

# Orientation program

## Three Institute Joint Degree M.Tech Program in Clinical Engineering

N.Manoj

Institute Coordinator at IIT Madras

Department of Biotechnology

IIT Madras



27-07-2018

## **Mandate**

Develop trained human resource trained for development of technology as well as effective and safe management of technology in hospitals and other healthcare delivery settings

## **Unique features**

**Compulsory Clinical Attachment** and **Internship** spread over three semesters across all three institutes with strengths in technology, biomedical engineering and medical sciences

- Indian Institute of Technology Madras (IITM)
- Sree Chitra Tirunal Institute for Medical Sciences & Technology (SCTIMST)
- Christian Medical College Vellore (CMC)

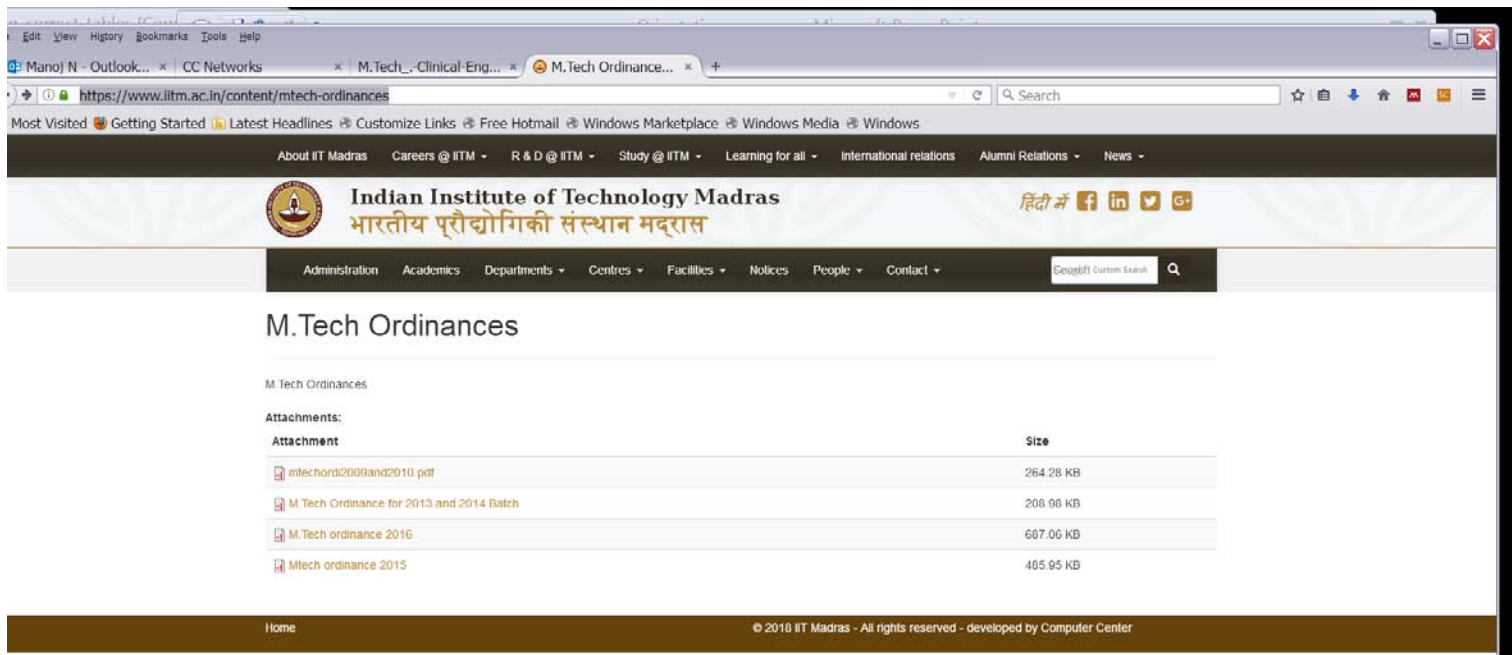
Designed to provide maximum possible exposure to the clinical environment with an aim to increasing familiarisation to this environment as well as providing an opportunity to identify the 'unmet clinical need'.

Upon graduation, students can

- (a) contribute to immediate specific needs of industries, R&D labs, hospitals
- (b) be innovators and leaders in specific areas of Medical Technology.
- (c) become entrepreneurs specializing in medical devices

**General rules and regulations regarding MTech programs at IIT Madras will hold primarily**

<https://www.iitm.ac.in/content/mtech-ordinances>



The screenshot shows a web browser window displaying the IIT Madras website. The address bar shows the URL <https://www.iitm.ac.in/content/mtech-ordinances>. The page header includes the IIT Madras logo, the name "Indian Institute of Technology Madras" in English and Hindi, and social media links. A navigation menu is visible below the header. The main content area is titled "M.Tech Ordinances" and lists four attachments with their respective sizes.

