

# Computational Musculoskeletal Biomechanics

## Overview

Accurate knowledge of muscle and joint loading during human locomotion is critical for improving the diagnosis of musculoskeletal conditions such as osteoarthritis (joint disease) and for evaluating the effects of implant design and surgical technique on the functional performance of total joint replacements. In vivo measurement of muscle and joint loading is infeasible thus computational modeling is used to evaluate these quantities non-invasively.

This course is aimed at senior undergraduate and graduate students who wish to broaden their knowledge of human motion biomechanics. The course will introduce the fundamental science underlying computational modelling of the human neuromusculoskeletal system. Students will gain in-depth knowledge and understanding of the structure and function of the skeletal, muscular, and sensory systems, and how these systems work synergistically to produce coordinated movement during daily activities like walking. On completing this course, students will be able to:

- describe the various elements comprising a computational model of the human neuromusculoskeletal system;
- formulate and solve differential equations that incorporate the mechanical and physiological properties of bone, muscle, ligament, cartilage and tendon;
- create simple, integrative models of the human neuromusculoskeletal system; and
- use computational models of the musculoskeletal system to study the biomechanics of human movement.

Dates for the course	1 <sup>st</sup> September to 10 <sup>th</sup> September 2018
Host Institute	IIT Madras
No. of Credits	2
Maximum no. of participants	30
This course is suitable for...	Students and professionals working in the areas of biomechanics, physiotherapy, and medicine (especially orthopaedics, prosthetics and rehabilitation)
Course Registration Fees	<p>Student participants from IIT Madras or other approved institutes of GIAN - Rs. 500 per credit; Non-student participants - Rs. 1500 per credit.</p> <p>These fees apply toward participation in the course, obtaining course material, computer use for tutorials and assignments, and laboratory equipment usage.</p> <p><u>Accommodation is not a part of the registration fee.</u></p> <p>Mode of payment: <u>Online transfer: (Preferred)</u> Account Name: CCE IIT Madras Account No: 36401111110 Branch: SBI, IIT Madras Branch, Chennai IFSC Code: SBIN0001055</p> <p><b>OR</b></p> <p>Demand draft in favour of "CCE, IIT Madras" payable at Chennai. The demand draft is to be sent to the Course Coordinator at the address given below.</p>
Accommodation	<p>Accommodation: The participants may be provided with hostel accommodation, depending on the availability, on payment basis. Accommodation is not a part of registration fee. Request for hostel accommodation may be submitted through the link: <a href="http://hosteldine.iitm.ac.in/iitmhostel">http://hosteldine.iitm.ac.in/iitmhostel</a></p>

## Course Faculty

### Professor Marcus G. Pandy



Professor Marcus Pandy is appointed as Chair of Mechanical and Biomedical Engineering in the Department of Mechanical Engineering at The University of Melbourne. He received a PhD in mechanical engineering from Ohio State University, Columbus USA, and completed a post-doctoral fellowship in mechanical engineering at Stanford University. Prior to joining the University of Melbourne, he held the Joe J. King Professorship in biomedical engineering at the University of Texas at Austin. He is a Fellow of the American Institute of Medical and Biological Engineering, the American Society of Mechanical Engineers and the Institute of Engineers Australia.

### Professor Sujatha Srinivasan



Professor Sujatha Srinivasan heads the TTK Center for Rehabilitation Research and Device Development (R2D2) in the Department of Mechanical Engineering at IIT Madras. She received a PhD in Mechanical Engineering from the Ohio State University, Columbus, USA. She worked in the prosthetics industry for about 8 years prior to starting her PhD. She has been at IIT Madras since 2008 and her research focuses on biomechanics and mechanisms geared towards the development of assistive devices for people with locomotor disability. More details are available at <https://home.iitm.ac.in/r2d2>.

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For detailed syllabus, please look at:  
URL: <https://home.iitm.ac.in/r2d2/giancmb>