

**Maharashtra State Board of Technical Education, Mumbai**  
**TEACHING PLAN (TP)**

K-1

**Academic Year:** 2025-26

**Date:** 15/12/2025

**Institute Name & Code:** K. K. Wagh Polytechnic, Nashik-3 (0078)

**Program & Code:** Artificial Intelligence & Machine Learning (AN) **Course Code & Abbr.:** 316319 (PIP)

**Course Name:** Principles of Image Processing

**Name of Faculty:** Mrs. P. H. Nawale

**Class:** TYAN

**Course Index:** 603

**Semester:** VI

**Scheme:** K

**Total Hrs:** 45

**● Teaching-Learning and Assessment Scheme:**

Course Code	Course Title	Abbreviation	Course Category/s	Learning Scheme				Credits	Paper Duration	Assessment Scheme								Total Marks		
				Actual Contact Hrs/Week			SLH	NLH		Theory			Based on LL Practical			Based on SL				
				CL	TL	LL				FA-TH	SA-TH	Total	FA-PR	SA-PR	SLA					
				Max	Max	Max				Max	Min	Max	Min	Max	Min	Max	Min			
316319	PRINCIPLES OF IMAGE PROCESSING	PIP	DSC	3	-	-	1	4	2	3	30	70	100	40	-	-	-	25 10 125		

**Abbreviations:** CL- Class Room Learning, TL- Tutorial Learning, LL-Laboratory Learning, SLH-Self Learning Hours, NLH-Notional Learning Hours, FA - Formative Assessment, SA -Summative assessment, IKS - Indian Knowledge System, SLA - Self Learning Assessment

**Legends:** @ Internal Assessment, # External Assessment, \*# On Line Examination , @\\$ Internal Online Examination

**● Course Outcomes (COs) & Theory Learning Outcomes (TLOs):**

By learning course, Linux Basics (PIP-316319) Third Year students will be able to:

CO No.	TLO No.	Course Outcomes (COs) / Theory Learning Outcomes (TLOs)
CO603.1		<b>Explain concepts of digital image processing.</b>
	TLO 1.1	Explain types of image processing techniques.
	TLO 1.2	Differentiate Megapixels and Image Quality.
	TLO 1.3	Explain steps involved in digital image processing with diagram.
	TLO 1.4	Explain components of an Image Processing System.
	TLO 1.5	Compare different image file formats.
	TLO 1.6	State different operation on images.
	TLO 1.7	Describe applications of Digital Image Processing.
CO603.2		<b>Elaborate image processing techniques to enhance image quality.</b>
	TLO 2.1	Explain Gray Level Transformations.
	TLO 2.2	Describe techniques of Spatial domain enhancement.
	TLO 2.3	Describe techniques of Frequency domain enhancement.
	TLO 2.4	Explain Homomorphic filtering.
CO603.3		<b>Identify image compression and segmentation techniques.</b>
	TLO 3.1	Explain types of redundancy.
	TLO 3.2	Describe Image and Video Compression Standards.
	TLO 3.3	Describe various coding compression techniques.
	TLO 3.4	Use Huffman coding to compress the text data in a string..
	TLO 3.5	Use DCT to analyze the performance of image compression.
	TLO 3.6	Compare Point Detections, Line Detection and Edge Detection.

	TLO 3.7	Explain Laplacian of Gaussian (LoG), Difference of Gaussian (DoG).
<b>CO603.4</b>		<b>Use image restoration techniques.</b>
	TLO 4.1	Compare constraint, unconstraint, and interactive restoration.
	TLO 4.2	Explain Image Degradation Model.
	TLO 4.3	Describe various noise models.
	TLO 4.4	Identify image processing techniques to reduce the noise and restore the image to its original quality.
	TLO 4.5	Compare Harmonic Mean Filter and Arithmetic Mean Filter.
	TLO 4.6	Compare Inverse Filtering and Wiener filtering.
	TLO 4.7	Write the applications of Image restoration.
<b>CO603.5</b>		<b>Identify image processing techniques for feature detection.</b>
	TLO 5.1	Explain importance of Texture Analysis.
	TLO 5.2	Explain Types of Shapes.
	TLO 5.3	Identify the method to enhance the contrast of a blurry image taken in low light to make it clear.
	TLO 5.4	Describe Color Feature Extraction.
	TLO 5.5	Draw components of an object recognition system.
	TLO 5.6	Identify object detection technique to detect and count the vehicles from a traffic surveillance camera.
	TLO 5.7	Elaborate feature extraction methods to recognize specific patterns to detect defects in a manufactured product.

