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Note : Remove “Table of Content” before including in CP Book

Each Course Plan shall be printed and made into a book with cover page

Blooms Level in all sections match with A.2, only if you plan to teach / learn at higher levels

15EC72 : Digital Image Processing

A. COURSE INFORMATION

1. Course Overview

Degree:	BE	Program:	EC
Year / Semester :	4/7	Academic Year:	2019-20
Course Title:	Digital Image Processing	Course Code:	15EC72
Credit / L-T-P:	03-01-00	SEE Duration:	180 Minutes
Total Contact Hours:	50	SEE Marks:	80
CIA Marks:	20	Assignment	1 / Module
Course Plan Author:	Dr.Shrishail Math	Sign	Dt:03-08-2018
Checked By:		Sign	Dt:

2. Course Content

Module	Module Content	Teaching Hours	Module Concepts	Blooms Level
1	Digital Image Fundamentals: What is Digital Image Processing? Origins of Digital Image Processing, Examples of fields that use DIP, Fundamental Steps in Digital Image Processing, Components of an Image Processing System, Elements of Visual Perception, Image Sensing and Acquisition, Image Sampling and Quantization, Some Basic Relationships Between Pixels, Linear and Nonlinear Operations.	05 05	Image processing System	L3
2	Spatial Domain: Some Basic Intensity Transformation Functions, Histogram Processing, Fundamentals of Spatial Filtering, Smoothing Spatial Filters, Sharpening Spatial Filters Frequency Domain: Preliminary Concepts, The Discrete Fourier Transform (DFT) of Two Variables, Properties of the 2-D DFT, Filtering in the Frequency Domain, Image Smoothing and Image Sharpening Using Frequency Domain Filters, Selective Filtering.	05 05	Analytical representation of digital image	I4
3	Restoration: Noise models, Restoration in the Presence of Noise Only using Spatial Filtering and Frequency Domain Filtering, Linear, Position-Invariant Degradations, Estimating the Degradation Function, Inverse Filtering, Minimum Mean Square Error (Wiener) Filtering, Constrained Least Squares Filtering.	10	Noise , Noise compensation ,treatment in image	L3

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4	Color Image Processing: Color Fundamentals, Color Models, Pseudocolor Image Processing. Wavelets: Background, Multiresolution Expansions. Morphological Image Processing: Preliminaries, Erosion and Dilation, Opening and Closing, The Hit-or-Miss Transforms, Some Basic Morphological Algorithms.	04 02 04	Color System	IP	L2
5	Segmentation: Point, Line, and Edge Detection, Thresholding, Region Based Segmentation, Segmentation Using Morphological Watersheds. Representation and Description: Representation, Boundary descriptors	08 02	Boundary identification & detection in image		L3
6					

3. Course Material

Module	Details	Available
1	Text books	
	Digital Image Processing - Rafael C Gonzalez and Richard E. Woods, PHI 3rd Edition 2010.	In Lib
		Available
2	Reference books	
	1. Digital Image Processing - S.Jayaraman, S.Esakkirajan, T.Veerakumar, Tata McGraw Hill 2014.	In dept Not Available
	2. Fundamentals of Digital Image Processing -A. K. Jain, Pearson 2004.	Available
3	Others (Web, Video, Simulation, Notes etc.)	
		Not Available

4. Course Prerequisites

SNo	Course Code	Course Name	Module / Topic / Description	Sem	Remarks	Blooms Level
1	15EC44	Signals and system	1. Terminology and Mathematical formula	4		L3
2	15EC52	DSP	4.	5	Plan Gap Course	L3

Note: If prerequisites are not taught earlier, GAP in curriculum needs to be addressed. Include in Remarks and implement in B.5.

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B. OBE PARAMETERS

1. Course Outcomes

#	COs	Teach. Hours	Concept	Instr Method	Assessment Method	Blooms' Level
15EC72.1	Students should able to understand image processing system	10	IP System	Lecture	CIA ,Assignment	L3
.2	Students should able to determine ,differentiate and analogy of elements of visual perception and digital image	10	Analogy of digital image and human eye	Lecture	CIA ,Assignment	L4
.3	Students should able to understand and analyze analytically digital image	10	Image analytics	Lecture	CIA ,Assignment	L3
.4	Students should able to understand noise,noise compensation in digital image	10	Noise compensation	Lecture / PPT	Assignment	L2
.5				Lecture	Slip test	L3
.6	Students should able to understand color image processing	06	Color IP System	Lecture and Tutorial	Assignment	L3
.7		09	segmentation	Lecture	Assignment and Slip Test	14
.8		09		Lecture	Assignment	L3
.9	Students should able to understand identify and represent segments in digital image	05		Lecture	Assignment	L2
.10	Students should able to understand segmentation algorithms					L3
-	Total	62	-	-	-	-

Note: Identify a max of 2 Concepts per Module. Write 1 CO per concept.

