# UNIVERSITY OF ENGINEERING & MANAGEMENT, JAIPUR

## Lecture-wise Plan

**Subject Name:** Organizational Behavior  
**Year:** 4th Year  
**Subject Code:** HU801  
**Semester:** Eighth

<table>
<thead>
<tr>
<th>Module Number</th>
<th>Topics</th>
<th>Number of Lectures</th>
</tr>
</thead>
</table>
| 1             | **Introduction:**  
Managerial Perspectives on Organizational Behaviour: Management Functions, Managerial Roles, Skills, Challenges and Effectiveness  
Organizational Culture: Culture and its Characteristics, Types of Cultures, Western and Oriental Organization Cultures, Indian Organization Culture, Culture Change  
Group Behaviour: Characteristics of Group, Types of Groups, Stages of Development, Group Decision-making, Organizational Politics, Cases on Group Decision-making  
Communication in Organization: Purpose, Process, Channels and Networks, Barriers, Making Communication Effective, Transactional Analysis (TA), Cases on Communication | 6  
| 2             | Leadership Styles:  
Leadership Theories, Leadership Styles, Skills and Influence Processes, Leadership Power, Examples of Effective Organizational Leadership in India, Cases on Leadership  
Conflict in Organization:  
Sources of Conflict, Types of Conflict, Conflict Process, Johari Window, Conflict Resolution, Cases on Conflict Resolution  

**Total Number of Hours 33**
<table>
<thead>
<tr>
<th>Faculty In-Charge</th>
<th>HOD, Humanities Dept.</th>
</tr>
</thead>
<tbody>
<tr>
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</table>
## Lecture-wise Plan

### Subject Name: Smart Antenna

**Subject Code:** EC801A  
**Year:** 4th Year  
**Semester:** Eighth

<table>
<thead>
<tr>
<th>Module Number</th>
<th>Topics</th>
<th>Number of Lectures</th>
</tr>
</thead>
</table>
| 1             | **Antenna Basics:**  
|               | 1. Phased array antenna, power pattern, beam steering, degree of freedom | 2                  |
|               | 1. adaptive antennas                                                   | 1                  |
|               | 2. smart antennas- key benefits of smart antenna technology            | 1                  |
|               | 3. wide band smart antennas, Propagation Channels                      | 1                  |
| 2             | **Smart Antenna Technology:**                                         | 8L                 |
|               | 1. Spatial Processing for Wireless Systems, Key Benefits of Smart Antenna Technology, The Vector Channel Impulse Response and the Spatial Signature, Spatial Processing Receivers | 2                  |
|               | 2. Beam forming Networks                                               | 1                  |
|               | 4. Diversity Techniques                                               | 1                  |
|               | 5. Multiple Input- Multiple Output(MIMO) Communications Systems, MIMO for frequency selective scenarios | 2                  |
| 3             | **Design algorithm:**                                                 | 6L                 |
|               | 1. Sample matrix inversion algorithm                                    | 1                  |
|               | 2. unconstrained LMS algorithm, normalized LMS algorithm, Constrained LMS algorithm | 2                  |
|               | 3. Perturbation algorithms, Neural network approach                   | 2                  |
|               | 4. Adaptive beam space processing, Implementation issues.              | 1                  |
| 4             | **Spectral estimation methods:**                                       | 7L                 |
|               | 1. linear prediction method, Maximum entropy method                    | 2                  |
|               | 2. Maximum likelihood method, Eigen structure methods                  | 2                  |
|               | 3. MUSIC algorithm                                                     | 1                  |
|               | 4. root music and cyclic music algorithm, the ESPRIT algorithm.        |                    |
| 5             | **Implementation:**                                                   | 7L                 |
|               | 1. DOA based beam former design using simulation and hard ware        | 1                  |
2. Adaptive beam forming implementation using Altera Stratix® Series FPGA 2
3. QRDRLS Algorithm 2
4. CORDIC algorithm 2

Total Number Of Hours = 33

Faculty In-Charge  
HOD, CSE Dept.

Assignment:
Module-1(Antenna Basics):
1. Discuss the radiation from slot antenna?
2. Determine the power radiated from the open-end of a coaxial line?
3. What are the types of lens antenna? Give the equation of the shape of the lens?
4. Explain how E-plan type metal plate lens antennas are developed and derive the expression for spacing between the plates and equation of ellipse.
5. For an array N element feed with signal of equivalent amplitude and phase, determine the maxima and minima directions. Draw the radiation pattern

Module-2 (Smart Antenna Technology):
1. Define dipole antenna. Derive the radiation field and radiation resistance from a half wave dipole.
2. Derive the expression for radiation field and radiation resistance.
3. For an array N element feed with signal of equivalent amplitude and phase, determine the maxima and minima directions. Draw the radiation pattern
4. Obtain the expression for the field and the radiation pattern produced by a 2 element array of infinitesimal dipole with distance of separation $\lambda/2$ & currents of equal magnitude and phase shift 180°.
5. Obtain the expression for the field and the radiation pattern produced by a 2 element array of infinitesimal dipole with distance of separation $\lambda/2$ and currents of equal magnitude and same phase.

Module-3(Design algorithm):
1. What is meant by Travelling wave antenna?
2. What do you mean by driven elements?
3. What do you mean by parasitic elements?
4. What is rhombic antenna and give its applications?
5. What is LPDA?
6. What are the applications of log periodic and Yagi Uda antenna?
7. Explain the construction of Yagi antenna. Discuss the design aspects.
8. Specify the design consideration for a rhombic antenna.
9. Explain the geometry of a log periodic antenna. How wideband operation is possible with this antenna.

Module-3(Spectral estimation methods):
Lecture-wise Plan

1. What are the major problems with the nonparametric power spectrum estimation methods that are overcome by using the parameter power spectrum estimation methods?

2. What is the basic limitation of the nonparametric methods and what is the reason for this limitation?

3. What is the basic difference between the parametric and nonparametric power spectrum estimation methods?

4. For what types of signals would the parametric spectrum estimation methods be much better to use instead of the nonparametric methods, and why?

