

INDIAN INSTITUTE OF TECHNOLOGY TIRUPATI
PROFORMA FOR NEW COURSE

1.	Title of the Course	Medical Imaging
2.	Course Number	EE5029
3.	Status of the Course	Elective
4.	Structure of Credits	3-0-0-3
5.	Offered To	PG
6.	New Course/Modification to	New
7.	To be Offered by	Department of Electrical Engineering
8.	To take effect from	July 2019
9.	Prerequisite	CoT for UG
10.	Whether approved by the Department	Yes
11.	Course Objective: The objective of this course is to provide students with an overview of the computational methods in medical imaging. The course covers the main sources of medical imaging data (X-Ray, CT, MRI, PET and ultrasound). In addition, this course presents various clinical applications and provides hands-on experience on various medical imaging Software tools. Many of the current methods used to enhance and extract useful information from medical images will be introduced.	
12.	Course Content: Basic image processing: spatial transformations, Fourier series, Fourier transform, convolution, sampling theory, aliasing, interpolation; Medical imaging modalities: X-Ray, computed tomography, Positron emission tomography, ultrasound, MRI physics, MR imaging, properties of MRI; Image enhancement: contrast enhancement, denoising, deblurring, edge detection, derivatives and Fourier theory, anisotropic diffusion; Image registration: correlation, least squares, transform-based registration, joint entropy, mutual information, binning discontinuities, registration optimization, registration by clustering, ensemble registration, gaussian mixture models; Image segmentation: region growing, k-means clustering, snakes, introduction to level sets, speed functions, multi-atlas fusion-based segmentation; Medical image reconstruction: theory of MRI reconstruction, MRI motion compensation, algebraic CT reconstruction, CT filtered back-projection.	
13.	Text book(s): 1. Prince J L and Links J M, <i>Medical Imaging Signals and Systems</i> , Pearson (2015). 2. Suetens P, <i>Fundamentals of Medical Imaging</i> , Cambridge University Press (2009).	
14.	Reference(s): 1. Birkfellner W, <i>Applied Medical Image Processing: A Basic Course</i> , CRC Press (2014). 2. Gonzalez R C and Woods R E, <i>Digital Image Processing</i> , Pearson (2016). 3. Nishimura D, <i>Principles of Magnetic Resonance Imaging</i> , Stanford University Press (2010).	