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 parietal 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 gait biomechanics and gait rehabilitation will conduct this course.

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

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

About GIAN
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.


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

Course Contents

Important Dates
- Last date for GIAN registration: 15-Dec-2017
- Last date of receiving DD: 20-Dec-2017
- 26-Dec-2017 to 30-Dec-2017

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

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, NIT Rourkela 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, BNSC, DRDO, etc.

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

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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-dimensional gait analysis.

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