensure the safe and effective use of technology in hospitals and health care delivery points.

Duration: Two years

Curriculum for M. Tech. in Clinical Engineering

Semester I (August-December) Location: IIT Madras

<u>Course Name</u>	<u>Credits</u>
Intro to Molecular & Cell Biology	3
Biomechanics	3
Introduction to Research	1
Management Science Elective +	3
Engineering Elective*	3
Engineering Elective*	3
Total Credits	16

* Open elective from the following departments- Aerospace Engineering, Applied Mechanics, Chemical Engineering, Computer Science and Engineering, Electrical Engineering, Engineering Design, Mechanical Engineering, Metallurgical and Materials Engineering and Physics

+ Electives pertaining to maintenance management, supply chain, QC, finance

Semester II (January-July) Location: CMC Vellore

<u>Course Name</u>	<u>Credits</u>
Functional Anatomy & Physiology	4
Anatomy & Physiology Lab	2
Biomedical Imaging Systems	3
Clinical Attachment	4
Transducers & Instrumentation	3
Elective	3
Total Credits	19

Semester III (August-December) Location: SCTIMST Thiruvananthapuram

<u>Course Name</u>	<u>Credits</u>
Medical Device Technology	3
Biomaterials	3
Clinical Engg, Health Systems & Mgmt	3
Elective	3
Design Tools for Clinical Engineering - Lab	2
Engineering Problems in Hospitals - Lab	2
Clinical Attachment	4
Clinical Engineering Internship - External	2
Total Credits	22

Semester IV (January-June) Project

<u>Course Name</u>	<u>Credits</u>
Project	10
Total Credits	10

Grand total Credits 67

List of suggested electives in IITM

AM5115 - System Approaches in Biomedical Engg
AM5520 - Medical Electronics
AM6518 - Biophysical aspects of tumor microenvironment.
ED5090 - Biomechanics Lab - Solid and Fluid Mechanics
ED5314 - Design, Analysis and Control of Robot Manipulators
ED5070 - Design of Monitoring and Diagnostic System (L&P)
MS5570 - Heuristics in Decision Making
MS6570 - Maintenance Management
MS5260 - Management Information Systems
EE5401 - Measurements and Instrumentation
EE5410 - Introduction to Digital Signal Processing
EE5130 - Analog Electronic circuits
EE5170 - Speech Signal Processing

Clinical Attachment at CMC (Semester II)

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 analyze 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. The evaluation will also be based on the 25 problems mentioned above and their innovative/novel solutions.

Internship in a Clinical Engineering Department at SCTIMST (Semester III)

This internship is intended to provide students with an opportunity to have direct exposure to day to day activities of the hospital and its Clinical Engineering Department. They will work in the department as if a regular employees and will be assigned various tasks. Assessment at the end of Internship would be by a professional interview. The candidate should be able to demonstrate that he/she has been able to acquire core competences and has enough hands-on experience to carry out various tasks as required by a clinical engineer.

Project

The project will be on the lines of the regular M.Tech project at IIT Madras. Two faculty members will guide the project, one from IITM, and the other guide from either SCTIMST or CMC.