

**Kadi Sarva Vishwavidyalaya**  
Faculty of Engineering and Technology  
**First Year Master of Engineering (Computer Engineering)**  
In Effect from Academic Year 2017-18

<b>Subject Code: MECE-205-N-C</b>	<b>Subject Title: DIGITAL IMAGE PROCESSING &amp; COMPUTER VISION</b>
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Teaching scheme				Total Credit	Evaluation Scheme					Total
L	T	P	Total		Theory		Mid Sem Exam	CIA	Pract.	
Hrs	Hrs	Hrs	Hrs		Hrs	Marks	Marks	Marks	Marks	Marks
04	00	02	06	05	03	70	30	20	30	150

The objective of this course is

- To study the image fundamentals and mathematical transforms necessary for image processing
- To study the image enhancement techniques
- To study image compression procedures
- To study image segmentation and representation techniques
- To study image restoration procedures

**OUTLINE OF THE COURSE:**

Unit No	Topics	Hours
1	Introduction and Digital Image Fundamentals	07
2	Image Enhancement in Frequency and spatial Domain	10
3	Image Restoration	06
4	Color Image Processing	06
5	Wavelets and Multi-resolution Processing	09
6	Image Compression	11
7	Image Segmentation and Image Morphological Image Processing:	15

**Total hours (Theory): 64**

**Total hours (Practical): 32**

**Total hours: 96**

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**DETAILED SYLLABUS**

Sr. No	Topic	Lecture Hours	Weight age (%)
1	<b>Introduction and Digital Image Fundamentals</b> <ul style="list-style-type: none"> <li>• Introduction to Digital Image Fundamentals</li> <li>• Image as 2D data</li> <li>• Image Representation –Grey and Color images</li> <li>• Image Sampling and Quantization</li> <li>• Neighbors of pixel adjacency connectivity, regions and boundaries, Distance measures.</li> </ul>	07	11
2	<b>Image Enhancement in Frequency and spatial Domain</b> <ul style="list-style-type: none"> <li>• Basic gray level Transformations,</li> <li>• Histogram Processing Techniques</li> <li>• Histogram Equalization</li> <li>• Contrast Stretching,</li> <li>• Introduction to the Fourier transform and frequency domain concepts.</li> <li>• Smoothing and Sharpening Filters for frequency and spatial domain.</li> </ul>	10	16
3	<b>Image Restoration</b> <ul style="list-style-type: none"> <li>• Noise models, mean, order—statistics, adaptive filters. Band reject, Band pass and notch filters.</li> <li>• Inverse Filtering</li> <li>• Noise Reduction</li> </ul>	06	09
4	<b>Color Image Processing:</b> <ul style="list-style-type: none"> <li>• Color fundamentals and Models</li> <li>• Color Transformation</li> <li>• Smoothing and Sharpening</li> <li>• Color Segmentation</li> </ul>	06	09
5	<b>Wavelets and Multi-resolution Processing:</b> <ul style="list-style-type: none"> <li>• Image pyramids</li> <li>• Multi-Resolution Expansion</li> <li>• Wavelet Transform</li> <li>• Harr Transform</li> </ul>	09	14

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6	<b>Image Compression :</b> <ul style="list-style-type: none"> <li>Fundamentals and redundancy</li> <li>Huffman Coding</li> <li>Arithmetic Coding</li> <li>LZW Coding</li> <li>JPEG Compression Standard</li> <li>Wavelet based image compression</li> </ul>	11	18
7	<b>Image Segmentation and Image Morphological Image Processing:</b> <ul style="list-style-type: none"> <li>Edge based segmentation</li> <li>Region based segmentation</li> <li>Region split and merge techniques</li> <li>Basic morphological operations</li> <li>Erosion, dilation, opening, closing</li> <li>Boundary extraction</li> <li>region filtering</li> <li>connected component extraction</li> <li>Convex Hull</li> <li>Thinning and Thickening</li> </ul>	15	23

**INSTRUCTIONAL METHOD AND PEDAGOGY** (Continuous Internal Assessment (CIA) Scheme)

- At the start of course, the course delivery pattern, prerequisite of the subject will be discussed.
- Lectures will be conducted with the aid of multi-media projector, black board, OHP etc.
- Attendance is compulsory in lecture and laboratory which carries 10 marks in overall evaluation.
- One internal exam will be conducted as a part of internal theory evaluation.
- Assignments based on the course content will be given to the students for each unit and will be evaluated at regular interval evaluation.
- Surprise tests/Quizzes/Seminar/tutorial will be conducted having a share of five marks in the overall internal evaluation.
- The course includes a laboratory, where students have an opportunity to build an appreciation for the concepts being taught in lectures.
- Experiments shall be performed in the laboratory related to course contents.

**STUDENTS LEARNING OUTCOMES:**

On successful completion of the course, the student will:

- Understand the basic concepts image processing.
- Clear Understanding of Spatial and Frequency domain.
- Image Restoration & Enhancement techniques.
- JPEG, MPEG understanding.
- Be able to learn color image processing.

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- Be able to learn segmentation.
- Familiar with morphological image processing.

**REFERENCE BOOKS:**

1. Digital Image Processing, Second Edition by Rafael C Gonzalez and Richard E. Woods, Pearson Education
2. Digital Image Processing by Bhabatosh Chanda and Dwijesh Majumder, PHI
3. Fundamentals of Digital Image Processing by Anil K Jain, PHI
4. Digital Image Processing Using Matlab, Rafael C. Gonzalez and Richard E. Woods, Pearson Education

**LIST OF PRACTICALS**

Sr. No	Name of Experiment
1	Introduction to Image Processing Toolbox-Matlab
2	Read an 8 bit image and then apply different image enhancement techniques: <ul style="list-style-type: none"><li>• Brightness improvement</li><li>• Brightness reduction</li><li>• Thresholding</li><li>• Negative of an image</li><li>• Log transformation</li><li>• Power Law transformation</li></ul>
3	To write and execute programs for image arithmetic operations and logical operations
4	Implement different interpolation techniques using MATLAB
5	Implementation of Histogram Processing and equalization
6	Implementation of various smoothing filters
7	To write and execute program for geometric transformation of image : Translation, Scaling, Rotation, Shrinking, Zooming
8	Read an image and apply (1) Gaussian 3x3 mask for blurring (2) High pass filter mask with different masks (3) Laplacian operator with center value positive and negative (4) High boost filtering.
9	Write a program to implement various low pass filters and high pass filter in frequency domain
10	Implement Image compression using DCT Transform
11	Write and execute program for image morphological operations erosion and dilation