DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEEERING

NATIONAL INSTITUTE OF TECHNOLOGY, TIRUCHIRAPPALLI

COURSE PLAN – PART I			
Name of the programme and specialization	**M-Tech VLSI System**		
Course Title	**Digital Image Processing**		
Course Code	**EC615**	**No. of Credits**	**3**
Course Code of Pre-requisite subject(s)			
Session	**January-April 2021**	**Section (if, applicable)**	
Name of Faculty	**Dr. Varun P. Gopi**	**Department**	**ECE**
Email	**varun@nitt.edu**	**Telephone No.**	**+919995114547**
Name of Course Coordinator(s) (if, applicable)	**Dr. Varun P. Gopi**		
E-mail	**varun@nitt.edu**	**Telephone No.**	**+919995114547**
Course Type	☐ Core course		☐ Elective course

Syllabus (approved in BoS)
Elements of Visual perception. Image sensing and Acquisition. Imaging in different bands. Digital Image Representation. Relationship between pixels. Image transformations: 2D-DFT, DCT, DST, Hadamard, Walsh, Hotelling transformation, 2D-Wavelet transformation, Wavelet packets. Image Enhancements in spatial domain and Frequency domain. Image Restoration techniques. Color Image processing. Error free compression: Variable length coding, LZW, Bit-plane coding, Lossless predictive coding Lossy compression: Lossy predictive coding, transform coding, wavelet coding. Image compression standards (CCITT, JPEG, JPEG 2000) and Video compression standards. Summary of morphological operations in Binary and Gray Images. Image segmentation: Point, Line and Edge segmentation. Edge linking and Boundary detection. Segmentation using thresholding, Region based segmentation. Segmentation by morphological watersheds. Use of motion in segmentation. Feature Extraction from the Image: Boundary descriptors, Regional descriptors, Relational descriptors. Dimensionality reduction techniques, Discriminative approach and the Probabilistic approach for image pattern recognition.

COURSE OBJECTIVES

1. To explore various techniques involved in Digital Image Processing

COURSE OUTCOMES (CO)

Course Outcomes	**Aligned Programme Outcomes (PO)**

1. Understand the need for image transforms different types of image transforms and their properties	1,2,3
2. Develop any image processing application	1,2,3
3. Understand the rapid advances in Machine vision	1,2,3
4. Learn different techniques employed for the enhancement of images	1,2,3
5. Learn different causes for image degradation and overview of image restoration techniques.	1,2,3

COURSE PLAN – PART II

COURSE OVERVIEW

1. An introduction to digital image processing fundamentals and image transforms
2. Image enhancement both in spatial and frequency domain
3. Image restoration techniques
4. Error free compression, Lossy and Lossless compression techniques
5. Morphological Operations
6. Image Segmentation methods in image processing
7. Feature extraction and dimensionality reduction techniques

COURSE TEACHING AND LEARNING ACTIVITIES

S.No.	Week/Contact Hours	Topic	Mode of Delivery
1	**I WEEK** **19 to 22 January** **(3 contact hours)**	Elements of Visual perception. Image sensing and Acquisition. Imaging in different bands. Digital Image Representation. Relationship between pixels.	C&T, PPT, group discussion, Quizzes, assignments
2	**2 WEEK** **25 to 29 January** **(3 contact hours)**	Image transformations: 2D-DFT, DCT, DST, Hadamard, Walsh	
3	**3 WEEK** **1 to 5 February** **(3 contact hours)**	Hotelling transformation, 2D-Wavelet transformation, Wavelet packets	
4	**4 WEEK** **8 to 12 February** **(3 contact hours)**	Image Enhancements in spatial domain and Frequency domain.	
5	**5 WEEK** **15 to 19 February** **(3 contact hours)**	Image Restoration techniques. Color Image processing.	

