

Course Code	Course Title	L	T	P	C
1156EC416	MEDICAL IMAGE ANALYSIS	0	0	0	2

a) Course Category

Independent Learning – Self Learning Course

b) Preamble

This course provides an overview of the computational and mathematical models in medical image processing. It includes the main source of medical image data (CT, MRI, PET and ultrasound). It also covers the current method used to enhance and extract useful information from medical images

c) Prerequisite

Nil

d) Related Courses

DIGITAL IMAGE PROCESSING

e) Course Outcomes

Upon the successful completion of the course, students will be able to

CO Nos.	Course Outcomes	Knowledge Level (Based on Revised Bloom's Taxonomy)
CO1	Explain the basic concepts in medical image acquisition	K2
CO2	Discuss different image enhancement techniques	K2
CO3	Compare the various registration techniques.	K2
CO4	Explain appropriate segmentation techniques.	K2
CO5	Describe MRI and CT image reconstruction	K2

f) Course Content

UNIT I MEDICAL IMAGE MODALITIES

Introduction – X-Ray–Computed Tomography–Position Emission Tomography–Ultrasound –MRI physics, MRI imaging, Properties of MRI

UNIT II IMAGE ENHANCEMENT

Contrast enhancement–Denoising–Deblurring–Edge detection–Derivatives and Fourier Theory–Anisotropic diffusion

UNIT III IMAGE REGISTRATION

Introduction to image registration – Correlation – Least squares – Transform based registration – Registration optimization – Registration by clustering _ Ensemble registration – Gaussian mixture models.

UNIT IV IMAGE SEGMENTATION

Introduction to image segmentation – Region growing – K-means Clustering – Snakes – introduction to level sets: speed functions – Implementing level sets

UNIT V MEDICAL IMAGE RECONSTRUCTION

Theory of MRI reconstruction – MRI motion compensation – Algebraic CT reconstruction – CT filter Backprojection

g) Learning Resources

Online Resources

1. <https://cs.uwaterloo.ca/~jorchard/cs473/CS473/Lectures.html>
2. <https://nptel.ac.in/courses/108105091/>