5. We all know that for a linear system if the input is a sinusoid then the resultant output will also be a sinusoid. Can we say the same thing about stationary random process input? Explain
<table>
<thead>
<tr>
<th>Module Number</th>
<th>Topics</th>
<th>Number of Lectures</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Unit 1: Structure of Solids</td>
<td>5L</td>
</tr>
<tr>
<td></td>
<td>Atoms and their binding, Bonds, Crystal Systems, Bravais Lattice Miller Indices, Crystalline, Polycrystalline and Amorphous Materials; Metals, Semiconductors and Insulators, Lattice defects- Qualitative ideas of point, line, surface and volume defects.</td>
<td>5</td>
</tr>
<tr>
<td>2</td>
<td>Unit 2: Dielectric Properties</td>
<td>4L</td>
</tr>
<tr>
<td></td>
<td>Dielectric Polarization and Mechanism-Internal or local field, Dielectric Loss, Temperature and Frequency dependence of dielectric constant, Elementary ideas of Piezoelectric, Ferroelectrics and Pyroelectric Materials and its Applications.</td>
<td>4</td>
</tr>
<tr>
<td>3</td>
<td>Unit 3: Magnetic Properties</td>
<td>2L</td>
</tr>
<tr>
<td></td>
<td>Elementary ideas of classification of magnetic materials– Diamagnetism, Para magnetism, Ferromagnetism, Ferrimagnetism, Magnetic Domains.</td>
<td>2</td>
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<tr>
<td>4</td>
<td>Unit 4: Superconductors</td>
<td>3L</td>
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<tr>
<td></td>
<td>Basic concepts of super conductivity, Transition temperature, Meissner effect High-T superconductors, Hard and Soft Materials, SQUID</td>
<td>3</td>
</tr>
<tr>
<td>5</td>
<td>Unit 5: Optical properties</td>
<td>3L</td>
</tr>
<tr>
<td></td>
<td>Absorption, Emission, Luminescence, Electro-optic and Acousto-optic effects, Photorefractive effects.</td>
<td>3</td>
</tr>
<tr>
<td>6</td>
<td>Unit 6: Materials for Optical Communication</td>
<td>3L</td>
</tr>
<tr>
<td></td>
<td>LED and Laser Materials, Optical Fiber.</td>
<td>3</td>
</tr>
<tr>
<td>7</td>
<td>Unit 7: Materials for Data Storage</td>
<td>5L</td>
</tr>
<tr>
<td></td>
<td>Magnetic Cores, Tapes, Disks, Hard disk, Floppy disk, Magneto-optic devices, Bubble memories, Magneto electronic Materials, CD, DVD, CCD.</td>
<td>5</td>
</tr>
<tr>
<td>8</td>
<td>Unit 8: Materials for Display Devices</td>
<td>3L</td>
</tr>
<tr>
<td></td>
<td>CRT, LED, LCD, TFT, Plasma Display.</td>
<td>3</td>
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<tr>
<td>9</td>
<td>Unit 9: Advanced Materials</td>
<td>2L</td>
</tr>
<tr>
<td></td>
<td>Metallic Glasses, Nanomaterials, etc.</td>
<td>2</td>
</tr>
</tbody>
</table>

**Total Number Of Hours = 30**
Assignment:

Assignment 1:

1. What is unit cell?
2. What do you mean by ‘space lattice’?
3. What is the difference between crystalline and non-crystalline?
4. What is coordination number?
5. Define the term ‘Atomic packing factor’. Calculate its value for body centered cube.
6. Define the term ‘Atomic packing factor’. Calculate its value for face centered cube.
7. Explain the procedure for finding Miller indices.
8. State the different types of bonds and their characteristics.
9. Give the comparison between ionic, covalent and metallic bonds.
10. Differentiate between ionic and covalent bond.
11. What is an ionic bond?
12. Explain the concepts of lattice, basis and crystal structure. How are they related?
13. Discuss in brief the points defects. How these defects affect the property of materials?
14. Explain Schottky and stacking faults.
15. Write short notes on:
   a. Bravais lattice
   b. Crystal defects

Assignment 2:

1. What are dielectric materials?
2. What are ‘dielectric losses’? How are these calculated?
3. What do you mean by ‘polarization of the dielectric’?
4. What are the electrical characteristics of dielectrics? Explain how different dielectrics are classified.
5. What are the effects of temperature on the dielectric constant of materials.
6. What are the effects of frequency on the dielectric constant of materials.
7. How polarization takes place in dielectrics?
8. Describe the characteristic properties of ferroelectric materials.
9. What is piezoelectricity?
10. What is pyroelectric effect? Give some application of pyroelectric materials.
11. What are piezoelectric materials.
12. Draw B-H curve for ferromagnetic materials and explain it.
13. What are the characteristics of dielectric materials?
14. What are the possible polarization types in a dielectric?

Assignment 3:

1. What is the cause of the macroscopic magnetic properties of a material?
2. What are paramagnetic materials?
3. Why dia and paramagnetic materials are considered to be non-magnetic?
4. What are antiferromagnetic materials?
5. What are ferromagnetic materials?
7. How are magnetic materials classified?
8. Explain (Discuss briefly) the following:
   a. Ferromagnetism
   b. Paramagnetism
   c. Diamagnetism
9. What are magnetic domains?
10. State the characteristics of magnetically soft materials.
11. Name the factors on which the shape of B-H curves for different types of soft and hard magnetic materials depend.
12. What is meant by soft and hard magnetic materials? Give applications of both these types.
13. What is the cause of the macroscopic magnetic properties of a material?

Assignment 4:
1. Show the variation of resistance verses temperature of a superconductor and normal conductor.
2. Define Meissner effect.
3. Write any two applications of superconductor.
4. What is superconductivity? Mention some important property changes that occur in materials when they undergo phase change from normal to the superconducting state.
5. Write a short note on potential applications of superconductors.

Assignment 5:
1. What are optical fibers? Discuss its principle of operation.
2. Draw the cross sectional view of an optical fiber and show the different components of the optical fiber in it.
3. Distinguish between step index multimode fiber and graded index multimode fiber.
4. What is the full form of LASER? State its different applications.
5. Distinguish between spontaneous emission, induced absorption and induced emission.
7. Distinguish between materials that are opaque, translucent, and transparent in terms of their appearance and light transmittance.
8. Describe phenomena of luminescence, what is the distinction between fluorescence and phosphorescence?
<table>
<thead>
<tr>
<th>Module Number</th>
<th>Topics</th>
<th>Number of Lectures</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Unit 1: Historical background, Basic concepts</td>
<td>2L</td>
</tr>
<tr>
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<td>Frequency allocation for satellite services, orbital &amp; spacecraft problems, Comparison of networks and services, modulation techniques used for satellite communication.</td>
<td>2</td>
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<td>2</td>
<td>Unit 2: Orbits</td>
<td>2L</td>
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<tr>
<td></td>
<td>Two body problem, orbital mechanics, geostationary orbit, change in longitude, orbital manoeuvres, orbital transfer, orbital perturbations.</td>
<td>2</td>
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<tr>
<td>3</td>
<td>Unit 3: Launch Vehicles</td>
<td>1L</td>
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<tr>
<td></td>
<td>principles of Rocket propulsion, powered flight, Launch vehicles for communication satellite</td>
<td>1</td>
</tr>
<tr>
<td>4</td>
<td>Unit 4: RF link</td>
<td>5L</td>
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<tr>
<td></td>
<td>noise, the basic RF link, satellite links (up and down), optimization RF link, inter satellite link, noise temperature, Antenna temperature, overall system temperature, propagation factors, rain attenuation model. Tropospheric and Ionospheric EFFECT</td>
<td>5</td>
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<tr>
<td>5</td>
<td>Unit 5: Multiple access</td>
<td>5L</td>
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<tr>
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<td>FDMA, TDMA, CDMA techniques, comparison of multiple access techniques, error connecting codes</td>
<td>5</td>
</tr>
<tr>
<td>6</td>
<td>Unit 6: Satellite subsystems and satellite link design</td>
<td>6L</td>
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<tr>
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<td>AOCS, TT&amp;C, power system, spacecraft antenna, transponder, Friis transmission equation, G/T ratio of earth station</td>
<td>6</td>
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<tr>
<td>7</td>
<td>Unit 7: Basic of remote sensing</td>
<td>3L</td>
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<td>Electromagnetic Radiation principles, Atmospheric window, Indian satellite sensing satellite system, Active, Passive, ground based and space based remote sensing</td>
<td>3</td>
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<tr>
<td>8</td>
<td>Unit 8</td>
<td>9L</td>
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<tr>
<td></td>
<td>Spatial, spectral, Radiometric and temporal resolution, satellite sensors, detectors and</td>
<td>9</td>
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</tbody>
</table>
scanning technique, FOV and error sources, Image analysis and Interpretation weather RADAR, LIDAR, acoustic sounding systems, TRMM, AURA- MLS, MeghaTropiques Altimeter, Scatterometer, Radiometer

<table>
<thead>
<tr>
<th>9</th>
<th>Unit 9</th>
<th>7L</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ground based and radio osculation techniques, spectral response of water, Sea surface temperature, wind speed, colour monitor, Clouds and aerosol, water vapour, convective system, Trace gases.</td>
<td>7</td>
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</tbody>
</table>

Total Number Of Hours = 40

Faculty In-Charge

HOD, ECE Dept.