6	**6 WEEK** **22 to 26 February** **(3 contact hours)**	Error free compression: Variable length coding, LZW	C&T, PPT, group discussion, Quizzes, assignments	
7	**7 WEEK** **1 to 5 March** **(3 contact hours)**	Bit-plane coding, Lossless predictive coding.		
8	**8 WEEK** **8 to 12 March** **(3 contact hours)**	Lossy compression: Lossy predictive coding, transform coding, wavelet coding.		
9	**9 WEEK** **15 to 19 March** **(3 contact hours)**	Image compression standards (CCITT, JPEG, JPEG 2000) and Video compression standards.		
10	**10 WEEK** **22 to 26 March** **(3 contact hours)**	Summary of morphological operations in Binary and Gray Images		
11	**11 WEEK** **16th to 20thMarch** **(3 contact hours)**	Image segmentation: Point, Line and Edge segmentation. Edge linking and Boundary detection.		
12	**12 WEEK** **29 March to 2 April** **(3 contact hours)**	Segmentation using thresholding, Region based segmentation. Segmentation by morphological watersheds. Use of motion in segmentation.		
13	**13 WEEK** **5 to 9 April** **1st to 3th April** **(3 contact hours)**	Feature Extraction from the Image: Boundary descriptors, Regional descriptors, Relational descriptors		
14	**14 WEEK** **12 to 16 April** **(3 contact hours)**	Dimensionality reduction techniques, Discriminative approach,		
15	**15 WEEK** **19 to 23 April** **(3 contact hours)**	The Probabilistic approach for image pattern recognition.		

COURSE ASSESSMENT METHODS (shall range from 4 to 6)

S.No.	Mode of Assessment	Week/Date	Duration	% Weightage
1	Assignment 1	4th Week		5
2	CT1	7th Week	60 Minutes	20
3	Assignment 2	11th Week		5
4	CT2-Viva	12th Week	60 Minutes	20

CPA	Compensation Assessment*	13th WEEK	60 minutes	Please refer course policy for more details
5	Quiz	14th Week	30 Minutes	20
6	Final Assessment *	15th Week	120 Minutes	30

*mandatory; refer to guidelines on page 4

COURSE EXIT SURVEY (mention the ways in which the feedback about the course shall be assessed)

1. The students through class representative may give their feedback at any time which will be duly addressed.
2. Feedback from the students through MIS and class committee meetings

COURSE POLICY (preferred mode of correspondence with students, compensation assessment policy to be specified)

MODE OF CORRESPONDENCE (email/ phone etc)

All the students are advised to come to the class regularly. All the correspondence (schedule of classes/ schedule of assignment/ course material/ any other information regarding this course) will be intimated in the class as well as in group mail.

COMPENSATION ASSESSMENT POLICY

If any student who fails to attend assessment 2 or assessment 4 due to any genuine reasons, student is permitted to attend compensation assessment for the weightage of 20 % (Including assessment I & assessment 2 Portions)

ATTENDANCE POLICY (A uniform attendance policy as specified below shall be followed)

- ➢ **At least 75% attendance in each course is mandatory.**

- ➢ **A maximum of 10% shall be allowed under On Duty (OD) category.**

- ➢ Students with **less than 65% of attendance** shall be prevented from writing the final assessment and **shall be awarded 'V' grade.**

ACADEMIC DISHONESTY & PLAGIARISM

- ➢ Possessing a mobile phone, carrying bits of paper, talking to other students, copying from others during an assessment will be treated as punishable dishonesty.

- ➢ Zero mark to be awarded for the offenders. For copying from another student, both students get the same penalty of zero mark.

- ➢ The departmental disciplinary committee including the course faculty member, PAC

chairperson and the HoD, as members shall verify the facts of the malpractice and award the punishment if the student is found guilty. The report shall be submitted to the Academic office.

The above policy against academic dishonesty shall be applicable for all the programmes.

ADDITIONAL INFORMATION

The faculty is available for consultation at times as per the intimation given by the faculty

FOR APPROVAL

Course Faculty _____ **CC-Chairperson** _____ **HOD** _____

Guidelines:

a) **The number of assessments for a course shall range from 4 to 6.**

b) **Every course shall have a final assessment on the entire syllabus with at least 30% weightage.**

c) **One compensation assessment for absentees in assessments (other than final assessment) is mandatory. Only genuine cases of absence shall be considered. Details of compensation assessment to be specified by faculty.**

d) **The passing minimum shall be as per the regulations.**

e) **Attendance policy and the policy on academic dishonesty & plagiarism by students are uniform for all the courses.**

f) **Absolute grading policy shall be incorporated if the number of students per course is less than 10.**

g) **Necessary care shall be taken to ensure that the course plan is reasonable and is objective.**