## ● Teaching Plan:

Unit No. (Allotted Hrs.)	TLO s	Title/Topic Details with CO	Plan (From-To & No. of Lectures)	Actual Execution (From-To & No. of Lectures)	Pedagogy used (Teaching Method/ Media)	Remark
1 (5 hrs) 12M		<b>Unit-1: Introduction to Image Processing [CO603.1]</b>				
	1.1 1.2	1.1 Image: Pixel, Distance measures, Color fundamentals & models – RGB, HIS, YIQ, Types of an image: Vector and Raster, Types of image processing, Formation of digital image, resolution (Spatial and gray level), Megapixels and Image Quality. Image Acquisition: Cameras and sensors.	15/12/25 To 15/12/25 (01)			
	1.3	1.2 Block Diagram: Fundamental Steps in Digital Image Processing, Advantages and disadvantages.	16/12/25 To 16/12/25 (01)		Chalk, Board, PPTs, Web References	
	1.4	1.3 Components of an Image Processing System, Difference between Image Sampling & quantization	17/12/25 To 17/12/25 (01)			
	1.5	1.4 Image file formats : JPEG , PNG, GIF, TIFF, BMP , Image Histogram.	22/12/25 To 22/12/25 (01)			
	1.6 1.7	1.5 Operations on images: image addition, subtraction, logical operations, scaling,	23/12/25 To 23/12/25			

		translation, rotation. Applications of Digital Image Processing	(01)			
		<b>Unit-2: II Image Enhancement in Spatial Domain and Frequency Domain [CO603.2]</b>				
2 (8 hrs) 14M	2.1	2.1 Basic Gray Level Transformations (Linear, Logarithmic, Power – law), Histogram Processing, Enhancement Using Arithmetic/Logic Operation	<b>24/12/25</b> To <b>29/01/26</b> (02)	Chalk, Board, PPTs, Web References		
	2.2	2.2 Spatial domain enhancement: Point operations- Log transformation, Power-law transformation, Piecewise linear transformations, Histogram equalization. Filtering operations- Image smoothing, Image sharpening	<b>30/12/25</b> To <b>05/01/26</b> (03)			
	2.3	2.3 Frequency domain enhancement: 2-D Discrete Fourier Transform (DFT), Smoothing and Sharpening in frequency domain. Homomorphic filtering	<b>06/01/25</b> To <b>12/01/26</b> (03)			
		<b>Unit-3: III Image Compression and Image Segmentation [CO603.3]</b>				
3 (10 hrs) 14M	3.1	3.1 Types of redundancy: Spatial Redundancy, Spectral Redundancy, Temporal Redundancy	<b>13/01/26</b> To <b>14/01/26</b> (02)	Chalk, Board, PPTs, Web References		
	3.2	3.2 Fidelity criteria: Objectives, Importance. Image and Video Compression Standards – JPEG, MPEG-1, MPEG-3	<b>19/01/26</b> To <b>20/01/26</b> (02)			
	3.3 3.4	3.3 Lossless compression: Run length coding, Huffman coding	<b>21/01/26</b> To <b>02/02/26</b> (02)			
	3.5	3.4 Lossy compression techniques – Discrete Cosine Transform (DCT) based compression	<b>03/02/26</b> To <b>04/02/26</b> (02)			
	3.6 3.7	3.5 Image Segmentation: Comparison of Point Detections, Line detection and Edge Detection, First order derivative -Prewitt and Sobel. Second order derivative – Laplacian of Gaussian (LoG), Difference of Gaussian (DoG)	<b>09/02/26</b> To <b>10/02/26</b> (02)			
		<b>Unit-4: IV Image Restoration [CO603.4]</b>				
4.1 4.2	4.1 Image restoration: Definition, Concepts of restoration: constraint and unconstraint restoration, interactive restoration, Image Degradation/ Restoration Model, Difference between restoration and enhancement	<b>11/02/26</b> To <b>17/02/26</b> (03)				
4 (10 hrs) 14M	4.3 4.4	4.2 Noise models: Gaussian Noise, Exponential Noise, Uniform Noise	<b>18/02/26</b> To <b>23/02/26</b> (02)	Chalk, Board, PPTs, Web References		
	4.5	4.3 Mean Filters : Overview of Arithmetic Mean Filter, Geometric Mean Filter, Harmonic Mean Filter, Band reject Filters, Band pass Filters	<b>24/02/26</b> To <b>02/03/26</b> (03)			