Assignment:

Assignment-1:

1. Derive satellite link design equation and explain different types of loss.
2. Derive the two body equation of motion of a satellite orbiting the earth.
3. What is system noise temperature of satellite receiver? Explain block wise.
4. Describe the process of placing a satellite into Geostationary orbit.
5. What is orbital perturbation? How does it affect communication? What are Geosynchronous and satellite Geostationary orbits?

Assignment-2:

1. Draw the simplest block diagram of a Ku band satellite and explain the function of each block.
2. What are the two segments for a communications satellite network? Explain with figure.
3. What is earth station azimuth angle to the satellite.
4. Write down and explain the three laws of Kepler governing the motion of the satellites.
5. Find out the power received in the receiving antenna from a satellite.
6. Discuss different methods to reduce the size of the receiving antennas.
7. Discuss satellite antenna patterns and coverage zone.
8. Discuss the advantage of using cassegrain antenna for large earth station antenna.

Assignment-3:

1. What is the difference between the geostationary and geosynchronous orbits?
2. With the help of a block diagram explain telemetry, tracking and command sub-system (TT & C) of a satellite.
3. Describe placement of satellite in geo-stationary orbit. The transmit power is 10 watts, and both the transmit and receive parabolic antennas have a diameter of 3 m. The antenna efficiency is 55% for both antennas. The satellite is in a GSO location, with a range of 35 900 km. The frequency of operation is 12 GHz. These are typical parameters for a moderate rate private network VSAT uplink terminal. Determine the received power, $P_r$, and the power flux density, $(pfd)_r$, for the link.
<table>
<thead>
<tr>
<th>Module Number</th>
<th>Topics</th>
<th>Number of Lectures</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Introduction to artificial neural networks:</td>
<td>5L</td>
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<tr>
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<td>1. Biological neural networks, Pattern analysis tasks: Classification, Regression, Clustering.</td>
<td>2</td>
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<td>2. Computational models of neurons.</td>
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<td>3. Structures of neural networks</td>
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<td>4. Learning principles</td>
<td>1</td>
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<tr>
<td>2</td>
<td>Linear models for regression and classification:</td>
<td>8L</td>
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<tr>
<td></td>
<td>1. Polynomial curve fitting, Bayesian curve fitting.</td>
<td>2</td>
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<td>2. Linear basis function models, Bias-variance decomposition.</td>
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<td></td>
<td>3. Bayesian linear regression, Least squares for classification.</td>
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<td>4. Logistic regression for classification, Bayesian logistic regression for classification.</td>
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<tr>
<td>3.</td>
<td>Feed forward neural networks:</td>
<td>8L</td>
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<td>1. Pattern classification using perceptron, Multilayer feed forward neural networks (MLFFNNs).</td>
<td>2</td>
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<td></td>
<td>2. Pattern classification and regression using MLFFNNs.</td>
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<td>3. Error back propagation learning.</td>
<td>1</td>
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<td>5. Bayesian neural networks.</td>
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<tr>
<td>4</td>
<td>Radial basis function networks:</td>
<td>5L</td>
</tr>
<tr>
<td></td>
<td>1. Regularization theory.</td>
<td>2</td>
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<tr>
<td></td>
<td>2. RBF networks for function approximation.</td>
<td>2</td>
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<tr>
<td></td>
<td>3. RBF networks for pattern classification.</td>
<td>1</td>
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<tr>
<td>5</td>
<td>Self-organizing maps:</td>
<td>4L</td>
</tr>
<tr>
<td></td>
<td>1. Pattern clustering, Topological mapping</td>
<td>2</td>
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<tr>
<td></td>
<td>2. Kohonen’s self-organizing map.</td>
<td>2</td>
</tr>
<tr>
<td>6</td>
<td>Feedback neural networks:</td>
<td>5L</td>
</tr>
<tr>
<td></td>
<td>1. Pattern storage and retrieval, Hopfield model</td>
<td>2</td>
</tr>
</tbody>
</table>
Faculty In-Charge: HOD, CSE Dept.

Assignment:

Module-1(Introduction):
1. Write Down short Notes: Classification & Regression.
2. Draw the structure of Neural networks & describe it.

Module-2(Linear models for regression and classification):
1. Notes: Bayesian linear regression & Bias-variance decomposition.
2. Prove that: \[ \text{MSE} = \text{Bias}^2 + \text{Var}. \]

Module-3(Feed forward neural networks):
1. Short Notes: Bayesian neural networks.
2. Describe the Error back propagation learning.
3. Write algorithm of back-propagation rule

Module-4(Radial basis function networks):

Module-5(Self-organizing maps):
1. Consider a Kohonen net with two cluster (outputs) units & five input units. The weight vectors for the output units are \( W_1=[1,0.8,0.6,0.4,0.2] \) and \( W_2=[1,0.5,1,0.5,1] \). Use the square of the Euclidean distance to find the winning neuron for the input pattern \( X=[0.5,1,0.5,0,0.5] \). Find the new weights for the winning unit. Assume learning rate as 0.2.

Module-6(Feedback neural networks):

Module-7(Kernel methods for pattern analysis):
1. Write down short note for SVM.
2. How its works in classification & regression?
<table>
<thead>
<tr>
<th>Module Number</th>
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</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td><strong>Unit 1: Digital Image Processing Systems:</strong> Introduction to structure of human eye, Image formation in the human eye, Brightness adaptation and discrimination, Image sensing and acquisition, storage, Processing, Communication, Display Image Sampling and quantization, Basic relationships between pixels.</td>
<td>4L</td>
</tr>
<tr>
<td>2</td>
<td><strong>Unit 2: Image Transforms(implementation):</strong> Introduction to Fourier transform, DFT and 2-D DFT, Properties of 2-D DFT, FFT, IFFT, Walsh transform, Hadamard transform, Discrete cosine transform, Slant transform, Optimum transform: Karhunen-Loeve (Hotelling) transform.</td>
<td>7L</td>
</tr>
<tr>
<td>3</td>
<td><strong>Unit 3: Image Enhancement in the Spatial and Frequency Domain:</strong> Gray level transformations, Histogram processing, Arithmetic and logic operations, Spatial filtering: Introduction, Smoothing and sharpening filters. Frequency domain filters: Homomorphic filtering.</td>
<td>6L</td>
</tr>
<tr>
<td>4</td>
<td><strong>Unit 4: Image Data Compression:</strong> Fundamentals, Redundancies: Coding, Interpixel Psycho-visual, Fidelity criteria, Image compression models, Error free compression, Lossy compression, Image compression standards: Binary image and Continuous Tone Still Image compression standards, Video compression standards.</td>
<td>6L</td>
</tr>
<tr>
<td>5</td>
<td><strong>Unit 5: Morphological Image Processing:</strong> Introduction, Dilation, Erosion, Opening, closing, Hit-or-miss transformation, Morphological algorithm operations on binary Images, Morphological algorithm operations on gray-scale Images.</td>
<td>6L</td>
</tr>
<tr>
<td>6</td>
<td><strong>Unit 6: Image Segmentation, Representation and Description</strong> Detection of discontinuities, Edge linking and Boundary detection, Thresholding, Region based segmentation, Image Representation schemes, Boundary descriptors, and Regional descriptors.</td>
<td>7L</td>
</tr>
</tbody>
</table>