Attachment	Size
<a href="#">mtechord2009and2010.pdf</a>	264.28 KB
<a href="#">M.Tech Ordinance for 2013 and 2014 Batch</a>	208.98 KB
<a href="#">M.Tech ordinance 2016</a>	607.06 KB
<a href="#">Mtech ordinance 2015</a>	465.95 KB

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# Details of M.Tech Clin. Engg. program

The screenshot shows a web browser window with the URL <https://biotech.iitm.ac.in/academics/clinical-engineering/mtech-clinical-engineering/>. The browser's address bar and tabs are visible at the top. The website's navigation menu includes links for Home, Research, Faculty, Academics (highlighted), Admissions, Infrastructure, Staff, Events, News, Room Booking, and Internal. Below the navigation menu, the page header identifies the Department of Biotechnology, Bhupat and Jyoti Mehta School of Biosciences, and the Indian Institute of Technology Madras. A search bar is located in the top right corner. The main content area features a breadcrumb trail: HOME > ACADEMICS > JOINT DEGREE PROGRAMME (JDP) > MTECH CLINICAL ENGINEERING. The title 'MTech Clinical Engineering' is displayed in a large, bold, blue font. The 'Introduction' section explains that there are about 16,000 hospitals in the country and that people with a **M. Tech. in Clinical Engineering** would be capable of managing and maintaining the wide range of equipment used in hospitals. It also mentions that the M.Tech. (Clinical Engineering) program (MCE) has an innovative approach of combining formal engineering training with hands-on clinical exposure. The 'Placement scenario' section states that placement opportunities are excellent in hospitals as well as in biomedical device companies, and that all students who have graduated thus far from the program have been placed through the placement offices and efforts at IIT Madras and SCTIMST. A yellow highlight at the bottom of the page reads: 'Applications for MTech should be made at the IIT Madras MTech Admissions Page.'

Manoj N - Outlook... x CC Networks x » MTech Clinical Engi... x M.Tech Ordinance... x +

https://biotech.iitm.ac.in/academics/clinical-engineering/mtech-clinical-engineering/ Search

Most Visited Getting Started Latest Headlines Customize Links Free Hotmail Windows Marketplace Windows Media Windows

Home Research Faculty Academics Admissions Infrastructure Staff Events News Room Booking Internal Contact

DEPARTMENT OF BIOTECHNOLOGY  
BHUPAT AND JYOTI MEHTA SCHOOL OF BIOSCIENCES  
INDIAN INSTITUTE OF TECHNOLOGY MADRAS

Search search

HOME > ACADEMICS > JOINT DEGREE PROGRAMME (JDP) > MTECH CLINICAL ENGINEERING

## MTech Clinical Engineering

### Introduction

There are about 16,000 hospitals in the country. People with a **M. Tech. in Clinical Engineering** would be capable of managing and maintaining the wide range of equipment used in hospitals. The total management of this aspect in a hospital, leading to cost-effective procurement and utilization of equipment without sacrificing safety and reliability, will also be addressed by them.

The M.Tech. (Clinical Engineering) program (MCE) has an innovative approach of combining formal engineering training with hands-on clinical exposure. 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 selection will be done once a year on an All-India basis, through a centralized M.Tech. admission process conducted by IIT Madras. For selection and admission details ([Click here](#)). The M.Tech. programme will be two years duration. The students will study and train at all the three participating Institutes.

### Placement scenario

The placement opportunities are excellent in hospitals as well as in biomedical device companies. The scope for higher studies (PhD), both in India and abroad, is also bright. All the students who have graduated thus far from the program have been placed through the placement offices and efforts at IIT Madras and SCTIMST; They have been placed in hospitals, medical device industries, and some have opted to go for a Ph.D., typically, abroad.

Curriculum: [M.Tech. Clinical Engineering Curriculum 2016 \(138.74 kB\)](#).

Applications for MTech should be made at the IIT Madras MTech Admissions Page.

RECENT POSTS

- IMS PhD Selection list July 2018

# Courses

## Semester I – IIT Madras

<u>Course Name</u>	
Cellular, Molecular Biology & Genetic Engineering	BT6540
Biomechanics	AM5010
Introduction to Research	ID6020/21
Management Science Elective <sup>+</sup>	MSxxxx
Engineering Elective*	XXxxxx
Engineering Elective*	XXxxxx

\* 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 (Management Studies Dept. follows a trimester system, contact MS faculty regarding course registration, details etc)

## **Semester II – 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

## **Semester III – SCTIMST Tvm**

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

## **Semester IV – M.Tech Project at any one of the 3 Institutes**

- Course requirements will not be waived
- Choose course electives and final project topic appropriate to your background and program mandate
- Project guides can be chosen across the institutes (joint collaborative projects are particularly encouraged)
- Contact seniors (currently in SCTIMST) regarding residence transfer, logistics, courses, projects etc

### **M.Tech to PhD conversion**

M.Tech students meeting certain criteria (minimum CGPA) can be allowed to transit to a PhD program after the **III** semester. The decision can be made at the end of the **II** semester according to the rules at IIT Madras (see IITM M.Tech ordinances)



## Academic Portal

[Log In](#)

[Downloads](#)[SlotWise/SubjectWise List](#)

### Course Details

## Academic Curriculum



Password

LogIn

This website contains information published by academic section. You can view the circulars issued for the academic year, download forms, view reports such as slot book, timetable, and students on roll etc.

