



THIRD-YEAR OF BACHELOR OF COMPUTER SCIENCE REVISED SYLLABUS ACCORDING TO CBCS

COURSE TITLE: DIGITAL IMAGE PROCESSING

SEMESTER-V, W.E.F. 2021-2022

**Recommended by the Board of Studies in Computer Science
And**

Approved by the Academic Council

Devrukh Shikshan Prasarak Mandal's

Nya. Tatyasaheb Athalye Arts, Ved. S. R. Sapre Commerce, and
Vid. Dadasaheb Pitre Science College (Autonomous), Devrukh.
Tal. Sangameshwar, Dist. Ratnagiri-415804, Maharashtra,
India

Academic Council Item No: _____

Name of the Implementing Institute	:	Nya. Tatyasaheb Athalye Arts, Ved. S. R. Sapre Commerce, and Vid. Dadasaheb Pitre Science College (Autonomous), Devrukh. Tal. Sangameshwar, Dist. Ratnagiri-415804,
Name of the Parent University	:	University of Mumbai
Name of the Programme	:	Bachelor of Science
Name of the Department	:	Computer Science
Name of the Class	:	Third Year
Semester	:	Six
No. of Credits	:	03
Title of the Course	:	Digital Image Processing
Course Code	:	USCST65
Name of the Vertical	:	Elective II
Eligibility for Admission	:	Any 12 th Pass seeking Admission to Degree Programme in adherence to Rules and Regulations of the University of Mumbai and Government of Maharashtra
Passing Marks	:	40%
Mode of Assessment	:	Formative and Summative
Level	:	UG
Pattern of Marks Distribution for TE and CIA	:	70:30
Status	:	CBCS
To be implemented from Academic Year	:	2021-2022
Ordinances /Regulations (if any)		

Syllabus for Third Year of Bachelor of Science in Computer Science

(With effect from the academic year 2021-2022)

SEMESTER-VI

Paper No.– 5

Course Title: Digital Image Processing

No. of Credits - 03

Type of Vertical: Elective II

COURSE CODE: USCST65

Learning Outcomes Based on BLOOM's Taxonomy:

After completing the course, the learner will be able to...		
Course Learning Outcome No.	Blooms Taxonomy	Course Learning Outcome
CO-01	Understand	After completion of this course, learner should get an understanding of the field of Digital Image Processing and its relationship to search engines.
CO-02	Understand	It will give the learner an understanding to apply Digital Image Processing models.

Syllabus for Third Year of Bachelor of Science in Computer Science

(With effect from the academic year 2021-2022)

SEMESTER-VI

Paper No.-5

Course Title: Digital Image Processing

No. of Credits - 03

Type of Vertical: Elective II

COURSE CODE: USCST65

COURSE CONTENT			
Unit No.	Content	Credits	No. of Lectures
I	<p>Introduction to Image-processing System : Introduction, Image Sampling, Quantization, Resolution, Human Visual Systems, Elements of an Image-processing System, Applications of Digital Image Processing</p> <p>2D Signals and Systems : 2D signals, separable sequence, periodic sequence, 2D systems, classification of 2D systems, 2D</p> <p>Digital filter</p> <p>Convolution and Correlation : 2D Convolution through graphical method, Convolution through 2D Z—transform, 2D Convolution through matrix analysis, Circular Convolution, Applications of Circular Convolution, 2D Correlation</p> <p>Image Transforms: Need for transform, image transforms, Fourier transform, 2D Discrete Fourier Transform, Properties of</p> <p>2D DFT, Importance of Phase, Walsh transform, Hadamard transform, Haar transform, Slant transform, Discrete Cosine transform, KL transform.</p>	01	15
II	<p>Image Enhancement :Image Enhancement in spatial domain, Enhancement through Point operations, Histogram manipulation, Linear and nonlinear Gray Level Transformation, local or neighborhood operation, Median Filter, Spatial domain High pass filtering, Bit-plane slicing, Image Enhancement in frequency domain, Homomorphic filter, Zooming operation, Image Arithmetic</p> <p>Binary Image processing :Mathematical morphology, Structuring elements, Morphological image processing,</p>	01	15

	Logical operations, Morphological operations, Dilation and Erosion, Distance Transform Colour Image processing :Colour images, Colour Model, Colour image quantization, Histogram of a colour image		
III	Image Segmentation: Image segmentation techniques, Region approach, Clustering techniques, Thresholding, Edge-based segmentation, Edge detection, Edge Linking, Hough Transform Image Compression: Need for image compression, Redundancy in images, Image-compression scheme, Fundamentals of Information Theory, Run-length coding, Shannon-Fano coding, Huffman Coding, Arithmetic Coding, Transform-based compression, Image-compression standard.	01	15
	Total	03	45

Required Previous Knowledge

Students should know basic concepts related to computer and computer handling

Access to the Course

The course is available for all the students admitted for Bachelor of Science (Computer Science).

Forms of Assessment

The assessment of the course will be of Diagnostic, Formative and Summative type. At the beginning of the course diagnostic assessment will be carried out. The formative assessment will be used for the Continuous Internal Evaluation whereas the summative assessment will be conducted at the end of the term. The weightage for formative and summative assessment will be 60:40. The detailed pattern is as given below.

Semester End Evaluation (70 Marks)
Question Paper Pattern
Time: 2:30 hours

Question No.	Unit/s	Question Pattern	Marks
Q.1	I,II &III	MCQ/Fill in the blanks/One line sentence	10
Q.2	I	Descriptive Questions	20
Q.3	II	Descriptive Questions	20
Q4.	III	Descriptive Questions	20
Total			70

Internal evaluation (30 Marks)

Sr. No.	Description	Marks
1	Classroom Tests	10
2	Project/ Viva/ Presentations/ Assignments	10
3	Attendance	10
Total		30

Grading Scale

10 points grading scale will be used. The grading scale used is O to F. Grade O is the highest passing grade on the grading scale, and grade F is a fail. The Board of Examinations of the college reserves the right to change the grading scale.

Reference book:

- Digital Image Processing, S Jayaraman, S Esakkirajan, T Veerakumar, Tata McGraw-Hill Education Pvt. Ltd., 2009

Text book:

- Techmax publication book

Additional References:

- Digital Image Processing 3rd Edition, Rafael C Gonzalez, Richard E Woods, Pearson, 2008
- Scilab Textbook Companion for Digital Image Processing, S. Jayaraman, S. Esakkirajan And T. Veerakumar, 2016 (https://scilab.in/textbook_companion/generate_book/125)

<p>Course: USCSP69</p>	<p>Practical of USCST65 (Credits : 1, Lectures/Week: 3)</p>
<p>USCSP69</p>	<p>Practical need to be performed using Scilab under Linux or Windows</p> <ol style="list-style-type: none"> 1. 2D Linear Convolution, Circular Convolution between two 2D matrices 2. Circular Convolution expressed as linear convolution plus alias 3. Linear Cross correlation of a 2D matrix, Circular correlation between two signals and Linear auto correlation of a 2D matrix, Linear Cross correlation of a 2D matrix 4. DFT of 4x4 gray scale image 5. Compute discrete cosine transform, Program to perform KL transform for the given 2D matrix 6. Brightness enhancement of an image, Contrast Manipulation, image Negative 7. Perform threshold operation, perform gray level slicing without background 8. Image Segmentation 9. Image Compression 10. Binary Image Processing and Colour Image processing