GIAN SPONSORED WORKSHOP ON
MECHANICS OF MUSCLES: MODELS, MOVEMENTS AND MEASUREMENTS

Organized by Department of Instrumentation and Control Engineering
National Institute of Technology, Tiruchirappalli
25th - 29th August, 2025

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Overview

Skeletal muscles are the motors that allow us to move. The mechanism of these motors is a masterpiece of engineering and it incorporates the information associated with both central and peripheral nerve activities. These mechanisms generate fine and precise force that help us to perform tasks such as hold a flower without crushing it, using chopsticks, and writing etc. There are around 640 skeletal muscles present in a human body and these are made up of motor units. The number of motor unit per muscle in humans may range from about 100 for a small hand muscle to 1000 or more for large limb muscles. The electrical activities of these contracting skeletal muscles are recorded using the technique called Electromyography (EMG). It can be recorded invasively (needle EMG) and non-invasively (surface EMG). Both these tools are considered as very important for the physiological investigations. Needle EMG is widely used for the diagnostic purpose. Because of the non-invasiveness, the application of surface EMG gains momentum in the fields of movement analysis, ergonomics, prosthetic control, occupational and sport mechanics. This course discusses the current status, scope and opportunities in the field of EMG in health and industry. It provides a comprehensive overview of the functionality of muscles and its mechanics, signal generation models, applications, issues and challenges in the analysis of EMG signals. It includes lectures, demonstrations and tutorials. The course is interdisciplinary, in nature and is proposed for research cum higher undergraduate level students. This course will help the researchers/scientist, faculties, and students to share and enrich knowledge at national and international level in the area of muscle mechanics who has more than 25 years of research experience in surface EMG.

Course participants will learn these topics through lectures and hands-on experiments. Also case studies and assignments will be shared to stimulate research motivation of participants.

Modules	• Introduction to EMG and Signal Acquisition. • EMG Signal Processing and Analysis. • Advanced Signal Processing Techniques in EMG Analysis. • Applications of EMG in Rehabilitation and Industry. • Movement Intention Detection and Research Scope. • Motor disorder society (mds): Neuromotor disorder analysis. • Co-activation, use of NIR for muscle activity detection
No. of Participants	**Number of participants will be limited to 50 Only.** (If more no. of participants registered, selection will be based on research interest in this field)

You Should Attend If…	You are a BE/B.Tech (final or pre-final year), PG, PhD student, post-doctoral fellow, faculty member, engineer, research scientist, or medical doctor working or interested in biomedical engineering, neurophysiology, muscle mechanics, artificial intelligence, rehabilitation, sports and occupational medicine, movement and exercise physiology, or related fields.
Registration	**Course Registration:** ➢ Please use the link below for the course registration. **Link: https://forms.gle/n7mqT3vRmYT17QiB6** ➢ Last date for Course Registration: **August 18, 2025**
Course Fee	The participation fees for the course is as follows: **Indian Participants** — **Course Fee (including GST 18%)** • Students / Research Scholars — **Rs. 1000 /-** • Faculty and Scientist — **Rs. 3000 /-** • Industrial participants — **Rs. 7500 /-** **Foreign Participants** • Students / Research Scholars — **US $ 200 /-** • Faculty and scientist — **US $ 500/-** • Industrial Participant — **US $ 1000/-** The above fee includes all course materials, computer use for tutorials and assignments, laboratory equipment usage charges, internet facility.
Payment Procedure	**Indian participants:** → Go to State Bank Collect (https://www.onlinesbi.sbi/sbicollect/) → Select Category: Educational Institutions → Search for **Conference and Workshop NIT Trichy** → Select Payment Category: **"GIAN MECHANICS 2025"** → Provide details of payment and submit. **International Participants:** Required to make the course fee payment via SWIFT transfer. **Account Details for SWIFT Transfer:** Account Number: **38322028974** Account Name: **Director, NIT-Tiruchirappalli**. SWIFT Code: **SBININBB190** Bank Name: **State Bank of India**
Accommodation	**Accommodation will be provided on request (*Charges per day per person*) and based on the availability. Rates are given below on additional payment basis.** **1.** Hostel: ₹225 (Per head) **2.** Guest House (Double Occupancy): ₹1800 + 18% GST **3.** Guest House (Single Occupancy): ₹1100 + 18% GST

The Faculty	**Dr. Dinesh Kumar, Professor, Royal Melbourne Institute of Technology, Melbourne, Australia.**  **Dr. Dinesh Kumar** is a Professor in the Department of Engineering at Royal Melbourne Institute of Technology, Melbourne, Australia. His research focuses on biomedical signal and image analysis, particularly for diagnostics and disease monitoring. His work on Parkinson's disease (PD) has been widely recognized, where he has explored e-health solutions for monitoring patient progress. His current research aims to develop portable and cost-effective methods for monitoring gait in PD and other neuromotor disorder patients.
	Dr. N. Sivakumaran, Professor, National Institute of Technology, Tiruchirappalli.  **Dr. N. Sivakumaran** is a Professor in the Department of Instrumentation and Control Engineering at NIT Trichy, India. His research focuses on process control, biomedical instrumentation, and automation. He has worked extensively on developing advanced control strategies for industrial processes and healthcare applications. His current research explores intelligent control techniques and their applications in biomedical systems, aiming to enhance automation and precision in medical diagnostics and treatment.
	Dr. P. A. Karthick, Assistant Professor, National Institute of Technology, Tiruchirappalli.  **Dr. P. A. Karthick** is a faculty associated with the Department of Instrumentation and Control Engineering at NIT Trichy, India. His research focuses on biomedical signal processing, machine learning, and rehabilitation engineering. He has worked extensively on developing advanced algorithms for analyzing physiological signals to aid in medical diagnostics and assistive technologies. His current research explores intelligent systems for neurorehabilitation, aiming to enhance healthcare solutions for individuals with neuromuscular disorders.
Course coordinators	**Dr. N. Sivakumaran / Dr. P. A. Karthick** Department of Instrumentation and Control Engineering, NIT Tiruchirappalli. Phone: 0431-2503362 / 3355 E-mail: nsk@nitt.edu / pakartick@nitt.edu Website: www.nitt.edu
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