You should login to see more specific information. For example, Faculty can view the grade information and registration of their advisees/research scholars and courses taken in previous semesters etc. HODs, Dean Academics, Dean Students and Dean Research can also login to view any student academic details. Students can login to view their registration and grade information.

To access institute moodle website <https://courses.iitm.ac.in>

To access workflow website for students <https://workflow.iitm.ac.in/student>

To access workflow website for Faculty and Staff <https://workflow.iitm.ac.in/employee>

To access IITM Website <https://www.iitm.ac.in/>

For problems related to Slot Book, Grade Information or Registration, contact academic section at [acadad@iitm.ac.in](mailto:acadad@iitm.ac.in). Research scholars can contact academic section at [dresearch@iitm.ac.in](mailto:dresearch@iitm.ac.in). Please send a copy to [workflow@rt.iitm.ac.in](mailto:workflow@rt.iitm.ac.in).

### Guidelines

Roll list based on slotwise, facultywise and subjectwise can be viewed in this report. Click the **COURSE NUMBER** to view the syllabus. Click the **STRENGTH** to get subjectwise roll list.

Enter the period:

JUL-NOV 2018

Department:

Management Studies

View

CSV

Excel

Search:

Sno	Slot	Additional Slot	Course No	Course Name	Instructor Name	Old Credit	New Credit	Room	Prereq	Coordinator	CC Chairperson	Strength	Allocation Type	Period
1	D		MS4100	Soft Skills Development Workshop	VIJAYALAKSHMI V	3	9			N	Usha Mohan	45	CG	JUL-NOV 2018
2	E		MS3520	Operations Management I	SRINIVASAN G	3	9			N	Usha Mohan	60	CG	JUL-NOV 2018
3	E		MS3610	Accounting and Finance for Engineers	ARUN KUMAR G	3	9			N	Usha Mohan	179	CG	JUL-NOV 2018
4	E		MS3610	Accounting and Finance for Engineers	KRISHNA PRASAN A P	3	9			N	Usha Mohan	179	CG	JUL-NOV 2018
5	E		MS3610	Accounting and Finance for Engineers	THILLAI RAJAN A	3	9			Y	Usha Mohan	179	CG	JUL-NOV 2018
6	E		MS3710	Marketing Management	Vaibhav Chawla	3	9			N	Usha Mohan	61	CG	JUL-NOV 2018
7	E		MS3830	Computer Simulation	RAHUL MARATHE	3	9			Y	Usha Mohan	6	CG	JUL-NOV 2018
8	E		MS4110	Introduction to Data Analytics	Nandan Sudarsanam	12	12			N	Usha Mohan	65	CG	JUL-NOV 2018
9	E		MS4120	Intellectual Property	Feroz Ali Khad	4	12			N	Usha Mohan	5	CG	JUL-NOV 2018
10	G		MS3510	Fundamentals of Operations Research	S Geshassayee	3	9			N	Usha Mohan	141	CG	JUL-NOV 2018

Showing 1 to 10 of 74 entries

[Previous](#)



2

3

4

5

8

Next



## **Placements**

Students can attend placements at IIT Madras during their 3<sup>rd</sup> semester residence period at SCTIMST  
(see placement rules and regulations of IIT Madras)

## Placement record of M.Tech Clinical Engineering students

### 2010-2013 (14/25 students)

HCL = 7

HTIC (IITMRP) = 2

Stryker = 1

L & T = 2

Global Hospitals = 1

IFGL Bioceramics= 1

### 2016-2017 (11/20 students)

Stryker=1

Cerner = 7

Medtronic = 1

Servion = 1

Non core Software = 1

### 2014-2015 (14/24 students)

HCL = 2

HTIC (IITMRP) = 1

Stryker = 1

Cerner = 2

Thermo Fisher = 1

Photon Interactive Pvt. Ltd =1

PhD = 2

Sagazza India (IITMRP) = 1

Premier Biosoft = 1

Non core Software = 2

## Contacts

### Institute coordinators

IIT Madras : Dr.N.Manoj ([nmanoj@iitm.ac.in](mailto:nmanoj@iitm.ac.in)) (Room No. BT304)  
CMC Vellore: Dr. Suresh Devasahayam ([surdev@cmcvellore.ac.in](mailto:surdev@cmcvellore.ac.in))  
SCTIMST Tvm: Dr.Roy Joseph ([rjoseph@sctimst.ac.in](mailto:rjoseph@sctimst.ac.in))

Faculty Advisors for 2018-2020 batch

- a) Prof. Srinivasa Chakravarthy (BT Dept) [schakra@iitm.ac.in](mailto:schakra@iitm.ac.in)
- b) Prof. R.S.Verma (BT Dept) [vermars@iitm.ac.in](mailto:vermars@iitm.ac.in)

Check with BT Office for whom you are assigned to.

