Innovative Principles of Gait Training: Neuroplasticity Principles, Biomechanics, and Computational Methods

December 26, 2017-December 30, 2017

Call for Registration and Participation

International Faculty

Dr. Trisha Kesar
Rehabilitation medicine, School of medicine
Emory University, USA

Course Coordinator

Dr. Anup Nandy
Department of Computer Science & Engg.
National Institute of Technology, Rourkela

Organized by

Department of Computer Science and Engineering

National Institute of Technology Rourkela

www.nitrkl.ac.in

About GIAN

Govt. of India introduced a new program titled Global Initiative of Academic Networks (**GIAN**) in Higher Education aimed at tapping the talent pool of scientists and entrepreneurs, internationally to encourage their engagement with the institutes of Higher Education in India so as to augment the country's existing academic resources, accelerate the pace of quality reform, and elevate India's scientific and technological capacity to global excellence.

http://www.gian.iitkgp.ac.in//files/brochures/BR1496314004New_gian_brochure_Gait_Training.pdf

Overview of the Course

As walking is a crucial component of activities of daily living, individuals with neurological pathologies such as stroke and multiple sclerosis consider restoration of walking an important goal of rehabilitation. A majority of individuals with post-stroke hemiparesis present with deficits in walking function (e.g. slowed gait speed, reduced endurance, gait asymmetry) and biomechanical gait impairments (e.g. foot drop, reduced paretic propulsion, circumduction). Due to the high impact of gait dysfunction on quality of life of individuals with neurological pathologies, there is a significant focus in rehabilitation research toward the development of innovative, evidence-based techniques to evaluate and treat gait dysfunction. The goal of this course is to provide the attendees with innovative, high-impact research evidence related to the evaluation and treatment of gait dysfunctions in neurological populations such as stroke and Parkinson diseases etc. The course will provide a detailed description of innovative measurement techniques, including 3-dimensional gait biomechanics, multi-muscle electromyography, non-invasive brain stimulation for measurement of corticospinal excitability of lower limb muscles, peripheral nerve stimulation for evaluation of spinal excitability, and clinical gait function. The treatment techniques will include treadmill training with and without body-weight support, functional electrical stimulation, real-time gait biofeedback, virtual reality biofeedback training, split-belt walking, etc. An internationally reputed faculty member with mastery in teaching, research, and expertise in stroke gait biomechanics and gait rehabilitation will conduct this course.

Who Can Attend ?

- You are graduate or undergraduate student in Electronics, Computer Science, Electrical, Biomechanics, Pathology and Biomedical Engineering
- You are a clinical scientist working with medicine industry and healthcare domain or want to pursue your career as a gait analytics.
- You are a Ph.D. student or faculty from academic institution interested in developing clinical applications for measurements and training of gait.

Number of participants for the course will be limited to thirty.

Course Contents

- Basic Concepts and Techniques for Measurement of gait function: December 26, 2017.
- Advanced Topics and Evaluation of Gait: December 27–December 28, 2017.
- Innovative treatment interventions for Gait: December 29 – December 30, 2017.

Important Dates

Last date for GIAN registration: **15-Dec- 2017**
Last date of receiving DD: **20-Dec-2017**
Course dates: **26-Dec-2017 to 30-Dec-2017**

Selection will be as per the eligibility, and on First-Come-First-Served basis.

Course Faculty

Dr. Trisha Kesar is a faculty in Rehabilitation medicine at Emory University School of medicine, Atlanta, Georgia, USA. Dr. Kesar is the Director of the Motion Analysis Laboratory at Emory Rehabilitation Hospital. She earned her Master's and PhD in Biomechanics and Movement Sciences from University of Delaware, USA. She completed post-doctoral research training to gain additional research expertise in post stroke gait rehabilitation at University of Delaware, and a visiting post-doctoral fellowship in neurophysiological evaluation using transcranial magnetic stimulation (TMS) at University of Maryland Baltimore, USA. Prior to her post-graduate training in USA, Dr. Kesar completed a Bachelors of Physiotherapy degree from Post Graduate Institute of Medical Education and Research (PGIMER), India. Dr. Kesar's research goal is focused on developing novel gait rehabilitation interventions and strategies that are based on an in-depth understanding of the neuroplasticity, biomechanical, and motor learning mechanisms underlying gait and gait training.

Dr. Anup Nandy is a faculty in the Department of Computer Science and Engineering at National Institute of Technology Rourkela. He earned his Ph.D. degree from IIIT-Allahabad. He received an early career research award as research grant From SERB, DST, Govt. of India. He also received an International Indo-Japanese Project grant from DST, Govt. of India. His research area includes Human Gait Analysis, Machine Learning, Robotics.

About Institute

NIT Rourkela is one of the premier national level institutions for technical education in the country and is funded by the Government of India. According to the Times Higher Education (THE) ranking of the World's best Universities 2017, it is ranked in top 800 institutes of world, and it is only NIT to feature in the list. According to the QS University ranking: BRICS 2016 has figured NIT Rourkela in the list of 111-120 top universities in Brazil, Russia, India, China and South Africa.