	4.6 4.7	4.4 Overview of Inverse Filtering and Wiener filtering, applications of Image restoration	03/03/26 To 04/03/26 (02)			
		<b>Unit-5: Unit - V Image Analysis [CO603.5]</b>				
	5.1 5.2 5.3 5.4	5.1 Feature Extraction: Texture analysis: Definition, Importance of Texture Analysis, overview of Texture Analysis Methods 5.2 Shape analysis: Definition, Types of Shapes, concept of Shape Representation 5.3 Color analysis: Definition, Color Spaces, Color Feature Extraction : Color Histogram , Color Moments , Color Coherence Vector (CCV) , Color Correlogram , Color Transfer	09/03/26 To 14/03/26 (04)			
5 (12 hrs) 16M	5.5 5.6	5.2 Object Recognition : components of an object recognition system (Model database , Feature detector , Hypothesizer, Hypothesis verifier) , Complexity of Object Recognition : Two-dimensional, Three-dimensional. Overview of Methods for Object Recognition : Feature-Based Recognition, Template Matching, Deep Learning (CNNs), Point Cloud Matching (3D Recognition), Object Detection Algorithms (YOLO, SSD)	16/03/26 To 21/03/26 (04)			Chalk, Board, PPTs, Web References
	5.7	5.3 Feature Detection : Global Features, Local Features, Relational Features 5.4 Overview of Advanced Image Processing concepts: Deep Learning and Convolutional Neural Networks (CNNs), 3D Image Processing and Computer Vision, Computer-Aided Diagnosis (CAD) in Medical system	23/03/26 To 28/03/26 (04)			
<b>45 Hrs.</b>		<b>Total</b>	<b>45 Hrs.</b>			

## ● COs-POs & PSOs Matrix:

Course Outcomes (COs)	Programme Outcomes (POs)							PSOs	
	PO-1 Basic and Discipline Specific Knowledge	PO-2 Problem Analysis	PO-3 Design/Development of Solutions	PO-4 Engineering Tools	PO-5 Engineering Practices for Society, Sustainability and Environment	PO-6 Project Management	PO-7 Life Long Learning	P	S
CO603.1	2	-	-	-	-	-	-	2	2
CO603.2	2	2	1	-	-	-	-	2	2
CO603.3	2	2	2	2	1	-	1	2	2
CO603.4	2	2	2	2	1	1	1	2	2
CO603.5	2	2	3	3	2	1	1	2	2

**Legends:** High:03, Medium:02, Low:01, No Mapping: -

PSO1: Apply fundamental concepts of Computer Engineering and Artificial Intelligence and machine learning to solve technical problems.

PSO2: Implement the domain knowledge to achieve successful career as an engineering professional.

## ● **Formative Assessment(FA-TH):**

- Two offline class tests of 30 marks each will be conducted. Average of two class tests marks will be considered as Formative Assessment for Theory marks out of 30.

## ● **Summative Assessment(SA-TH):**

- End semester assessment of 70 marks through paper based examination by MSBTE.
- Total theory marks (100) will be calculated as marks of Formative Assessment (30) + marks of Summative Assessment (70)

## ● **Self-Learning Activities**

- Assignments:  
Solve assignment covering all COs given by course teacher.