2. Course Applications

SNo	Application Area	CO	Level
-----	------------------	----	-------

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1	Able to identify and perform the appropriate image processing steps	CO1	L2
2	Able to find applications of image processing in our daily life	CO2	L2
3	Understand analyze and apply mathematical concepts to digital images	CO3	L2
4	Understanding image as function of intensity and place	CO4	L3
5		CO5	L2
6		CO6	L2
7		CO7	L3
8		CO8	L2
9		CO9	L2
10		CO10	L4

Note: Write 1 or 2 applications per CO.

3. Articulation Matrix

(CO – PO MAPPING)

#	Course Outcomes COs	Program Outcomes												Level	
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12		
15EC72.1	Students should able to understand image processing system														L2
.2	Students should able to determine ,differentiate and analogy of elements of visual perception and digital image														L2
.3	Students should able to understand and analyze analytically digital image														L2
.4	Students should able to understand noise,noise compensation in digital image														L3
.5															L2
.6	Students should able to understand color image processing														L2
.7	Students should able to understand identify and represent segments in digital image														L3
.8	Students should able to														L2
.9	Students should able to														L2
.10	Students should able to														

Note: Mention the mapping strength as 1, 2, or 3

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4. Mapping Justification

Mapping		Justification	Mapping Level
CO	PO	-	-
CO1	PO1		L1
CO1	PO2		L3
CO1	PO5		

Note: Write justification for each CO-PO mapping.

5. Curricular Gap and Content

SNo	Gap Topic	Actions Planned	Schedule Planned	Resources Person	PO Mapping
1					
2					
3					
4					
5					

Note: Write Gap topics from A.4 and add others also.

6. Content Beyond Syllabus

SNo	Gap Topic	Actions Planned	Schedule Planned	Resources Person	PO Mapping
1	Lab using MATLAB				
2					

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3					
4					
5					
6					
7					
8					
9					
10					

Note: Anything not covered above is included here.

C. COURSE ASSESSMENT

1. Course Coverage

Module #	Title	Teaching Hours	No. of question in Exam						CO	Levels
			CIA-1	CIA-2	CIA-3	Asg	Extra Asg	SEE		
1	Digital Image Fundamentals	10	2	-	-	1	1	2	CO1, CO2	L1, L2
2	Spatial and Frequency Domain	10	2	-	-	1	1	2	CO3, CO4	L2, L3
3	Restoration	10	-	2	-	1	1	2	CO5, CO6	L3, L4
4	Color Image Processing, Wavelets and Morphological Image Processing	10	-	2	-	1	1	2	CO7, CO8	L2, L3
5	Segmentation, Representation and Description	10	-	-	4	1	1	2	CO9, CO10	L4, L5
-	Total	50	4	4	4	5	5	10	-	-

Note: Distinct assignment for each student. 1 Assignment per chapter per student. 1 seminar per test per student.

2. Continuous Internal Assessment (CIA)

Evaluation	Weightage in Marks	CO	Levels
CIA Exam - 1	30	CO1, CO2, CO3, CO4	L2, L3, L4, L2
CIA Exam - 2	30	CO5, CO6, CO7, CO8	L1, L2, L3, L4
CIA Exam - 3	30	CO9, CO10	L3, L1
Assignment - 1	05	CO1, CO2, CO3, CO4	L2, L3, L4, L3

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Assignment – 2	05	CO5, CO6, CO7, CO8	L1, L2, L3, L1
Assignment – 3	05	CO9, CO10	L3, L4
Seminar – 1	05	CO1, CO2, CO3, CO4	L2, L3, L4, L3
Seminar – 2	05	CO5, CO6, CO7, CO8	L1, L2, L3, L1
Seminar – 3	05	CO9, CO10	L3, L4
Other Activities – define – Slip test		CO1 to Co9	L2, L3, L4 . .
Final CIA Marks	40	-	-

Note : Blooms Level in last column shall match with A.2 above.