**Total Number Of Hours = 36**
Assignment:

Assignment-1:

1. Obtain the images “lena.bin” and “peppers.bin” from the web. Each image has 256 × 256 pixels and each pixel has 8 bits.
   (a) Read and display the images.
   (b) Define a new 256 × 256 image J as follows: the left half of J, e.g., the first 128 columns, should be equal to the left half of the Lena image. The right half of J, e.g., the 129th column through the 256th column, should be equal to the right half of the Peppers image.
   (c) Define a new 256 × 256 image K by swapping the left and right halves of J.
   (d) Be sure to turn in: A listing of your code and printouts of the original images, image J, and image K.

Assignment-2:

1. Obtain the images Suzi1.bin and ctscan.bin from the web. Each image has 256 × 256 pixels and each pixel has 8 bits. In this assignment you will perform object extraction (target extraction) by using simple thresholding, followed by connected components labelling (blob colouring) with minor region removal. This is a special case of two classical image processing problems known as image segmentation and classification. Throughout the assignment, including the printing of your results, use a value of 255 (Hex 0xFF) for LOGIC ONE and a value of zero (Hex 0x00) for LOGIC ZERO.
   Objectives:
   1. Suzi1: the first objective is to produce a binary image J that is LOGIC ONE at pixels contained in the “girl” object of the original image and that is LOGIC ZERO at pixels contained in the background of the original image. The second objective is to produce a grayscale image K of the segmented “girl” object. At pixels where J is LOGIC ONE, K should be equal to the original Suzi1 image. At pixels where J is LOGIC ZERO, K should be 255.
   2. ct scan: the first objective is to produce a binary image J that is LOGIC ONE at pixels contained in the “torso section” object of the original image and that is LOGIC ZERO at pixels contained in the background of the original image. The second objective is to produce a grayscale image K of the segmented “torso section” object. This should be done exactly the same way it was for the Suzi1 image.
   For each image, use the following procedure:
   A) Study the image and select an appropriate threshold that will discriminate between the desired object and the background.
   B) Form a binary image J by applying the threshold so that pixels likely to be part of the desired object are assigned the value LOGIC ONE, while those likely to be part of the background are assigned the value LOGIC ZERO.
   Hint: for the Suzi1 image, this means that J(i, j) should be LOGIC ONE if the corresponding input pixel is below threshold. For the ct scan image the opposite is true: you should set J(i, j) = LOGIC ONE if the corresponding input pixel is above threshold.
C) Apply connected components labeling with minor region removal to refine the segmentation in J.
D) Construct the segmented object grayscale image K.

Assignment-3:

1. Obtain the image “Mammogram.bin” from the course web site. This image has 256× 256 pixels. Each pixel has 8 bits. Note: the server is Unix; the filename is case-sensitive. Do not make the mistake of getting the incorrect 512 × 512 file “mammogram.bin.”
   (a) There are two main regions in the input image: the imaged tissue and the dark background region on the left side of the image. Write a program to convert this grayscale image into a binary image by simple thresholding. In the binary image, use a value of 255 = 0xff for logical one and a value of 0 = 0x00 for logical zero. Select the threshold so that the binary image is equal to logical zero over the background region and logical one over the tissue.
   (b) Write a program to implement the Approximate Contour Image Generation algorithm given on page 2.104 of the notes. Your program should input the binary image and output a binary contour image. Run your program to generate an approximate contour image from the binary image you obtained by thresholding Mammogram.bin.
   (c) Could a chain code be used to represent the main contour in your contour image? Why or why not?

2. Obtain the image “lady.256” from the course web site. This is a 256 × 256 grayscale image with 8-bit pixels. Plot a histogram for the image. Write a program to perform full-scale contrast stretch on the image and plot a histogram for the result.

3. Obtain the image “actontBin.bin” from the course web site. This image has 256 × 256 pixels with 8 bits each. It is a true binary image; the pixel value 255 represents logical one and the pixel value 0 represents logical zero. Write a program to find instances of the letter “T” in the image using the Binary Template Matching algorithm given on pages 2.92 - 2.97 of the notes. You will have to design the template yourself based on an analysis of the image. Apply the match measure M2 at every pixel in the input image where a sufficiently large neighbourhood exists. Construct an output image J1 where each pixel is equal to the match measure M2 (set J1 equal to zero at pixels where a sufficiently large neighbourhood does not exist in the input image). Threshold the image J1 to obtain a binary image J2 that should be equal to logical one at pixels where there is a high probability that the letter “T” is present in the input image.

4. Obtain the image “johnny.bin” from the course web site. This image has 256 × 256 pixels. Each pixel has 8 bits. Plot the histogram of the original image. Write a program to perform histogram equalization on this image. Show the equalized image and plot its histogram.
<table>
<thead>
<tr>
<th>Module Number</th>
<th>Topics</th>
<th>Number of Lectures</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Chapter 1: Introduction to Energy sources:</td>
<td>2L</td>
</tr>
<tr>
<td></td>
<td>1. Renewable and non-renewable energy sources, energy consumption as a measure of Nation’s development; strategy for meeting the future energy requirements.</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>2. Global and National scenarios, Prospects of renewable energy sources. Impact of renewable energy generation on environment, Kyoto Protocol.</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td><strong>Chapter 2: Solar Energy:</strong></td>
<td>5L</td>
</tr>
<tr>
<td></td>
<td>1. Solar radiation -beam and diffuse radiation, solar constant, earth sun angles, attenuation and measurement of solar radiation, local solar time, derived solar angles, sunrise, sunset and day length.</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>2. Flat plate collectors, concentrating collectors, Solar air heaters types, solar driers, storage of solar energy-thermal storage, solar pond, solar water heaters of PV Cells, Mono-poly Crystalline and amorphous Silicon solar cells.</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>3. Design of PV array. Efficiency and cost of PV systems &amp; its applications. PV hybrid systems.</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td><strong>Chapter 3: Wind Energy:</strong></td>
<td>6L</td>
</tr>
<tr>
<td></td>
<td>1. Principle of wind energy conversion; Basic components of wind energy conversion systems;</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>2. Wind mill components, various types and their constructional features</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>3. Design considerations of horizontal and vertical axis wind machines: analysis of aerodynamic or cesacting on wind mill blades and estimation of power output; wind data and site selection considerations</td>
<td>3</td>
</tr>
<tr>
<td>2</td>
<td><strong>Chapter 4: Energy from Biomass:</strong></td>
<td>4L</td>
</tr>
<tr>
<td></td>
<td>1. Biomass conversion technologies, Biogas generation plants, classification, advantages and disadvantages.</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>2. Constructional details, site selection, digester design consideration, filling a digester for starting, maintaining biogas production</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>3. Fuel properties of bio gas, utilization of biogas</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td><strong>Chapter 5: Geothermal Energy:</strong></td>
<td>4L</td>
</tr>
<tr>
<td></td>
<td>1. Introduction, Basic definitions.</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>2. Estimation and nature of geothermal energy, geothermal sources and resources like hydrothermal, geo-pressured hot dry rock, magma.</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>3. Advantages, disadvantages and application of geothermal energy, prospects of geothermal energy in India.</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td><strong>Chapter 6: Energy from Ocean:</strong></td>
<td>6L</td>
</tr>
<tr>
<td></td>
<td>1. Ocean Thermal Electric Conversion (OTEC) systems like open cycle, closed cycle, Hybrid cycle, prospects of OTEC in India.</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>2. Energy from tides, basic principle of tidal power, single basin and double basin tidal power plants, advantages, limitation and scope of tidal energy</td>
<td>2</td>
</tr>
</tbody>
</table>
Assignment:

Module-1
1. Mention the different forms of energy.
2. What is Kyoto protocol and what are its implications for developed and developing countries.
3. Explain the different characteristics of PV system.
4. With a neat diagram, explain how wind energy can be converted into electrical energy.

Module-2
1. What is the prospect of geothermal energy?
2. What principles guide in the location of a geothermal power station?
3. Write a short note on Biodiesel

Module-3:
1. Write short notes on:
   (a) Magneto hydrodynamic energy (b) Wave energy
2. Discuss the advantages and limitations of tidal energy.

Module-4:
1. What is fuel cell? Discuss different types of fuel cell. What are the advantages of fuel cell energy?
   Discuss on alkaline fuel cell and hydrogen fuel cell.
2. Discuss the various methods of hydrogen production.
Title of Course: Digital Image Processing
Course Code: EC892B
L-T-P scheme: 0-0-3 Course Credit: 2

Objectives:
Introduces practice of digital image processing. Topics presented include, two-dimensional signal processing theory, image acquisition, representation, elementary operations, enhancement, filtering, coding, compressing, restoration, and analysis, as well as image processing hardware. The students will learn about state-of-the-art techniques in the lecture, and experiment with selected methods during the lab sessions. The computer lab session is an essential part of this course as it is supposed to lower the barrier and the reservations that some students might have towards using computer-based biomedical imaging technology for their own work.

Learning Outcomes:
Students who complete this course will be able to:
1. Describe different modalities and current techniques in image acquisition
2. Describe how digital images are represented and stored efficiently depending on the desired quality, color depth, dynamics (time-varying data)
3. Use the mathematical principles of digital image enhancement (contrast, gradients, noise)
4. Describe and apply the concepts of feature detection and contour finding algorithms.
5. Analyze the constraints in image processing when dealing with larger data sets (efficient storage and compression schemes)
6. Apply the knowledge primarily obtained by studying examples and cases in the field of biomedical imaging to other engineering disciplines

Course Contents:
Exercises that must be done in this course are listed below:

Exercise No.1: Histogram display and histogram equalization
Exercise No.2: Kernel processing on images leading to image enhancement
Exercise No.3: Display of 2D filters frequency responses and processing the images using these
Exercise No.4: Implementation of Arithmetic Coding for images
Exercise No.5: Basic JPEG algorithm implementation
Exercise No.6: DPCM encoding and decoding of images
Exercise No.7: Simple image watermarking algorithms using LSB substitution
Exercise No.8: Simple content based image retrieval using various distance metrics
Exercise No.9: Image segmentation algorithms using Snakes
Exercise No.10: Color images manipulations, reading and writing of color images

Text Book:
2. AnilK.Jain:-DigitalImageProcessing (Prentice-Hall,India)

Recommended Systems/Software Requirements:
1. Intel based desktop PC with at least 2GB RAM and 15 GB free disk space.
2. Matlab/Scilab in Windows XP or Linux Operating System.
Experiment: 1

Histogram display and histogram equalization
Scilab code Solution
1 // Program 1 Histogram display and histogram equalization
2 // Software version
3 // OS Windows7
4 // Scilab 5.4.1
5 // Image Processing Design Toolbox 8.3.1-1
6 // Scilab Image and Video Processing toolbox 0.5.3.1-2
7 clc;
8 clear;
9 close;
10 // a=imread('C: n Users n sen thilkumar n Desktop n Chandra Mohan LAB n Digital Image Processing Lab n tire. tif'); // Image Path
11 a=imread('C:n Users n sen thilkumar n Desktop n Chandra Mohan LAB n Digital Image Processing Lab n tire.jpeg');
12 [m n]=size(a);
13 for i=1:256
14 b(i)= length(find(a==(i-1)));
15 end
16 pbb =b/(m*n);
17 pb (1) = pbb (1) ;
18 for i=2:256
19 pb(i)=pb(i-1)+pbb(i);
20 end
21
22 s=pb*255;
23 sb= uint8( round(s));
24 index =0;
25 for i=1: m
26 for j=1: n
27 index = double( a(i,j)) +1; // convert it to double
28 otherwise index = 255+1 =0
29 hea (i,j)= sb( index ); // histogram equalization
30 end
31 end
32 figure ,
33 ShowImage(a,' Original Image ' )//IPD toolbox
34 title (' Original Image ' )
35 figure
36 plot2d3 (' gnn ',[1:256] , b)
37 title (' Histogram of the Image ' )
38 figure
39 ShowImage(hea,' Image after Histogram equalization ' )//IPD toolbox
40 title (' Image after Histogram equalization ' )

Figure 1.1: Exp1
Figure 1.2: Exp1
Experiment: 2

Kernel processing on images leading to image enhancement
Scilab code Solution
1 // Program 2. Kernel processing on images leading to image enhancement.
2 // Software version
3 // OS Windows7
4 // Scilab 5.4.1
5 // Image Processing Design Toolbox 8.3.1 − 1
6 // Scilab Image and Video Processing toolbox
0.5 .3 .1 − 2
7clc
8 clear
9 close
10 a = imread(’C:n Users nsenthilkumarn Desktop n Chandra Mohan LABn Digital Image Processing Lab n ct noise .jpeg’); // SIVP toolbox
11 ks = input(’enter the size of the kernel 1 for 11 3 for 33 ... ’); // Kernel size 3x3
12 [m n] = size(a);
13
14 a1 = zeros (m+ks-1,n+ks-1);
15 [m1 n1] = size(a1);
16 x = floor(ks /2);
17 a1 (1+ x:m1-x,1+ x:n1-x)=a;
18 b=[];
19 c=[];
20
21 for i =1+ x:m1-x
22 for j =1+ x:n1-x
23 t=a1(i-x:i+x,j-x:j+x);
24 men = sum(sum(t))/(ks*ks);
25 med = median(t (:));
26 b(i-x,j-x)= men ;
27 c(i-x,j-x)= med ;
28 end
29 end
30
31 figure
32 ShowImage (a, ’Noised image (before enhancement) ’ ); // IPD toolbox
33 title (’Noised image (before enhancement) ’ );
34 figure
35 ShowImage(uint8(b), ’enhancement with mean filtering’
 ) ); // IPD toolbox
36 title (’enhancement with mean filtering’ );
37 figure
38 ShowImage(uint8(c), ’enhancement with median filtering’
 );// IPD toolbox
39 title (’enhancement with median filtering’ );
40 //RESULT
41 // enter the size of the kernel for 113 for 33 ...
... 3
Experiment: 3