# Project

Students are required to use their residence period at the 3 institutes to explore, consult and decide on the institute/project area/guide well in advance of the project start date in the 4<sup>th</sup> semester

Academic activities of this program will primarily follow the academic calendar of IIT Madras, in particular, for project thesis submission, viva voce and program completion

Contact coordinators at CMC and SCTIMST for details of faculty at these institutes

A tentative list of faculty at IIT Madras is given in the following slides. There are several other faculty and labs as well that you may choose as appropriate to the mandate of this program



**Dr. Rama S Verma Ph.D.,**  
**Indian Institute of Technology Madras**

Professor, Dept. of Biotechnology

044-2257-4109; [vermars@iitm.ac.in](mailto:vermars@iitm.ac.in)

<http://www.biotech.iitm.ac.in/verma>



**1- *Trans-differentiation of stem cell  
into cardiac tissue-***

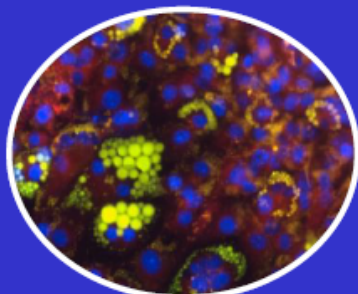
*Developing patched using  
biodegradable material and stem cells*

**2- *Construction of Novel Immunotoxins-***

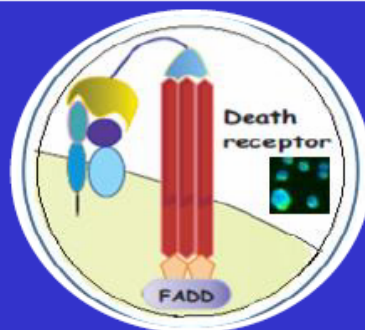
*Targeted anticancer therapy with  
recombinant immunotoxins*

**3- Fanconi Anemia-**

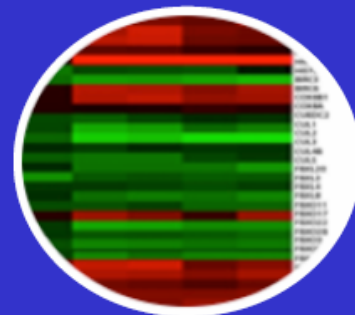
*Gene expression profiling of Fanconi  
anemia and Identifying marker genes*



Stem cell biology and  
transdifferentiation of stem and  
tissue regeneration



Immunotoxins for Cancer Therapy



Biomarker studies of Fanconi Anemias



# Dr. V. Srinivasa Chakravarthy

PhD, University of Texas at Austin, Austin, USA.  
Professor, Department of Biotechnology,  
IIT Madras.

Tel: 044-2257-4115; [schakra@iitm.ac.in](mailto:schakra@iitm.ac.in)

[http://www.biotech.iitm.ac.in/faculty/CNS\\_LAB/home.html](http://www.biotech.iitm.ac.in/faculty/CNS_LAB/home.html)



## Research Area: Computational Neuroscience

### Objective 1:

Develop a comprehensive Computational model of Basal Ganglia, a part of the brain affected in Parkinson's Disease.

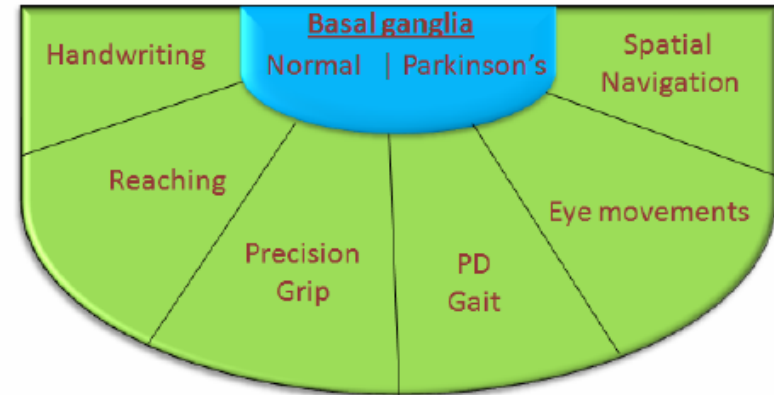
### Application:

The model developed has potential Application in Deep Brain Stimulation Surgery for PD.

### Objective 2:

Using computational modeling, study the role of vascular dynamics on neural activity.

**Application:** Leads to the radical notion of vascular computation.



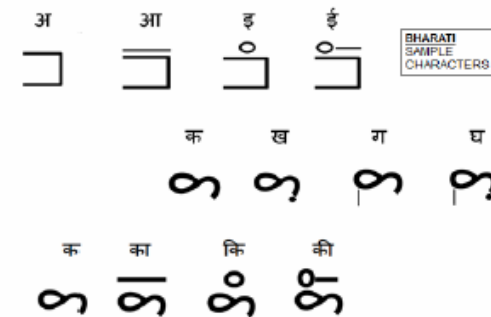
## Research Area:

### Indian Language Technology

Develop a new script called Bharati.

The script can represent 9 major Indian scripts.

Simple and easy to learn.





