**Instructor Name:** DEBDOOT SHEET (IIT Kharagpur - Electrical Engineering)

**COURSE DURATION:** Feb-Mar 2017  
**CORE / ELECTIVE:** Elective  
**UG / PG:** Both

**PRE-REQUISITES:** Digital Image Processing

**INTENDED AUDIENCE:** Electrical Engineering, Computer Science, Electronics Engineering, Information Technology, Biomedical

**INDUSTRIES APPLICABLE TO:** GE, Siemens, Philips, Toshiba, Samsung, Microsoft, Google, Zeiss, Robert Bosch, TCS, CDAC, IBM, Boston Scientific, Volcano Corp., Aloka, Rohde & Schwarz

**COURSE OUTLINE:** You get to learn about current technology in processing and analysis of medical images; a rapidly growing industry expected to reach $2.4 billion by 2017. If you are looking forward to a career in medical imaging instrument and softwares design, medical imaging, medical visualization, medical robotics and augmented reality, this is the key subject you should enroll for. The aim is to teach students advanced technology in processing and analysis of medical images. It would be beneficial to students opting for specialization in medical imaging instrument design, medical imaging, medical visualization, medical robotics and augmented reality, who can use the gained skills in order to develop newer technological innovations and regularize them for high-throughput clinical translation and usage.

**ABOUT INSTRUCTOR:** Debdoot Sheet is an Assistant Professor of Electrical Engineering at the Indian Institute of Technology Kharagpur, India. He received the MS and PhD degrees from the Indian Institute of Technology Kharagpur, India in 2010 and 2014 respectively. His current research interests include computational medical imaging, machine learning, image and multidimensional signal processing, visualisation and augmented reality. He is also a DAAD alumni and was a visiting scholar at the Technical University of Munich, Germany during 2011-12. He is also recipient of the IEEE Computer Society Richard E. Merwin Student Scholarship in 2012, the Fraunhofer Applications Award at the Indo-German Grand Science Slam in 2012, and winner of the GE Edison Challenge 2013. He currently serves as a Regional Editor of IEEE PULSE since 2014.

**COURSE PLAN**

**Week 1:** Introduction to Medical Imaging and Analysis Softwares

**Week 1:** X-ray and Computed Tomography (CT) imaging

**Week 1:** Magnetic Resonance Imaging (MRI)

**Week 1:** Ultrasonic Imaging

**Week 1:** Molecular Imaging, SPECT and PET

**Week 2:** Texture in Medical Images

**Week 2:** Region Growing and Clustering

**Week 2:** Random Walks for Segmentation

**Week 2:** Active Contours for Segmentation

**Week 2:** Systematic Evaluation and Validation

**Week 3:** Decision Trees for Segmentation and Classification

**Week 3:** Random Forests for Segmentation and Classification

**Week 3:** Neural Networks for Segmentation and Classification

**Week 3:** Deep Learning for Medical Image Analysis
Week 4: Retinal Vessel Segmentation

Week 4: Vessel Segmentation in Lung CT Images

Week 4: Lesion Segmentation in Brain MRI

Week 4: Ultrasonic Tissue Characterisation

Week 4: Metastatic Region Segmentation in Lymph Node Histology