Display of 2D filters frequency responses and processing the images using these filters

Scilab code Solution

1 // Program 3 : Display of 2D filters frequency responses and processing the images using these filters
3 // Note: The in-built Scilab functions fft2d and ifft2d are not working properly
4 // It gives wrong results.
5 // Use My functions for 2D-FFT and 2D-IFFT.
6 // Software version
7 127 // OS Windows7
8 // Scilab 5.4.1
9 // Image Processing Design Toolbox 8.3.1–1
10 // Scilab Image and Video Processing toolbox 0.5.3–1
11 clc;
12 close;
13 clear;
14 exec('C:n Users senthil kumar Desktop n Chandra Mohan LABn Digital Image Processing Labn fft2d.sce')
15 exec('C:n Users senthil kumar Desktop n Chandra Mohan LABn Digital Image Processing Labn ifft2d.sce')
16 im1 = imread('C:n Users senthil kumar Desktop n Digital Image Processing Labn balloonsnoisy.png'); // colour noise image
17 im = rgb2gray (im1); // gray noise image
18 fc = 100; // cutoff frequency - more features choose high cutoff frequency
19 n = 1; // filter order = 1
20 [co , ro ] = size (im);
21 cx = round (co /2); // centre of the image
22 cy = round (ro /2);
23 IM = fft2d (double (im));
24 imf = fftshift (IM);
25 H = zeros (co ,ro);
26 for i = 1: co
27 for j = 1: ro
28 d = (i-cx).^2+(j-cy).^2;
29 H(i,j) = 1/(1+((d/fc/fc).^(2* n)))); // Low Pass Butterworth First Order filter
30 end
31 end
32 out_im = imf.*H;
33 out = abs ( ifft2d (out_im ));
34 out = uint8 (out);
35 figure
36 ShowColorImage (im1 , ' Colour Noisy Image ')
37 figure
38 ShowImage (im , ' Gray Noise Image ')
39 figure
40 ShowImage (out , ' Output Image ')
41 figure
42 ShowColorImage (out , ' Processed Color Image ')
43 close all
Experiment: 4

Implementation of Arithmetic Coding for images
Scilab code Solution
1 // Program 4. Implementation of arithmetic coding for images
2 // Note 1: In order to run this program download
3 // Scilab atoms
4 // Note 2: The Huffman atom is used to encode images of small size only
5 // Software version
6 //OS Windows 7
7 // Scilab 5.4.1
8 //Image Processing Design Toolbox 8.3.1
9 //Scilab Image and Video Processing toolbox 0.5.3.1
10 clear;
11 clc;
12 close;
13 //A=test matrix('frk',10)+1;
14 a = imread('C:\n Users n senthil Kumar n Desktop n Chandra Mohan LABn Digital Image Processing Lab n cameraman.jpg');
15 A = imresize(a,[16 16]); // Only Image of small size is possible to call huffcode
16 B = size (A);
17 A=A(:,:);
18 A = double (A);
19 [QT,QM]= huffcode (A); // Huffman Encoding
20 disp (' compressed Bit sequence: ');
21 disp (QT);
22 disp ( ' Code Table: ');
23 disp (QM);
24 //Now, the reverse operation
25 C = huffdeco (QT,QM); // Huffman Decoding
26 for i =1: B (1)
27 E(i,:1:B (2)) = C((i-1)*B (2)+1:i*B (2));
28 end
29 D = E ';
30 E = imresize (D,[32 ,32] );
31 figure
32 ShowImage (a, ' Original cameraman Image 256x256 ')
33 figure
34 ShowImage (E, ' Reconstructed cameraman Image 256x256 ');

Experiment: 5

Basic JPEG algorithm implementation
Scilab code Solution
1 // Program 5. Basic JPEG algorithm implementation
2 // Software version
3 // OS Windows7
4 // Scilab 5.4.1
5 // Image Processing Design Toolbox 8.3.1-1
6 // Scilab Image and Video Processing toolbox 0.5.3.1-2
7 close
8 clear;
9 clc;
10 exec ('C:
8 users
senthil kumar
Desktop
Chandra Mohan LAB
Digital Image Processing Lab
zigzag5.sci')
11 exec ('C:
users
senthil kumar
Desktop
Chandra Mohan LAB
Digital Image Processing Lab
izigzag5.sci')
12 I = imread ('C:
users
senthil kumar
Desktop
Chandra Mohan LAB
Digital Image Processing Lab
 cameraman.jpg'); // 256 x256 image
13 I = imresize (I,0.25); // reduced to 64 x64 image [in order to reduce the computation time]
14 [m,n]= size (I); // Finding the dimensions of the image file.
15 I= double (I);
16 q= [16 11 10 16 24 40 51 61;
 17 12 12 14 19 26 58 60 55;
 18 14 13 16 24 40 57 69 56;
 19 14 17 22 29 51 87 80 62;
 20 18 22 37 56 68 109 103 77;
 21 24 35 55 64 81 104 113 92;
 22 49 64 78 87 103 121 120 101;
 23 72 92 95 98 112 100 103 99];
24 N =8; // Block size for which DCT is Computed.
25 M =8;
26 I_Transform .block = zeros (N,M); // Initializing the DCT Coefficients Structure Matrix "ITransform" with the required dimensions.
27 for a =1: m/N
28 for b =1: n/M
29 for k =1: N
30 for l =1: M
31 Mean_Sum =0;
32 // 2D-Discrete Cosine Transform///////////
33 for i =1: N
34 for j =1: M
35 Mean_Sum = Mean_Sum + double (I (N*(a-1) +i,M*(b-1) +j)) * cos ( %pi *(k-1) *(2*i-1) / (2* N)) * cos ( %pi *(l-1) *(2*j-1) / (2* M));
36 end
37 end
38 // /////////
39 if k ==1
Mean_Sum = Mean_Sum * sqrt (2/ N);
if l ==1 
  Mean_Sum = Mean_Sum * sqrt (1/ M);
else
  Mean_Sum = Mean_Sum * sqrt (2/ M);
end
I_Trsfrm (a,b). block (k,l)= Mean_Sum ;
end

// Normalizing the DCT Matrix and Quantizing the resulting values.
I_Trsfrm (a,b). block = round ( I_Trsfrm (a,b). block ./q);
end

I_zigzag .block = zeros (N,M);
for a= 1:m/N 
  for b = 1:n/M 
    I_zigzag (a,b). block = zigzag_5 ( I_Trsfrm (a,b). block );
  end
end

I_rec_Trnsfm .block = zeros (N,M);
for a= 1:m/N 
  for b = 1:n/M 
    I_rec_Trnsfm (a,b). block = izigzag_5 ( I_zigzag (a,b). block );
  end
end