G. K. Suraishkumar

Ph.D., Drexel University, Philadelphia, USA

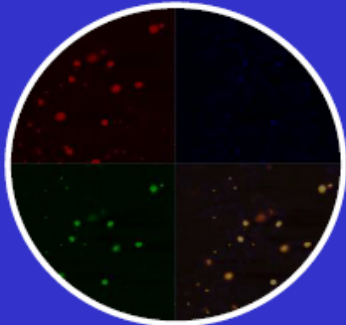
Professor, Dept. of Biotechnology

044-2257-4105; [gk@iitm.ac.in](mailto:gk@iitm.ac.in)

[http://www.biotech.iitm.ac.in/GK\\_research](http://www.biotech.iitm.ac.in/GK_research)



- Reactive Species/Algae biofuels
- Reactive Species/Bioprocess strategies
- Novel strategies for optimal operation of Bioreactors/Industrial bioreactors



Improved bio-oil yields from  
microalgae



Bioprocess strategies



Industrial bioreactors

Quantitative Understanding and Manipulation of Biological Systems



# Dr. Vignesh Muthuvijayan

## PhD, Oklahoma State University, USA

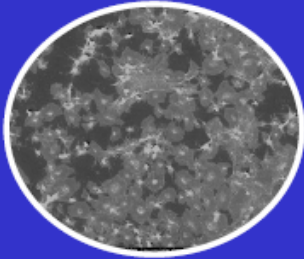
Assistant Professor, Dept. of Biotechnology

044-2257-4123; vigneshm@iitm.ac.in

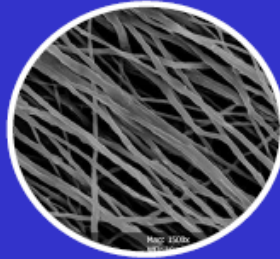
<http://www.biotech.iitm.ac.in/vignesh>



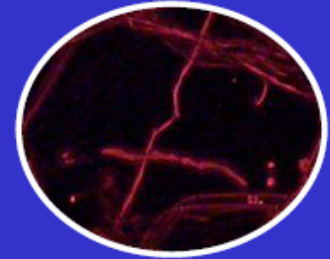
- Surface modification of polymeric materials
- Novel biomaterials as tissue engineering scaffolds
- Development of drug delivery systems



Haemocompatibility



Tissue engineering  
scaffolds



Controlled drug  
delivery

**BIOMATERIALS AND TISSUE ENGINEERING**





# Dr. SRIKANTH VEDANTAM

## SCD, Massachusetts Inst. of Technology, USA

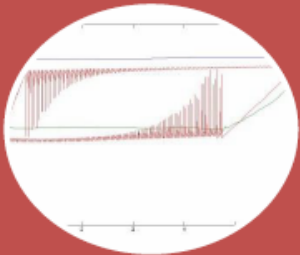
Associate Professor, Dept. of Engineering Design

044-2257-4739; [srikanth@iitm.ac.in](mailto:srikanth@iitm.ac.in)

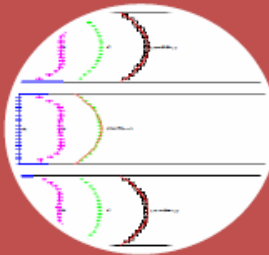
<http://ed.iitm.ac.in/~srikanth>



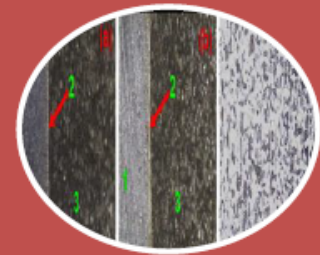
- Mechanics of Smart Materials and Functionally Graded materials
- Hydrodynamics of flow in microchannels
- Discrete computational mechanics



Shape memory reinforced  
composites for impact  
resistant structures



DNA separation and  
manipulation of biological  
cells in microchannels



Functionally graded  
materials for brake  
applications



Dr. G SARAVANA KUMAR

PhD, IIT Kanpur, India

Professor, Dept. of Engineering Design

044-2257-4736; [gsaravana@iitm.ac.in](mailto:gsaravana@iitm.ac.in)

