Walchand College of Engineering, Sangli
(Government Aided Autonomous Institute)

AY 2023-24

Course Information

Programme	B. Tech.
Class, Semester	Final Year B. Tech., Semester-VII
Course Code	5OE457
Course Name	Open Elective-5: Medical Image Processing
Desired Requisites:	-

Teaching Scheme		Examination Scheme (Marks)			
Lecture	3Hrs/week	MSE	ISE	ESE	Total
Tutorial	-	30	20	50	100
Practical	-				
Interaction	-	Credits: 3			

Course Objectives

1	To learn facts about medical imaging sources and study various formats.
2	To study various segmentation and filtering technique of medical image.
3	To learn spatial transformation of medical image

Course Outcomes (CO) with Bloom's Taxonomy Level

At the end of the course, the students will be able to,

CO1	Demonstrate various image sources, there representation and various formats of image.
CO2	Apply segmentation, filtering and transformation on medical image.
CO3	Analyse various facts of image registration and CT reconstructed image.
CO4	

Module	Module Contents	
I	**Basics of Medical Image Sources:** Radiology, the electromagnetic spectrum, basic x-ray physics, attenuation and imaging, computed tomography, magnetic resonance tomography, ultrasound, nuclear medicine and molecular imaging, other imaging techniques, radiation protection and dosimetry	6
II	**Image Representation:** Pixels and voxels, gray scale and color representation, image file formats, DICOM, other formats, image quality, and the signal-to-noise ratio, the intensity transform function and the, dynamic range, windowing, histograms and histogram operations, dithering and depth	6
III	**Segmentation:** The segmentation problem, roi definition and centroids, thresholding, region growing, more sophisticated segmentation methods, morphological operations	6
IV	**Filtering and Transformations:** The filtering operation, the fourier transform, other transforms, discretization – resolution and artifacts, interpolation and volume regularization, translation and rotation, reformatting, tracking and image-guided therapy	**6**
V	**Rendering and Surface Models:** Visualization, orthogonal and perspective projection, and the viewpoint, ray casting, surface–based rendering **Registration:** Fusing information, registration paradigms, merit functions, optimization strategies, some general comments, camera calibration, registration to physical space	6
VI	**CT Reconstruction:** Introduction, radon transform, algebraic reconstruction, some remarks on fourier transform and Filtering, filtered backprojection	6

	Text Books
1	Wolfgang Birkfellner, Michael Figl, and Johann Hummel, "Applied Medical Image Processing: A Basic Course", CRC Press, Taylor & Francis, 2014.
2	G R Sinha, Bhagwati Charan Patel, "Medical Image Processing", PHI Learning Pvt Ltd. 2014.
3	

	References
1	Geoff Dougherty, "Medical Image Processing", Springer Science and Business Media, 2011
2	Geoff Dougherty, "Digital Image Processing for Medical Applications", Cambridge University Press, 2009.
3	

	Useful Links
1	https://www.coursera.org/
2	
3	
4	

CO-PO Mapping

	Programme Outcomes (PO)												PSO	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1	3													
CO2			2											
CO3						2								2
CO4														

The strength of mapping is to be written as 1,2,3; Where, 1:Low, 2:Medium, 3:High

Each CO of the course must map to at least one PO.

Assessment

The assessment is based on MSE, ISE and ESE.

MSE shall be typically on modules 1 to 3.

ISE shall be taken throughout the semester in the form of teacher's assessment. Mode of assessment can be field visit, assignments etc. and is expected to map at least one higher order PO.

ESE shall be on all modules with around 40% weightage on modules 1 to 3 and 60% weightage on modules 4 to 6.

For passing a theory course, Min. 40% marks in (MSE+ISE+ESE) are needed and Min. 40% marks in ESE are needed. (ESE shall be a separate head of passing)