D1. TEACHING PLAN – 1

Module – 1

Title:	Digital Image Fundamentals	Appr Time:	16 Hrs
a	Course Outcomes	-	Blooms Level
-	The student should be able to:	-	
1	Evaluate time and space complexity and calculate performance	CO1	L2
2	Understand searching and sorting schemes	CO2	L3
b	Course Schedule	-	-
Class No	Module Content Covered	CO	Level
1	Digital Image Fundamentals	CO1	L2
2	What is Digital Image Processing?		
3	Origins of Digital Image Processing		
4	Examples of fields that use DIP		
5	Fundamental Steps in Digital Image Processing		
6	Components of an Image Processing System		
7	Elements of Visual Perception		
8	Image Sensing and Acquisition		
9	Image Sampling and Quantization		
10	Some Basic Relationships Between Pixels		
11	Linear and Nonlinear Operations		
12			
13			
14			
15			
16			

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c	Application Areas	CO	Level
1	Able to identify and perform the appropriate image processing steps	CO1	L3
2	Able to find applications of image processing in our daily life	CO2	L4
d	Review Questions	-	-
1	List out the examples of image processing applications as per electromagnetic spectrum	CO1	L1
2	Discuss the fundamental digital image processing steps	CO1	L3
3	Explain the components of digital image processing	CO2	L2
4	Define and explain pixel, sampling ,quantization, grey levels, relation between pixels	CO2	L4
5	Describe human eye and image formation	CO2	L2
6		CO2	L5
7		CO2	L2
8		CO2	L3
9		CO2	L4
10		CO1	L1
11		CO1	L4
e	Experiences	-	-
1		CO1	L2
2			
3			
4		CO3	L3
5			

Module – 2

Title:	Spatial and Frequency Domain	Appr Time:	10 Hrs
a	Course Outcomes	-	Blooms Level
-	The student should be able to:	-	Level
1	Understand analyze and apply mathematical concepts to digital images	CO3	L4
2	Understanding image as function of intensity and place	CO4	L3
b	Course Schedule	-	-
Class No	Module Content Covered	CO	Level
17	Introduction to Subject, course objectives and outcomes		
18	Spatial Domain: Some Basic Intensity Transformation Functions		
19	Histogram Processing, Fundamentals of Spatial Filtering		

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20	Smoothing Spatial Filters, Sharpening Spatial Filters		
21	Frequency Domain: Preliminary Concepts		
22	The Discrete Fourier Transform (DFT) of Two Variables,		
23	Properties of the 2-D DFT		
24	Filtering in the Frequency Domain		
25	Image Smoothing		
26	Image Sharpening Using Frequency Domain Filters,		
27	Selective Filtering		
c	Application Areas	CO	Level
1	Use to find applications of histogram processing	CO3	L3
2	Used find applications of filtering in digital image	CO4	L4
d	Review Questions	-	-
12	What is Image Transform ? What is the need for transform ? Write applications of transform	CO3	L1
13	Explain 2D Unitary DFT and state the various properties	CO4	L3
14	What are image sharpening filters ?Write the application of sharpening filters	CO3	L2
15	Discuss image smoothing filter with its model I the spatial domain	CO4	L4
16	What is histogram? Explain the role of histogram equalization in image enhancement. Explain why this technique yields a flat histogram	CO4	L2
17	Explain the concept of histogram matching, development of the method and the corresponding implementation with suitable example.	CO3	L5
18		CO3	L2
19		CO3	L3
e	Experiences	-	-
1		CO1	L2
2			
3			
4		CO3	L3
5			



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E1. CIA EXAM - 1

a. Model Question Paper - 1

Crs Code:	15EC72	Sem:	VII	Marks:	30	Time:	75 minutes	
Course:	Digital Image Processing							
-	-	Note: Answer any 3 questions, each carry equal marks.				Mark s	CO	Level
1	a					20	CO1	L1
	b							L2
	c						CO2	L3
	d							L1
2	a					20		L2
	b							L4
	c							L3
	d							L2
3	a					20	CO3	L1
	b						CO4	L2
	c							L1
	d							L2
4	a					20		L2
	b							L2
	c							L1
	d							L3

b. Assignment -1

Note: A distinct assignment to be assigned to each student.