<http://ed.iitm.ac.in/~gsaravana>



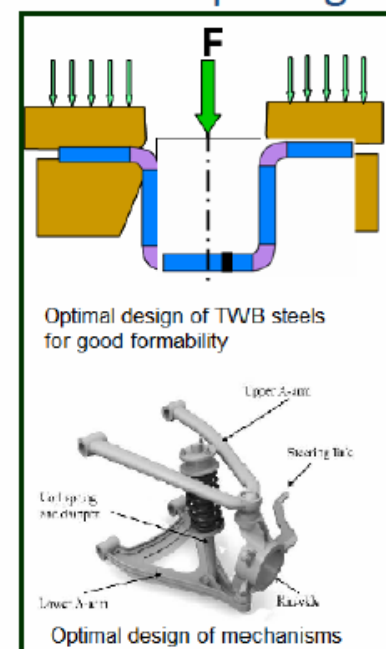
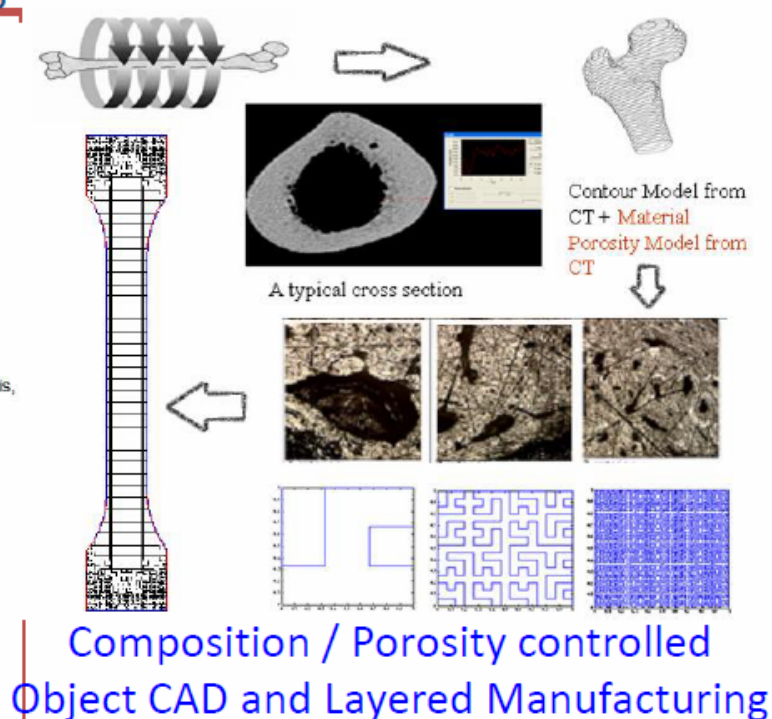
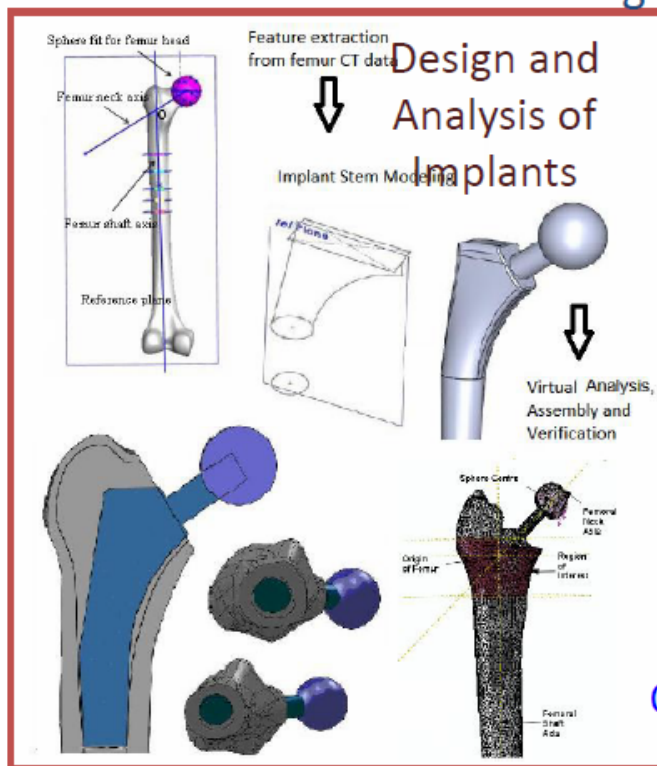
Development of representational and computational tools for virtual and physical prototyping applied to arrive at solutions to design problems.

• CAD/CAE/CAM

• Engineering Optimization

• Additive Manufacturing

• Nature Inspired Computing



Optimal Design



# Dr. Krishnan Balasubramaniam

Professor, Mechanical Engineering

044-2257-4662; [balas@iitm.ac.in](mailto:balas@iitm.ac.in)

<http://www.cnde-iitm.net/balas/index.html>



## Major Areas of Research

- Non-destructive Imaging & Evaluation of Materials, Structures, Products
- Structural Health Monitoring using in-situ Sensor Systems
- Measurements of Material Properties and In-Process Parameters.

GPR Testing Techniques and  
Models for Structures

IN-PROCESS monitoring of Cure  
Properties of Concrete,  
Polymers, and Joints

Material Property  
Measurements at Ambient  
Temperatures and Elevated  
temperatures up to 1500 C

← Applying Acoustic and Electromagnetic Spectrum for Industrial Measurements →



**Dr.Varadhan S.K.M**

PhD(The Pennsylvania State University, USA )

**Asst. Professor, Dept. of Applied Mechanics**

+91 44 2257 4071; [skm@iitm.ac.in](mailto:skm@iitm.ac.in)

<http://apm.iitm.ac.in/biomedical/skm/index.html>



## Research Areas

## Description

### Neuromechanics

The neural basis of Biomechanics, understanding the central nervous system control strategies responsible for movement generation

### Motor Learning

Understanding the mechanisms that underlie learning motor tasks, from simple, daily movements to special movements in art and sport

### Rehabilitation

Development of Assist devices to be used in Rehabilitation of patients with neuro-motor disorders, such as stroke





# Dr. Prathap Haridoss

Associate Professor, Metallurgical and Materials Engineering

044-2257-4771; prathap@iitm.ac.in



## Major Areas of Research

- **Proton Exchange Membrane (PEM) Fuel Cells: Materials and Technology**
- **Carbon Nanotubes (CNTs): Synthesis and Applications**

