

Bio-Medical Engineering: Insight and Signal Processing

Overview

Analysing biomedical signals such as electrocardiogram and electroencephalogram has become very important with modern healthcare striving to provide cost effective point-of care diagnosis and personalised treatment. Furthermore, fast computing power in recent years has made possible the analysis of complex methodologies. As a result biomedical engineering has become a very active area of research and relevance. The aim of this course is to provide attendees with a fundamental understanding of signal processing techniques and classification algorithms for analysing biomedical signals. The course will allow the attendee to demonstrate understanding of basic principles of digital signals; awareness of physiology and characteristics of different biomedical signals; describe and apply pre- and post-processing techniques, such as conditioning, filtering, feature extraction, classification and statistical validation techniques for biomedical signals and solve practical biomedical signal analysis problems using the industry standard software, MATLAB.

This course is organized in a single module and will be having lectures, tutorials consisting of practical sessions, test and its discussion, in order to make the course interesting and interactive. The lecture session is designed to give an insight into the basics as well as the signal processing aspects of biomedical engineering. The topics that will be covered in lecture sessions are Introduction to common biomedical signals (such as Electrocardiogram, Electroencephalogram, Evoked Potential, Electromyogram), Introduction to Brain and EEG signals, Discrete-time signal (Sampling, Quantisation, Coding, Aliasing), Spectral analysis - Fourier transform and related issues (periodogram, Welch etc.), Digital filtering: Filter specifications, FIR, IIR, Signal conditioning- Noise reduction techniques (mean, median filtering, principal component analysis etc), Feature extraction: Simple features, Correlation, Autoregressive, Spectral and time domain based, Signal Classification: k-nearest neighbour, multi-layer perceptron, training and testing the classifiers. Lecture sessions will be followed by Practical Sessions in which the participants will get hands-on experience in MATLAB on introduction to MATLAB, Signal Processing Toolbox in Matlab, filtering and noise reduction, feature extraction and classification. The course will also be having a small test followed by the discussion on solutions.

Course name	Biomedical Engineering: Insight and Signal Processing: Dates: 26 th Dec – 30 th Dec 2016 Number of participants for the course will be limited to thirty.
Who should attend?	<ul style="list-style-type: none">Final year undergraduates, postgraduates of Electrical, Electronics and Computer engineering from reputed academic and technical institutions.Physical scientists, engineers and researchers who have interest in Biomedical Signal Processing.
Fees	The participation fees for taking the course is as follows: Participants from abroad : US \$500 Industry/ Research Organizations: Rs. 10000 Academic Institutions: Rs. 4000 Students: Rs. 1500 The above fee includes all instructional materials, computer use for tutorials and assignments, laboratory equipment usage charges, free internet facility. The participants will be provided with boarding and lodging in campus on payment basis subject to availability. All course registrations will be processed via the national GIAN portal (gian.iitgp.ac.in), where a Rs. 500/- one-time fee is payable in addition to the above amount.

The Faculty



Dr. Palaniappan Ramaswamy is Reader in the School of Computing, University of Kent, UK, which is among the top 20 UK universities. His research interests include Signal processing, Electrophysiological analysis (for various mental and cardiovascular disorders, Brain-computer interface, Time-series analysis, Biometrics and Machine learning (neural networks, genetic algorithms) and image processing. To date, he has about 166 publications to his credit which include 4 books, 61 journals, 12 book chapters and 89 conference publications, with citations totalling over 2000 in peer reviewed journals, book chapters, and conference proceedings. He is also the Editor-in-Chief of International Journal of Cognitive Biometrics and editorial board member for several international journals. He also serves in the prestigious Peer Review for UK Research Councils and many other international grant funding bodies. His pioneering work on revolutionary new areas of brain-computer interfaces and emerging biometrics has not only received international awards and recognition by the scientific community but also from the media and public. His international research collaborations on signal processing and machine learning include among others institutions from Canada, China, India, Malaysia and Singapore.



Dr. Yusuf Uzzaman Khan is a Professor of Department of Electrical Engineering, ZHCET, Aligarh Muslim University. His research interest is in biomedical signal processing, wavelets and neural networks. He was a Post-Doctoral Fellow at McGill University, Montreal, Canada and a Commonwealth Fellow to Essex University, UK. He is a recipient of Felix Scholarship and has done his D. Phil. in Trinity term 1997 from University of Oxford, UK as a Felix Scholar. He received University medal for standing first in Master of Engineering in Electrical Engineering from University of Roorkee, India. He has around 16 years of teaching experience and 19 years experience in research with publications in conferences and refereed journals.

Prof. Khan is a senior member of IEEE, Fellow of IETE, Life member of Indian Epilepsy Association and of Systems Society of India.

Course Co-ordinator

Prof. Yusuf Uzzaman Khan
Dept. of Electrical Engineering
Z H College of Engineering & Technology
Aligarh Muslim University, Aligarh - 202002
Phone: +91-571-2721178, 8194067000
E-mail: yusufkhan.ee@amu.ac.in

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For Registration:
<http://www.gjan.iitkqp.ac.in/GREGN>