Model Assignment Questions								
Crs Code:	CS501PC	Sem:	I	Marks:	5 / 10	Time:	90 - 120 minutes	
Course:	Design and Analysis of Algorithms							
Note: Each student to answer 2-3 assignments. Each assignment carries equal mark.								
SNo	USN	Assignment Description				Mark s	CO	Level
1						5	CO1	L2
2						5	CO2	L3
3							CO2	L4
4						5	CO1	L3
5								
6								

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D2. TEACHING PLAN – 2

Module – 3

Title:	Restoration	Appr Time:	16 Hrs
a	Course Outcomes	-	Blooms Level
-	The student should be able to:	-	Level
1	Evaluate time and space complexity and calculate performance	CO5	L2
2	Understand searching and sorting schemes	CO6	L3
b	Course Schedule		
Class No	Module Content Covered	CO	Level
1	Introduction to Subject, course objectives and outcomes	C6	
2	Restoration:		
3	Noise models		
4	Restoration in the Presence of Noise Only using Spatial Filtering		
5	Restoration in the Presence of Noise Only using Frequency Domain Filtering	C5	
6	Linear, Position-Invariant Degradations,		
7	Estimating the Degradation Function		
8	Inverse Filtering,		
9	Minimum Mean Square Error (Wiener) Filtering,		
10	Constrained Least Squares Filtering.		
11			
12			
13			
14			
15			
16			
c	Application Areas	CO	Level
1	Use to find performance of algorithm	CO1	L3
2	Used in Searching and sorting	CO2	L4
d	Review Questions	-	-
1	What is meant by image restoration? Give the difference between enhancement and restoration	CO1	L1
2	Define the process of restoration. Explain the order statistics filter for restoring images in the presence of noise.	CO1	L3
3	How the estimation of noise parameters are done? Give the	CO2	L2

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	expression for exponential noise		
4	Dias cuss various mean filters	CO2	L4
5		CO2	L2
6		CO2	L5
7		CO2	L2
8		CO2	L3
9		CO2	L4
10		CO1	L1
11		CO1	L4
e	Experiences	-	-
1		CO1	L2
2			
3			
4		CO3	L3
5			

Module – 4

Title:	Color Image Processing,Wavelet and Morphological Image Processing	Appr Time:	16 Hrs
a	Course Outcomes	-	Blooms Level
-	The student should be able to:	-	Level
1	Evaluate time and space complexity and calculate performance	CO7	L2
2	Understand searching and sorting schemes	CO8	L3
b	Course Schedule		
Class No	Module Content Covered	CO	Level
1	Introduction to Subject, course objectives and outcomes		
2	Color Image Processing		
3	Color Fundamentals		
4	Color Models		
5	Pseudocolor Image Processing.		
6	Wavelets: Background,		
7	Multiresolution Expansions		
8	Morphological Image Processing:Preliminaries		
9	Erosion and Dilation, Opening and Closing		
10	The Hit-or-Miss Transforms,		
11	Some Basic Morphological Algorithms		
12			
13			

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14			
15			
16			
c	Application Areas	CO	Level
1	Use to find performance of algorithm	CO8	L3
2	Used in Searching and sorting	CO7	L4
d	Review Questions	-	-
1		CO7	L1
2		CO7	L3
3		CO8	L2
4		CO7	L4
5		CO8	L2
6		CO8	L5
7			L2
8			L3
9			L4
10			L1
11			L4
e	Experiences	-	-
1		CO7	L2
2			
3			
4		CO8	L3
5			

E2. CIA EXAM - 2

a. Model Question Paper - 2

Crs Code:	15EC72	Sem:	VII	Marks:	30	Time:	75 minutes	
Course:	Digital Image Processing							
-	-	Note: Answer any 2 questions, each carry equal marks.				Mark s	CO	Level
1	a					20	CO5	L1
	b							L2
	c						CO6	L3
	d							L1
2	a					20	CO7	L2

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	b				L4
	c				L3
	d				L2
3	a		20	CO8	L1
	b			CO8	L2
	c				L1
	d				L2
4	a		20		L2
	b				L2
	c				L1
	d				L3

b. Assignment - 2

Note: A distinct assignment to be assigned to each student.

Model Assignment Questions							
Crs Code:	15EC72	Sem:	VII	Marks:	5 / 10	Time:	90 - 120 minutes
Course:	Design and Analysis of Algorithms						

Note: Each student to answer 2-3 assignments. Each assignment carries equal mark.

