COURSE SYLLABUS

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YEAR COURSE OFFERED: 2022

SEMESTER COURSE OFFERED: Spring

DEPARTMENT: Computer Science

COURSE NUMBER: 19239

NAME OF COURSE: Digital Image Processing

NAME OF INSTRUCTOR: Pranav Mantini

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The information contained in this class syllabus is subject to change without notice. Students are expected to be aware of any additional course policies presented by the instructor during the course.

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Learning Objectives

1] Introduce essential concepts of **Digital Image Processing**
-Acquisition
-Display
-Processing
-Practical Applications and Implementation
-Elementary Image Analysis

2] Make digital image processing accessible to engineers and computer scientists

3] Present numerous examples to illustrate the use of image processing and the material taught in class

4] Create an interactive teaching environment
-Ask questions
-Comment on level of instruction and material
-Comment on speed of delivery

Major Assignments/Exams

Midterm Exam 20%, Quiz: 20%, and Assignments and Project 60%

Required Reading

COURSE SYLLABUS

Digital Image Processing, 2nd or 3rd Edition, R. C. Gonzales and R. E. Woods, Prentice Hall, 2002.

Recommended Reading

Digital Image Processing, K. R. Castleman, Prentice Hall, 1996.

List of discussion/lecture topics

COURSE SYLLABUS

TENTATIVE SCHEDULE

TIMELINE	MATERIAL COVERED
Week 1-2	Image Formation, Human Visual System, Projection, OpenCV Installation
Week 2-3	Intro to Python, Digital Image Formation, Image Acquisition, Image Representation, Resampling
Week 3-4	Opencv Basics, Binary Images Processing – Generation, Logical Operations, BLOB Coloring; Binary Morphology, Skeletonization, Compression
Week 4-5	Point Operation – Linear Point Operations, Offset, Scaling; Non-Linear Point Operations, Histogram Shaping, Flattening, Matching, Basic Algebraic Image Operations, Geometric Image Operations
Week 5-6	Frequency Domain Analysis, Periodic Function, Fourier Transform, DFT, Properties of DFT
Week 6-7	Spatial Filtering – Smoothing, Sharpening; Convolution Theorem
Week 7-8	Wraparound Convolution, Filtering in Frequency Domain – Ideal, Butterworth and Gaussian
Week 8-9	Midterm
Week 9-10	Image Restoration - Image Degradation/Restoration Process; Noise - Model
Week 10-11	Estimation of Noise Parameters, Restoration of Filters, Degradation Function, Inverse Filtering,
Week 11-12	Color Image Processing - Color, Fundamentals, Primary Colors,
Week 12-13	Principle of Trichromacy, RGB, CMYK, HIS, Grey to Color Image, Full Color Image Processing
Week 13-14	Edge Detection – Formation, Characteristics, Noise, DoG, Image Derivatives;
Week 14-15	Edge Detectors – First Order, Second Order, Canny Edge Detector