

Course Code	Course Title	L	T	P	C
1152EC235	DIGITAL IMAGE PROCESSING	1	0	4	3

a) **Course Category**

Program Elective

b) **Preamble**

Digital Image Processing provides an introduction to the fundamental concepts and general principles of image processing. It covers the key stages of digital image processing techniques. Students will also get an opportunity to implement the algorithms that are specific to real time image processing systems/applications.

c) **Prerequisite**

Nil

d) **Related Courses**

Digital Video Signal Processing

e) **Course Outcome**

Upon the successful completion of the course, student will be able to:

CO Nos.	Course Outcomes	Skill Level (Based on Dave's Taxonomy)
CO1	Perform the basic image processing operations	S2
CO2	Implement the image enhancement, edge detection and noise analysis	S2
CO3	Demonstrate the image compression, morphology and segmentation techniques	S3

f) **Correlation of COs with POs**

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	M	L	-	-	M	-	-	-	H	-	-	L	L	L
CO2	M	L	L	L	M	L	L	L	H	L	-	M	M	-
CO3	M	L	L	L	M	L	L	L	H	L	-	H	M	-

g)Examination Scheme for practical dominated course										
Internal evaluation (40M)							Semester end evaluation (60M)			
Laboratory experiment (15M)				Model laboratory test (25M)			Part-A (20M)	Part-B (40M)		
Performance in conducting experiment (5)	Result and analysis (3)	Viva Voc (3)	Record (4)	Performance in conducting experiment (15)	Result and analysis (5)	Viva Voc (5)	Theory questions to evaluate the knowledge and understanding (20)	Performance in conducting experiment (25)	Result and analysis (10)	Viva Voc (5)

h) Course Content :

Theory

15 Hours

Digital image representation – Types of digital image – Basic operations on images – Basic relations between pixels – Image transformations.

Image enhancement: Linear filtering – Smoothing and sharpening filters – Fourier transform on images – Edge detection

Image degradation model – Noise models – Noise removal filters

Fundamentals of image compression: Error free compression: Variable length coding, LZW coding, bit plane coding – discrete cosine transformation.

Morphological operations. Image segmentation basics: Local and global processing – Thresholding – background subtraction.

i) List of experiments

S. No	CO Mapping	Practical Exercises (60 Hours)
1.	CO1	Digital image conversion from RGB to gray, gray to binary
2.	CO1	Image transformations
3.	CO2	Image enhancement using Histogram Equalization
4.	CO2	Sharpening and smoothing filters
5.	CO2	Fourier transform on images
6.	CO2	Comparison of edge detection techniques
7.	CO2	Noise analysis
8.	CO3	Image compression using Bit plane slicing
9.	CO3	Image compression using DCT
10.	CO3	Morphological operations
11.	CO3	Image Thresholding
12.	CO3	Segmentation using Background subtraction technique

Total 75hrs

j) Learning Resources Textbooks

1. Rafael C. Gonzalez and Richard E. Woods, "Digital Image Processing", 2nd edition, PHI/Pearson Education, 2002.
2. A.K.Jain, "Fundamentals of Digital Image Processing", 1st edition, Prentice Hall India, 1988.
3. Madhuri. A. Joshi, "Digital Image Processing-an algorithmic approach", 1st edition, PHI, 2006.

List of Major Equipment/ Instrument/Software with Broad Specifications

1. MATLAB 2007a (Licensed version).
2. OpenCV (Free version).
3. Code Composer Studio (Free version).
4. TMS320C6713 (operating at 225 Mhz, Embedded USB JTAG controller with plug and play drivers, USB cable included, TLV320AIC codec, 2M x 32 on board SDRAM, 512K bytes of on board Flash ROM, 3 expansion connectors (Memory Interface, Peripheral Interface, and Host Port Interface)).

5. TI - OMAP L-138/6748 LCDK (Audio & Video Development DSP Board) (Integrated floating/fixed-point DSP with up to 456 MHz performance; and ARM9 with up to 456 MHz performance).

List of Software/Learning Websites

1. <https://opencv.org>
2. <https://pythonprogramming.net/>

Online resources

1. Prof. P.K. Biswas, Video lecture on Digital Image Processing, Centre for Educational Technology, IITKharagpur Sponsored by National Programme on Technology Enhanced Learning (NPTEL).
2. <http://nptel.ac.in/syllabus/syllabus.php?subjectId=117105079>.