SNo	USN	Assignment Description	Marks	CO	Level
1			5	CO8	L2
2			5	CO9	L3
3				CO10	L4
4			5	CO9	L3
5					
6					
7					
8					
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D3. TEACHING PLAN – 3

Module – 5

Title:	Segmentation	Appr Time:	16 Hrs
a	<i>Course Outcomes</i>	-	Blooms Level
-	The student should be able to:	-	Level
1	Evaluate segmentation schemes	CO9	L2
2	Understand algorithms	CO10	L3
b	<i>Course Schedule</i>		
Class No	Module Content Covered	CO	Level

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1	Introduction to Subject, course objectives and outcomes		
2	Segmentation:Point, Line		
3	Edge Detection		
4	Thresholding		
5	Region Based Segmentation		
6	Segmentation Using Morphological Watersheds		
7	Representation and Description:		
8	Representation		
9	Boundary descriptors		
10	Edge Detection		
11			
12			
13			
14			
15			
16			
c	Application Areas	CO	Level
1	Use to find segmentation algorithm	CO10	L3
2	Used boundaries in the image	CO9	L4
d	Review Questions	-	-
1		CO10	L1
2		CO10	L3
3		CO9	L2
4		CO9	L4
5			L2
6			L5
7			L2
8			L3
9			L4
10			L1
11			L4
e	Experiences	-	-
1		CO10	L2
2			
3			
4		CO9	L3
5			

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E3. CIA EXAM – 3

a. Model Question Paper – 3

Crs Code:	15EC72	Sem:	VII	Marks:	30	Time:	75 minutes	
Course:	Design and Analysis of Algorithms							
-	-	Note: Answer any 2 questions, each carry equal marks.				Mark s	CO	Level
1	a					20	CO9	L1
	b							L2
	c						CO9	L3
	d							L1
2	a					20	CO10	L2
	b							L4
	c							L3
	d							L2
3	a					20	CO10	L1
	b						CO10	L2
	c							L1
	d							L2
4	a					20		L2
	b							L2
	c							L1
	d							L3

b. Assignment – 3

Note: A distinct assignment to be assigned to each student.

Model Assignment Questions								
Crs Code:	15EC72	Sem:	VII	Marks:	5 / 10	Time:	90 – 120 minutes	
Course:	Digital image processing							
Note: Each student to answer 2–3 assignments. Each assignment carries equal mark.								
SNo	USN	Assignment Description				Mark s	CO	Level
1						5	CO9	L2
2						5	CO9	L3
3							CO10	L4
4						5	CO10	L3
5								
6								

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F. EXAM PREPARATION

1. University Model Question Paper----- First time introduced No Model question papers and previous question paper questions

Course:	Digital Image Processing				Month / Year	May / 2018		
Crs Code:	15EC72	Sem:	VII	Marks:	100	Time: 180 minutes		
-	Note	Answer all FIVE full questions. All questions carry equal marks.				Mark s	CO	Leve l
1	a					16 / 20	CO1	
	b							
	c						CO2	
	d							
-	a					16 / 20	CO1	
	b						CO2	
	c							
	d							
2	a					16 / 20	CO3	
	b							
	c						CO4	
	d							
-	a					16 / 20	CO3	
	b						CO4	
	c							
	d							
3	a					16 / 20	CO5	
	b							
	c						CO6	
	d							
-	a					16 / 20	CO5	
	b							

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	c			CO6
	d			
4	a		16 / 20	CO7
	b			
	c			CO8
	d			
-	a		16 / 20	CO7
	b			CO8
	c			
	d			
5	a		16 / 20	CO9
	b			CO10
	c			
	d			
	a		16 / 20	CO9
	b			
	c			CO10
	d			

2. SEE Important Questions

Course:	Digital Image Processing				Month / Year	May / 2018	
Crs Code:	15EC72	Sem:	VII	Marks:	100	Time:	180 minutes
	Note	Answer one question from each module. All questions carry equal marks.				-	-
Module	Qno.				Marks	CO	Year
1	1				16 / 20		2004
	2						2004
	3						2004
	4						2007

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	5				2007
2	1		16 / 20		2005
	2				2005
	3				2009
	4				2006
	5				2004
3	1		16 / 20		2006
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