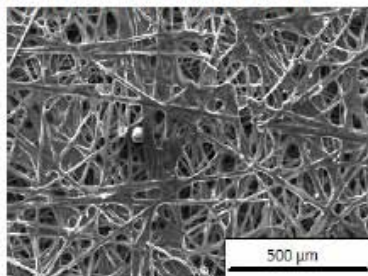
### PEM Fuel Cells



Segmented fuel cell testing



Fuel cell powered bicycle, using commercially available components

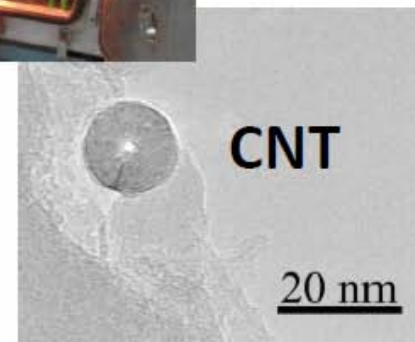
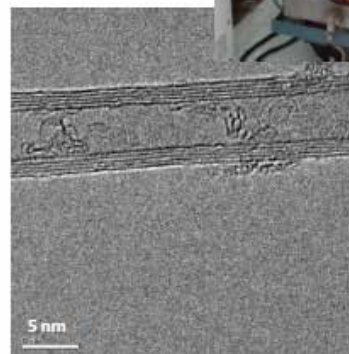


Enhanced Gas Diffusion Layer

### Carbon Nanotubes



Modified Arc Discharge method for synthesis of Carbon Nanotubes



Carbon Nanotubes in different orientations



# Dr. Asokan Thondiyath

Ph.D, IIT Madras, India

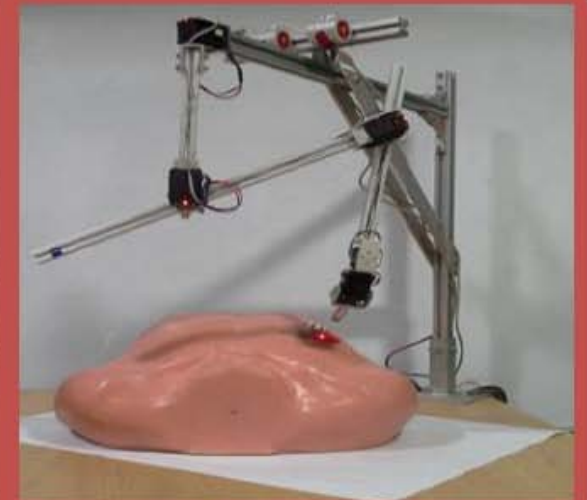
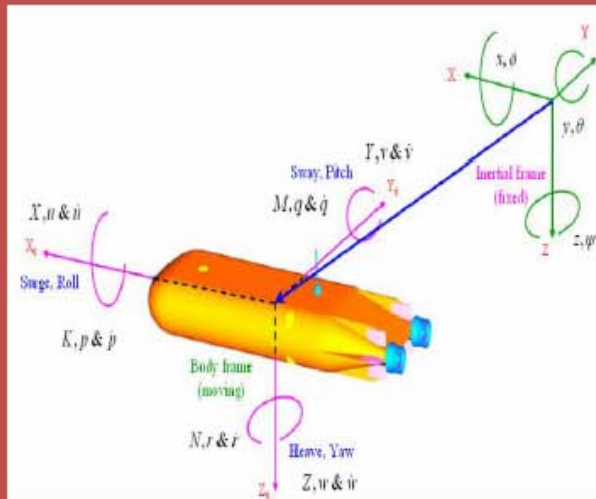
Associate Professor, Dept. of Engineering Design

044-2257-4707; [asok@iitm.ac.in](mailto:asok@iitm.ac.in)

<http://ed.iitm.ac.in/~asokan>



- Robotics (Underwater, Mobile and Medical Robotics)
- Mechatronics
- Medical Device Development







# Dr. SOMA GUHATHAKURTA

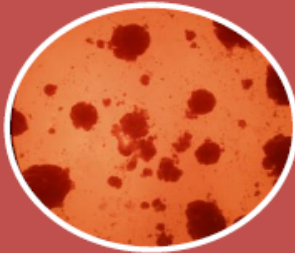
## PHD, IIT MADRAS, INDIA

Professor, Dept. of ENG. DESIGN

044-2257-4744; [soma@iitm.ac.in](mailto:soma@iitm.ac.in)



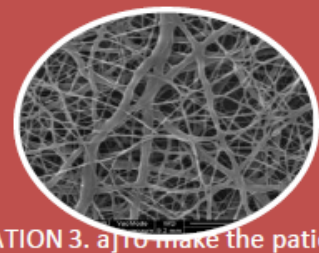
- Research Area/Focus1. Bioreactor Designing for Tissue Engineering and Stem cell technology. Polymer nanofibre scaffold development as usable biomaterial in human
- Research Area/Focus 2. Development of innovative medical devices
- Research Area/Focus 3. Inter-disciplinary approach to Biomedical Engineering



APPLICATION 1: Organ, Tissue, and Blood off the shelf may possibly be available through this versatile bioreactor system



APPLICATION 2. Simple instruments for day to day diagnosis practice so that sophisticated diagnostics may be eliminated



APPLICATION 3. a) To make the patient's waiting time less in the hospitals or in health centres with a usable data with accuracy to receive treatment effectively. b) Purely mechanical devices for blood pressure monitoring or drug delivery (intravenous), so that electrical energy dependency can be avoided.