// Denormalizing the reconstructed Transform matrix using the same normalization matrix.
for a =1: m/N 
  for b =1: n/M 
    I_rec_Trnsfm (a,b). block =( I_rec_Trnsfm (a,b). block ).*q;
  end
end

// Inverse 2D-DCT
for a =1: m/N 
  for b =1: n/M 
    for i =1: N 
      for j =1: M 
        Mean_Sum =0;
        for k =1: N 
          for l =1: M 
            if k ==1 
              temp = double ( sqrt (1/2) * I_rec_Trnsfm (a,b). block (k,l))* cos( %pi *(k -1) *(2*i -1) /(2* N))* cos
                ( %pi *(l-1) *(2*j -1) /2* M));
            else
              temp = double ( I_rec_Trnsfm (a,b). block (k,l))* cos( %pi *(k -1) *(2*i -1) 2* N))* cos
                ( %pi *(l-1) *(2*j -1) /2* M));
            end
          end
        end
      end
    end
  end
end
\[ \text{block} \left( k, l \right) \times \cos \left( \pi \left( k - 1 \right) \left( 2i - 1 \right) \left( 2^* N \right) \right) \times \cos \left( \pi \left( l - 1 \right) \left( 2j - 1 \right) \left( 2^* M \right) \right); \]

87 \text{ end}
88 \text{ if } l == 1
89 \text{ temp = temp } \times \sqrt{1/2};
90 \text{ end}
91 \text{ Mean_Sum = Mean_Sum + temp;}
92 \text{ end}
93 \text{ end}
94 \text{ Mean_Sum = Mean_Sum } \times \left( 2/ \sqrt{M} \times N \right);
\]

195 \text{i_rec } \left( (a - 1) \times N + i , (b - 1) \times M + j \right) = \text{Mean_Sum ;}
96 \text{ end}
97 \text{ end}
98 \text{ end}
99 \text{ end}

100 // D i s p l a y i n g t h e R e c o n s t r u c t e d I m a g e .
101 \text{diff_image = im2double } \left( I \right) * 255 - \text{i_rec ;}
102 \text{diff_image = diff_image } / \max \left( \max (\text{diff_image}) \right);
103 \text{diff_image = im2uint8 } \left( \text{diff_image } \right);
104 \text{i_rec = i_rec } / \max \left( \text{i_rec } \right);
105 \text{i_rec = im2uint8 } \left( \text{i_rec } \right);
106 \text{figure}
107 \text{ShowImage } \left( \text{i_rec }, ' \text{Recovered Image}' \right);
108 \text{figure}
109 \text{ShowImage } \left( \text{diff_image }, ' \text{Difference Image}' \right)
110 \text{figure}
111 \text{imhist( i_rec );}
112 \text{figure}
113 \text{imhist( diff );}

Experiment: 6

DPCM encoding and decoding of images
Scilab code Solution
1 // Program 6 DPCM encoding and decoding of images
2 // S o f t w a r e version
3 // O S W i ndows7
4 // Scilab 5.4.1
5 // Image Processing Design Toolbox 8.3.1 –1
6 // Scilab Image and Video Processing toolbox
7clc
8 clear
9 // Function to find number of elements in an image
10 function [N] = numel(X)
11 //X - input image
12 // N - number of elements in image X
13 [m,n]= size(X);
14 N = m*n;
15 endfunction
16 //
217 // Function to calculate peak signal to noise ratio
20 //X - original Image
21 //Xapp - reconstructed image
22 //psnr - peak signal to noise ratio
23 //mse - mean square error
24 //maxerr - maximum error
25 X = double (X);
26 Xapp = double (Xapp);
27 absD = abs(X - Xapp);
28 A = absD.^2;
29 mse = sum(A(:))/numel(X);
30 psnr = 10* log10 (255*255/mse);
31 maxerr = round(max(absD(:))); 
32 end

33 //
34 //
35 a= imread('C:\Users\senthil\Desktop\Chandra Mohan LAB\Digital Image Processing Lab\cameraman.jpg');
36 a= double(a);
37 [m n]= size(a);
38 pre = 0;
39 q = input('enter the quantization value');
40 for i =1: m
41 for j =1: n
42 t1 = a(i,j)-pre;
43 tq = round(t1/q);
44 pre = pre + tq*q;
45 b(i,j) = tq;
46 end
47 end
48 repre = 0;
49 for i =1: m
50 for j =1: n
51 ret = b(i,j);
52 inq = ret*q;
53 c(i,j) = repre;
54 end
55 end
56 figure
57 ShowImage(a, 'Image Before Quantization');
58 figure
59 ShowImage(b, 'Quantized Image');
60 figure
61 ShowImage(c, 'Reconstructed Image From Quantized Image');
62 psnr = psnr_mse_maxerr(a,c);
63 disp(psnr, 'PSNR in dB =');
64 //RESULT
65 //enter the quantization value 2
66 //PSNR in dB = 51.165559
67 //enter the quantization value 8
68 //PSNR in dB = 40.698164
69 //
Experiment: 7

Simple image watermarking algorithms using LSB substitution
SciLab code Solution

1 // Program 7. Simple image watermarking algorithms using LSB substitution
2 // Note 1: The imread function in SIVP toolbox read the binary image as gray
3 // scale image. During bit set it will create problems.
4 // The grayscale image can be converted into a binary image using the function
5 // gray2bin()
6 // Note 2: The functions bit set and bit get are written in order to save the
7 // SciLab workspace memory during execution
8 // Software version
9 // OS Windows 7
10 // SciLab 5.4.1
11 // Image Processing Design Toolbox 8.3.1 - 1
12 // SciLab Image and Video Processing toolbox
270.5.3.1-2
13 clc
14 clear
15 close
16 // Function to find number of elements in an image
17 function [N] = numel (X)
18 // X - input image
19 // N - number of elements in image X
20 [m,n]= size (X);
21 N = m*n;
22 endfunction
23 // Function to calculate peak signal to noise ratio
24 function [psnr ,mse , maxerr ] = psnr_mse_maxerr (X, Xapp )
25 // PSNR MSE MAXERR Peak signal to noise ratio
26 // X - original image
27 // Xapp - reconstructed image
28 // psnr - peak signal to noise ratio
29 // mse - mean square error
30 // maxerr - maximum error
31 X = double (X);
32 Xapp = double (Xapp);
33 absD = abs(X- Xapp);
34 A = absD .^2;
35 mse = sum (A (:)) / numel (X);
36 psnr = 10* log10 (255*255/mse);
37 maxerr = round ( max ( absD (:)));
38 endfunction
39 //
40 function [A] = gray2bin (B)
41 [m,n] = size (B)
42 for i = 1:m
43 for j = 1:n
44 if(B(i,j) >200)
45 A(i,j)= 1;
46 else
47 A(i,j) =0;
48 end
function [c]=bit_set (c,b)
[m,n] = size (c);
for i =1: m
for j =1: n
   c(i,j)= bitset (c(i,j) ,1,b(i,j));
end
end
endfunction

function [d] = bit_get (c)
[m,n] = size (c);
for i =1: m
for j =1: n
   d(i,j)= bitget (c(i,j) ,1);
end
end
endfunction

a = imread( 'C:\nUsers\senthil\kumar\Desktop\Chandra Mohan LAB\Digital Image Processing Lab\camera\cameraman.jpg' ); // original image
b = imread( 'C:\nUsers\senthil\kumar\Desktop\Chandra Mohan LAB\Digital Image Processing Lab\watermark\wat.jpg' ); // watermark image

