# Indraprastha College for Women
## University of Delhi

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| Course Name: | B.Sc(H) CS |
| Paper Title: | Digital Image Processing |
| Unique Paper Code: | |
| Semester: | VII |
| Faculty(s): | Ms. Seema Jangra |
| Year: | 2025 |

| Work Plan | | | |
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| Unit No. | Learning Objective | Lecture No. | Topics to be Covered |
| 1 | **Introduction: Digital Image Fundamentals** | 1 | Brightness, Adaptation and Discrimination |
| | | 2 | Brightness, Adaptation and Discrimination |
| | | 3 | Light and Electromagnetic Spectrum. |
| | | 4 | Light and Electromagnetic Spectrum. |
| | | 5 | Image Sampling and Quantization |
| | | 6 | Image Sampling and Quantization |
| | | 7 | Some Basic Relationships Between Pixels, |
| | | 8 | Some Basic Relationships Between Pixels |
| 2 | **Spatial Domain Filtering** | 9 | Some Basic Intensity Transformation Functions, |
| | | 10 | Some Basic Intensity Transformation Functions |
| | | 11 | Histogram Equalization, |
| | | 12 | Histogram Equalization, |
| | | 13 | Spatial Correlation and Convolution, |

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| | | 14 | Smoothening Spatial Filters, |
| | | 15 | Smoothening Spatial Filters |
| | | 16 | Smoothening Spatial Filters |
| | | 17 | Sharpening Spatial Filters |
| | | 18 | Sharpening Spatial Filters |
| 3 | **Filtering in Frequency Domain** | 19 | The Discrete Fourier Transformation (DFT) |
| | | 20 | The Discrete Fourier Transformation (DFT) |
| | | 21 | Frequency Domain Filtering |
| | | 22 | Frequency Domain Filtering |
| | | 23 | Frequency Domain Filtering |
| | | 24 | Frequency Domain Filtering-Ideal and Butterworth Low pass and High pass filters, DCT Transform (1D, 2D). |
| | | 25 | Frequency Domain Filtering-Ideal and Butterworth Low pass and High pass filters, DCT Transform (1D, 2D). |
| | | 26 | Frequency Domain Filtering-Ideal and Butterworth Low pass and High pass filters, DCT Transform (1D, 2D). |
| | | 27 | Frequency Domain Filtering-Ideal and Butterworth Low pass and High pass filters, DCT Transform (1D, 2D). |
| | | 28 | Frequency Domain Filtering-Ideal and Butterworth Low pass and High pass filters, DCT Transform (1D, 2D). |
| 4 | **Image Restoration** | 29 | Image Degradation/Restoration Process, |
| | | 30 | Image Degradation/Restoration Process, |
| | | 31 | Noise models, Noise Restoration Filters |
| | | 32 | Noise models, Noise Restoration Filters |
| | | 33 | Noise models, Noise Restoration Filters |
| | | 34 | Noise models, Noise Restoration Filters |

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| 5 | **Image Compression** | 35 | Fundamentals of Image Compression |
| | | 36 | Huffman Coding, |
| | | 37 | Huffman Coding, |
| | | 38 | Run Length Coding, |
| | | 39 | Bit Plane Coding |
| | | 40 | Bit Plane Coding |
| 6 | **Morphological Image Processing** | 41 | Erosion |
| | | 42 | Erosion |
| | | 43 | Dilation |
| | | 44 | Dilation |
| | | 45 | Opening, Closing, |
| | | 46 | Opening, Closing, |
| | | 47 | Hit-or-Miss Transformation |
| | | 48 | Hit-or-Miss Transformation, |
| | | 49 | Basic Morphological Algorithms |
| | | 50 | Basic Morphological Algorithms |
| | | 51 | Basic Morphological Algorithms |
| | | 52 | Basic Morphological Algorithms |
| 7 | **Image Segmentation** | 53 | Point, Line and Edge Detection |
| | | 54 | Point, Line and Edge Detection |
| | | 55 | Thresholding, |
| | | 56 | Thresholding, |
| | | 57 | Region Based Segmentation. |
| | | 58 | Region Based Segmentation |
| | | 59 | Region Based Segmentation |
| | | 60 | Region Based Segmentation |

| **Syllabus** | | |
|---|---|---|
| **Unit** | **Contents** | **Contact Hours** |
| I | **Introduction: Digital Image Fundamentals** Brightness, Adaptation and Discrimination, Light and Electromagnetic Spectrum, Image Sampling and Quantization, Some Basic Relationships Between Pixels, Types of images | 8 |

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| II | **Spatial Domain Filtering** Some Basic Intensity Transformation Functions, Histogram Equalization, Spatial Correlation and Convolution, Smoothening Spatial Filters: Low pass filters, Order Statistics filters, Sharpening Spatial Filters: Laplacian filter | 10 |
| III | **Filtering in Frequency Domain**<br>The Discrete Fourier Transformation (DFT), Frequency Domain Filtering: Ideal and Butterworth Low pass and High pass filters, DCT Transform (1D, 2D). | 10 |
| IV | **Image Restoration:** Image Degradation/Restoration Process, Noise models, Noise Restoration Filters | 8 |
| V | **Image Compression:** Fundamentals of Image Compression, Huffman Coding, Run Length Coding, JPEG | 6 |
| VI | **Morphological Image Processing:** Erosion, Dilation, Opening, Closing, Hit-or-Miss Transformation, Basic Morphological Algorithms | 10 |
| VII | **Image Segmentation:** Point, Line and Edge Detection, Thresholding, Region Based Segmentation | 8 |
| | **Total** | **60** |

**Text Books/Suggested Readings:**

| S. No. | Name of Authors/Books/Publishers | Year of Publication/ Reprint |
|---|---|---|
| 1. | **References**<br>Gonzalez, R. C., & Woods, R. E. (2017). Digital Image Processing. 4th edition. Pearson Education. Sons. | 2017 |
| 2. | Jain, A. K. (1988). Fundamentals of Digital Image Processing. 1st edition Prentice Hall of India. | First Edition |
| 1. | **Additional Resources**<br>Castleman, K. R. (1995.). Digital Image Processing. 1st edition. Pearson Education | 1st Edition |

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| 2. | Gonzalez, R. C., Woods, R. E., & Eddins, S. (2004). Digital Image Processing using MATLAB. Pearson Education Inc. | 2004 |
| 3 | Schalkoff, D. (1989). Image Processing and Computer Vision. 1st edition. John Wiley and | 1st Edition |

| | **Paper Components** | | |
|---|---|---|---|
| **Credits** | **Lecture (L)** | **Tutorial (T)** | **Practical (P)** |
| | **3** | **0** | **1** |
| **Assessment Scheme** | | | |
| **S.No.** | **Component** | **Marking Scheme** | **Total Marks** |
| 1 | Internal Assessment | | 30 |
| | • Assignment/Quiz/Project/ Presentation | 12 | |
| | • Class Test | 12 | |
| | • Attendance | 6 | |
| 2. | Continuous Assessment (**Tutorial)** | | NA |
| | • Activity 1 | NA | |
| | • Activity 2 | NA | |
| | • Attendance | NA | |
| 3. | Practical | | 40 |
| | • Continuous Assessment | 10 | |
| | • End Term Written/Practical Exam | 20 | |
| | • Viva | 10 | |
| 4. | End Semester Examination | | 90 |