About Department

The Department of Computer Science and Engineering was established in the year 1983 with the recent technological advancements in Computer Science. The department has currently 19 faculty members with different research and teaching expertise in the field of Computer Science. The department runs several sponsored projects from government organizations like DST, SERB, BRNS, DRDO, etc.

Registration Fee Details

Candidates have to send the necessary course fee in form of Demand Draft which should be drawn in favor of '**Continuing Education, NIT Rourkela**' payable at **SBI, NIT Rourkela.**

Participants from abroad : **US $500**
Industry/ Research Organizations : INR 5000
Academic Institutions (Faculty): **INR 3000**
Students: **INR 2000**

N.B.: Candidates registering early will be given preference in the short-listing process The above fee include all instructional materials, computer use for tutorials and assignments, laboratory equipment usage charges, 24 hr free internet facility. The participants will be provided with accommodation on payment basis.

How to Register?

Registration to this course is a two-step process:

Participants will have to first register to the GIAN portal. It is a one-time process. One time Nonrefundable fee of Rs. 500/- is to be charged for this service. You are required to apply online using the following steps in the given link:

- Apply online for registration. Go to: http://www.gian.iitkgp.ac.in/GREGN/index
- Fill up the registration form.
- Pay Rs 500/- (non-refundable) through online payment Gateway.
- Click on course registration option at the top of registration form. Select the course titled "Innovative Principles of Gait Training: Neuroplasticity Principles, Biomechanics, and Computational Methods from the list and click on Save option. Confirm your registration by clicking on Confirm Course.

The course coordinators will confirm your selection as a participant in due course of time. Once you are selected, you will be informed by email and will be requested to pay the full fees through Demand Draft and fill the course registration details in following link:
https://goo.gl/forms/mQjJK7TZtS3TIKuk1
NB: Please send the DD and registration copy (from GIAN) by post to Dr. Anup Nandy (coordinator), Department of Computer Science & Engg., NIT Rourkela, Rourkela – 769008.

Contact Details

Course Coordinator: Dr. Anup Nandy
Ph: 0661-2462370
E-mail: nandya@nitrkl.ac.in
Mob: +91-8763721281

Register yourself at:
http://www.gian.iitkgp.ac.in/GREGN/inde

Detailed GIAN Course Outline

Module A: Basic concepts related to measurement of gait function (normal and pathological) and neuroplasticity

December 26, 2017

Lecture 1(1 Hour): Basic concepts related to normal and pathological gait patterns; Fundamentals of 3-dimenstional gait analysis.

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Lecture 2 (1 Hour): Summary of the current state of research evidence related to the effectiveness of post-stroke gait rehabilitation

Lecture 3 (1 Hour): Definition, mechanisms, and clinical importance of neuroplasticity; Origin of neurological disorders and role of gait training. Multi-modal gait analysis through exploitation of kinematic gait features.

Module B: Description, advantages, and limitations of specialized techniques for evaluation of gait

December 27, 2017

Lecture 4 (1 Hour): 3-dimensional biomechanics, multi-muscle electromyography, modification and instrumentation of clinical tests for assessing dynamic balance and gait.

Lecture 5 (1 Hour): Background and rationale for incorporating measurement of neuroplasticity outcomes in conjunction with clinical function and biomechanics.

Lecture 6 (1 Hour): Non-invasive brain stimulation for measurement of corticospinal excitability of lower limb muscles, peripheral nerve stimulation for evaluation of spinal excitability

December 28, 2017

Lecture 7 (1 Hour): Discussion on different techniques for gait stability analysis: Lyapunov exponent, computation of joint decomposition index and coefficient of correspondence for angle-angle coordination analysis.

Lecture 8 (1 Hour): Wearable sensors and real-time feedback for gait training: Rationale, research evidence, advantages, and challenges for the incorporation of wearable sensors for providing real-time feedback during gait training. Recent research evidence from our laboratory and others demonstrating the feasibility and effects of gait biofeedback, as well as future directions for research and clinical applications.

Tutorial 1 (1 Hour): Clinical case study example, problem solving, and doubt clearing session.

Module C: Description, physiological basis, and research evidence related to innovative treatment interventions for gait retraining and rehabilitation

December 29, 2017

Lecture 10 (1 Hour): Physiological principles, biomechanical effects, methodological protocols, and clinical effectiveness of gait training interventions that utilize treadmill stepping for mass practice and neuromuscular stimulation for enhancing neuroplasticity - Fast treadmill training, body-weight supported gait training, functional electrical stimulation

Lecture 11 (1.5 hour): Physiological and motor learning principles, biomechanical effects, methodological protocols, and clinical effectiveness of gait training interventions utilizing neurofeedback - Real-time gait biofeedback, virtual reality biofeedback training, split-belt walking, other training paradigms based on error-augmentation

Module C (continued): Description, physiological basis, and research evidence related to innovative treatment interventions for gait retraining and rehabilitation

December 30, 2017

Lecture 12 (2 hour): Development and testing of innovative gait training techniques that capitalize on wearable sensor technologies and computational and real-time analysis of gait

Tutorial 2 (1 hour): Problem solving /Open discussion with the audience, and Quiz.

Final Examination
Date of Examination: December 30, 2017