

Level	Correlation
-	Nil
1	Slightly / Low
2	Moderate / Medium
3	Substantial / High

Assessment Rubrics:

- Quiz / Assignment/ Quiz/ Discussion / Seminar
- Midterm Exam
- Programming Assignments
- Final Exam

Mapping of COs to Assessment Rubrics:

	Internal Exam	Assignment	Lab Assessment	End Semester Examinations
CO1	✓		✓	✓
CO2	✓	✓	✓	✓
CO3	✓		✓	✓
CO4	✓	✓	✓	✓

13. MEDICAL IMAGING AND ANALYSIS

Discipline	Computer Science
Course Code	UK3DSCCSC212
Course Title	MEDICAL IMAGING AND ANALYSIS

Type of Course	DSC				
Semester	III				
Academic Level	2				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours/Week
	4	3 hours	-	2 hours	5 hours
Pre-requisites	-				
Course Summary	This course introduces students to the principles, techniques, and applications of medical imaging and analysis. Topics covered include various imaging modalities, image processing and analysis methods, and their applications in healthcare.				

Detailed Syllabus:

Module	Unit	Content	Hrs (L+P)
I	Introduction		15
	1	Medical Imaging, Modalities, Medical Imaging from Physiology to Information Processing, General Performance measures, Biomedical Image Processing and Analysis, Matlab Image Processing toolbox, Imagepro interface in Matlab Environment and Image Databases, ImageJ and Other image Processing Software Packages, Medical image analysis in Python	
II	Medical Imaging Modalities		15
	2	X-RAY Imaging: Introduction, Generation, X-Ray 2-D Projection Imaging, X-Ray Mammography, X-Ray CT, Spiral X-Ray CT	
3	Magnetic Resonance Imaging: Principles, Instrumentation, Pulse Sequences		

	4	Ultrasound Imaging: Propagation of a sound in a medium, Reflection and Refraction, Attenuation, Ultrasound Reflection Imaging, Doppler Ultrasound Imaging.	
III	Image Processing and Segmentation		15
	5	Image Processing: Spatial Domain Methods, Frequency domain Filtering, Wavelet Transform	
	6	Image Segmentation: Edge-based Image Segmentation, Pixel-Based Direct Classification Methods, Region-Based Segmentation.	
IV	Image Representation, Analysis and Classification		15
	7	Feature Extraction and Representation: Statistical Pixel-level features, Shape features, Texture features, Relational Features.	
	8	Feature Selection: LDA, PCA and GA-Based optimization	
	9	Feature and Image Classification: Statistical classification, Rule Based systems, Neural Network, SVM.	
V		Flexi Module (Not Included for External Exam)	15
	10	Image Visualization: 2-D and 3-d display methods, VR-Based Interactive Visualization- Virtual Endoscopy	

REFERENCE BOOKS

1. Atam P. Dhawan, "Medical Image Analysis", Wiley Publishers, Second Edition.
2. Isaac N. Bankman, "Handbook of Medical Imaging: Processing and Analysis", Academic Press.

LAB EXERCISES

Lab exercises will contain 15-20 questions like sample questions.

1. Image Loading and Display.
2. Medical Image Enhancement.
3. Medical Image Segmentation.
4. Feature extraction in medical images.
5. Medical images classification problems

COURSE OUTCOMES

No.	Upon completion of the course the graduate will be able to	Cognitive Level	PSO addressed
CO1	Outline medical images, integrating theory, tools, and ethical considerations effectively.	U	PSO1, 3
CO2	Discuss principles of X-ray, MRI, and ultrasound imaging, enabling effective medical diagnosis.	Ap	PSO1, 2, 3
CO3	Outline image processing and segmentation methods	U	PSO 1, 2, 3
CO4	Identify methods of Image representation, analysis and classification	U	PSO1, 2, 3

R-Remember, U-Understand, Ap-Apply, An-Analyse, E-Evaluate, C-Create

Note: 1 or 2 COs/module

Name of the Course: MEDICAL IMAGING AND ANALYSIS

Credits: 3:0:1 (Lecture: Tutorial: Practical)

CO No.	CO	PO/PSO	Cognitive Level	Knowledge Category	Lecture (L)/ Tutorial (T)	Practical (P)
CO1	Outline medical images, integrating theory, tools, and ethical considerations effectively.	PO 2, 5, 6, 7 PSO 1, 3	U	F, C, P	L	P
CO2	Discuss principles of X-ray, MRI, and ultrasound imaging, enabling effective medical diagnosis.	PO 2,5, 6, 7 PSO 1, 2, 3	U	F, C, P	L	P
CO3	Outline image processing and segmentation methods	PO 2, 5, 6, 7 PSO 1, 2, 3, 4	U	F, C, P	L	P
CO4	Identify methods of Image representation, analysis and classification	PO2, 5, 6, 7 PSO 1, 2, 3	U	F, C, P	L	P

F-Factual, C- Conceptual, P-Procedural, M-Metacognitive

Mapping of COs with PSOs and POs :

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO 1	PSO 2	PSO 3	PSO 4
CO 1	-	2	-	-	1	3	3	-	3	-	3	-
CO 2	-	2	-	-	1	3	3	-	3	2	3	-
CO 3	-	2	-	-	1	3	3	-	3	2	3	-
CO 4	-	2	-	-	1	3	3	-	3	2	3	-

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