## ● **References:**

### 1. Suggested Books:

Sr. No	Author	Title	Publisher
1	S. Annadurai	Fundamentals of Digital Image Processing	Pearson Education India
2	Rafael C. Gonzalez, Richard E. Woods	Digital Image Processing Fourth edition (30 July 2018)	Pearson Education
3	Alasdair McAndrew	A Computational Introduction to Digital Image Processing, 2nd Edition	Chapman and Hall
4	William K. Pratt	Digital Image Processing: PIKS Scientific Inside	Wiley India Private Limited; Fourth edition
5	Kenneth R. Castleman	Digital Image Processing	Pearson Education India,

### 2. Learning Web Sites:

Sr. No.	Link /Portal	Description
1	<a href="https://www.geeksforgeeks.org/digital-image-processing-basics/">https://www.geeksforgeeks.org/digital-image-processing-basics/</a>	Digital Image Processing Basics
2	<a href="https://www.tutorialspoint.com/dip/index.htm">https://www.tutorialspoint.com/dip/index.htm</a>	Image Processing for Beginners
3	<a href="https://www.tpointtech.com/digital-image-processing-tutorial">https://www.tpointtech.com/digital-image-processing-tutorial</a>	Digital Image Processing Tutorial
4	<a href="https://onlinecourses.nptel.ac.in/noc22_ee116/preview">https://onlinecourses.nptel.ac.in/noc22_ee116/preview</a>	Image processing techniques, algorithms and their applications
5	<a href="https://www.coursera.org/learn/digital">https://www.coursera.org/learn/digital</a>	Fundamentals of Digital Image and Video Processing
6	<a href="https://www.coursera.org/learn/introduction-image-processing">https://www.coursera.org/learn/introduction-image-processing</a>	Introduction to Image Processing

### 3. Learning URLs of referenced YouTube Videos:

Sr. No.	URL of YouTube Video	Topic
1	<a href="https://youtu.be/YzWQ1dRTWVs?si=aetaWzbb7B7MULtv">https://youtu.be/YzWQ1dRTWVs?si=aetaWzbb7B7MULtv</a>	Introduction to Digital Image Processing
2	<a href="https://youtu.be/WnWfvWGpuzw?si=YXZTiwSx5VSgOwTJ">https://youtu.be/WnWfvWGpuzw?si=YXZTiwSx5VSgOwTJ</a>	Sampling and Quantization of Digital image
3	<a href="https://youtu.be/ag6x3OMKMb8?si=7kze4dW6wvYMGMfz">https://youtu.be/ag6x3OMKMb8?si=7kze4dW6wvYMGMfz</a>	Fundamental steps in Digital image processing

4	<a href="https://youtu.be/JKzC1B4JAJw?si=pSD6nalh_nf4Y1H5">https://youtu.be/JKzC1B4JAJw?si=pSD6nalh_nf4Y1H5</a>	Introduction to image enhancement using spatial domain
5	<a href="https://youtu.be/uqeOrtAzSyU?si=f3IKHIHSobidV4DZ">https://youtu.be/uqeOrtAzSyU?si=f3IKHIHSobidV4DZ</a>	Histogram equalization in digital image processing with example
6	<a href="https://youtu.be/ynKpS0DMpRA?si=yViW0rl_Wgae8U20">https://youtu.be/ynKpS0DMpRA?si=yViW0rl_Wgae8U20</a>	Introduction to Image enhancement in frequency domain in image processing
7	<a href="https://youtu.be/hL1aHfrDFPs?si=yfOwJTJlcM-mKLaC">https://youtu.be/hL1aHfrDFPs?si=yfOwJTJlcM-mKLaC</a>	Image restoration
8	<a href="https://youtu.be/4SmtEAdwHBE?si=6VPk1yOGwVUSIjg8">https://youtu.be/4SmtEAdwHBE?si=6VPk1yOGwVUSIjg8</a>	Spatial filtering
9	<a href="https://youtu.be/Yd0c5HeB0Gg?si=MQsz6ZiY7rsLDGec">https://youtu.be/Yd0c5HeB0Gg?si=MQsz6ZiY7rsLDGec</a>	Periodic noise reduction using frequency domain filtering
10	<a href="https://youtu.be/MhIuj7ASbeg?si=nIXWzQc9HxgkDIGV">https://youtu.be/MhIuj7ASbeg?si=nIXWzQc9HxgkDIGV</a>	Colour models of Digital image

**4. Tools used:**, MKCL LMS-Learn Live, YouTube, Google Classroom

Mrs. P. H. Nawale  
**(Subject Teacher)**

Mrs. R. Y. Thombare  
**(HOD-AN)**

CC- 1. Course File-PIP