# Dr. R. Krishna Kumar

## PhD, IIT Madras

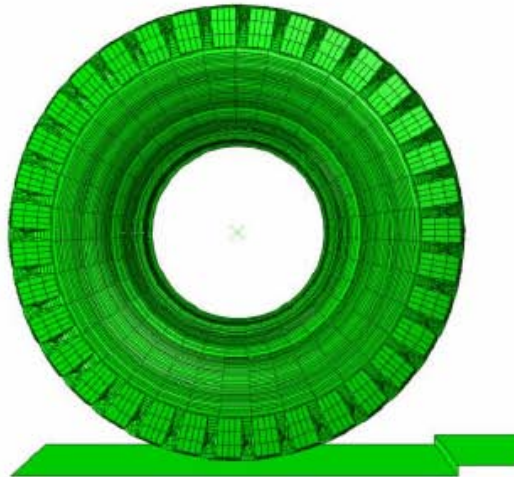
Professor, Dept. of Engineering Design

044-2257-4661; [rkkumar@iitm.ac.in](mailto:rkkumar@iitm.ac.in)

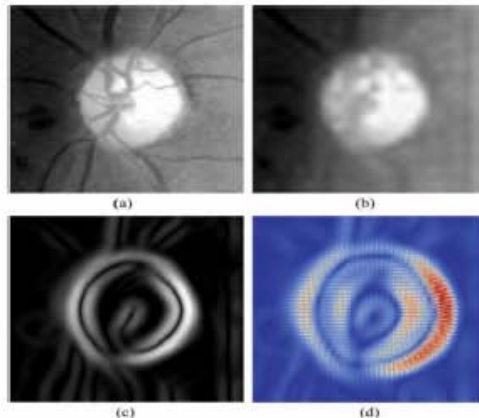
<http://www.iitm.ac.in/ED>



- Non-linear Finite Element / Tire mechanics and Biomechanics
- Biomedical Signal Processing/Cardiovascular
- Biomedical Image Processing/Diabetic Retinopathy, Cardiac imaging, image guided surgery



Tire Mechanics



Optic Disc Detection



Five lead wireless ECG





**Professor T. Pradeep**  
**Ph.D. (Indian Institute of Science, India)**

Professor, Department of Chemistry

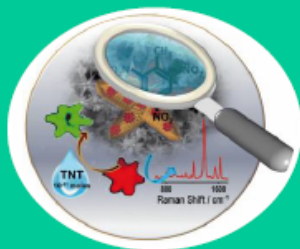
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<http://www.iitm.ac.in/component/faculty/138/pradeep/>

Most updated link: <http://www.dstuns.iitm.ac.in/t-pradeep.php>



- **Research Area/Focus 1:** Molecular and nanoscale materials
- **Research Area/Focus 2:** Drinking water purification
- **Research Area/Focus 3:** Ice chemistry



**Advanced  
Sensors**



**Water  
Purification**



**Ice Chemistry**

← Diverse nanomaterials and their properties in the context of affordable clean water; with emphasis on understanding phenomena →



## Dr. Jagadeesh Kumar V

Professor, Electrical Engineering Department

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[http://www.ee.iitm.ac.in/facs\\_vjkumar](http://www.ee.iitm.ac.in/facs_vjkumar)



- Electrical, Electronic and Biomedical Instrumentation.
- Sensors and signal conditioning.
- Measurements on properties of ferromagnetic materials.



Variable Reluctance Type  
Pressure Transducer



Calibration free pulse  
oximeter



Brake wear sensor for  
heavy vehicles

Applying analog and digital electronics for Sensing and Measurements

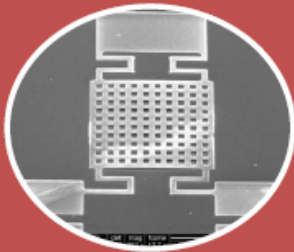
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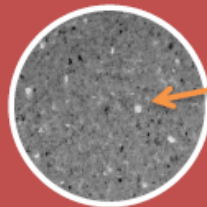
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- MEMS and NEMS
- Biosensors and BioMEMS
- Semiconductor materials and devices



MEMS processes  
and sensors



20 nm

Silicon nanoporous  
membranes



Bio sensors/MEMS  
digital microfluidics

Processes, devices and sensors in amorphous, porous, poly and crystalline silicon





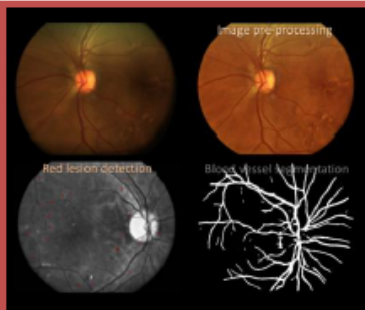
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- Healthcare technologies
- Biomedical devices and instrumentation
- Medical signal/image processing



Screening



Diagnosis



Therapeutic



at IIT Madras Research Park

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Good luck