[m n] = size (a);
a = double (a);
c = a;
c = bit_set (c,b);
d = bit_get (c);

figure
ShowImage (a, 'Original image');
title ('Original image');
figure
ShowImage (b, 'watermark image');
title ('watermark image');
figure
ShowImage ( uint8 (c), 'watermarked image' );
title ('watermarked image');
figure
ShowImage (d, 'extracted watermark' );
title ('extracted watermark');

psnr = psnr_mse_maxerr (a,c);
correlation = corr2 (b,d);
Experiment: 8

Simple content based imageretrieval using various distancemetrics
Scilab code Solution
1 // Program 8: Simple content based imageretrieval using various distancemetrics.
2 // Based on Similarity matrix
3 // Using Colormaps of different images
4 // Note 1: Other methods like wavelet based
decomposition along with Euclidean distance
5 // comparison of sub images can be used for image
retrieval
6 // Note 2: Principal Component Analysis (PCA) inbuilt function is available to
7 // get eigenvectors and eigenvalues for image retrieval
8 // Software version
9 // OS Windows7
10 // Scilab 5.4.1
11 // Image Processing Design Toolbox 8.3.1 ~1
12 // Scilab Image and Video Processing toolbox
320.5.3.1 ~2
13 clear;
14 clc;
15 close;
16 I1 = imread('C:n Users senthilkumar n Desktop Chandra Mohan LAB Digital Image Processing Lab n Picture1.png'); // 257 x257 x3.
17 I1 = imresize (I1,0.5);
18 [IndexedImage_I1, ColorMap] = RGB2Ind(I1); //IPD toolbox
19 I = ColorMap; // 66049 x3
20 J1 = imread('C:n Users senthilkumar n Desktop Chandra Mohan LAB Digital Image Processing Lab n Picture2.png'); // 257 x257 x3.
21 J1 = imresize (J1,0.5);
22 [IndexedImage_J1, ColorMap] = RGB2Ind(J1); //IPD toolbox
23 J = ColorMap; // 66049 x3
24 // Similarity Matrix Method
25 [r,c]= size (I);
26 A = [];
27 I = double (I);
28 J = double (J);
29 for i = 1:r
30 for j = 1:c
31 M1(i,j) = (I(i,2) * sin (I(i,1) ) - J(j,2) * sin (J(j,1))) ^2;
32 M2(i,j) = (I(i,2) * cos (I(i,1) ) - J(j,2) * cos (J(j,1))) ^2;
33 M3(i,j) = (I(i,3) - J(i,3) ) ^2;
34 M(i,j) = sqrt (M1(i,j)+M2(i,j)+M3(i,j));
35 A(i,j) = 1 - M(i,j)/ sqrt (5) ;
36 end
37 end
38 I1_rec = Ind2RGB (IndexedImage_I1, A)
39 I1_rec = imresize(I1_rec,2);
40 J1_rec = Ind2RGB (IndexedImage_J1, A)
41 J1_rec = imresize( J1_rec ,2 ) ;
Experiment: 9

Image segmentation algorithms using Snakes
Scilab code Solution
2 // Note: Incomplete.
3 // So many functions are not available in Scilab
4 // Image segmentation algorithms using snakes is impossible with current
5 // version of Scilab and Scilab image processing atoms.
6 // I tried my best
7 // Software version
8 // OS Windows7
9 // Scilab 5.4.1
10 // Image Processing Design Toolbox 8.3.1 –1
11 // Scilab Image and Video Processing toolbox
0.5.3.1 –2
12 close ;
13 clear ;
14 clc ;
15 J = imread('C:
Users
senthil
kumar
Desktop
35Chandra
Mohan
LAB
Digital
Image
Processing
Lab
binary
image.jpg');
16 J = rgb2gray (J);
17 J = imresize (J ,[256 ,256]) ;
18 J = double (J);
19 [h,w] = size (J);
20 for i = 1:h
21 for j= 1:w
22 if(J(i,j) >200)
23 J(i,j) =1;
24 else
25 J(i,j) =0;
26 end
27 end
28 end
29 I = imfilter (J, fspecial('gaussian',[17 17],3));
30 figure
31 ShowImage (I, 'Snakes')
32 N =500; // number of snake points
33 alpha =1;
34 tstep =1;
35 N_iter =500;
36 f =50;
37 global EDGE_SOBEL ;
38 gradient = EdgeFilter (I, EDGE_SOBEL );
39 [m,n] = size ( gradient );
40 Ix = gradient (: ,:);
41 Iy = gradient (: ,:');
42 S = f*( Ix .* Ix + Iy .* Iy);
43 gradient = EdgeFilter (S, EDGE_SOBEL );
44 Sx = gradient (: ,:);
45 Sy = gradient (: ,:');
Smag = sqrt (Sx .^2 + Sy .^2) + eps ;
Sx (: ) = Sx ./Smag ;
Sy (: ) = Sy ./Smag ;
D = [ - tstep * alpha * ones (N ,1) (1+2* tstep * alpha )* ones (N ,1) -tstep * alpha * ones (N ,1) ];
D(2 ,3) = D(2 ,3) - tstep * alpha ;
D(-1 ,1) = D(-1 ,1) - tstep * alpha ;
theta = linspace (0 ,2* %pi ,N);
theta = theta (:);
x = w/2 + 10 + (h /3) * cos( theta );
y = h/2 - 10 + (h /4) * sin( theta );
plot (x,y, ' r ' );

Experiment: 10

Color images manipulations, reading and writing of color images
Scilab code Solution
1 // Program 1 0 . Color images manipulations, reading and writing of color images
2 // Software version
3 // OS Windows 7
4 // Scilab 5.4.1
5 // Image Processing Design Toolbox 8.3.1 -1
6 // Scilab Image and Video Processing toolbox 0.5.3.1 -2
7 clc
8 clear
9 close
10 // Showing RGB components of a color RGB image.
11 // Splitting the color image (RGB Image) into three planes
12 a = imread( 'C:n Users n senthil kumar n Desktop n Chandra Mohan LABn DIP Scilab Programs n peppers . png' ); // this image is 348 x512 x3 size
3813 figure
14 ar=a(: ,: ,1);
15 ShowImage (ar , 'RED Matrix ' )
16 figure
17 ag=a(: ,: ,2);
18 ShowImage (ag , 'GREEN Matrix ' )
19 figure
20 ab=a(: ,: ,3);
21 ShowImage (ab , 'BLUE Matrix ' )
22 // Reconstruction of original color image from three RGB planes
23 24 RGB = imread( 'C:n Users n senthil kumar n Desktop n Chandra Mohan LABn DIP Scilab Programs n peppers . png' ); // SIVP toolbox
25 RGB_128 = RGB /2;
26 RGB_128 = round ( RGB_128 )
27 [X, map ] = RGB2Ind ( RGB_128 );
28 figure
29 ShowImage (X, 'Indexed Image' ,map )
30 // Limiting no of colours to 8 without dithering
31 figure
34 \[X_1, \text{map1}\] = RGB2Ind (RGB);
35 ShowImage (X1, ’Without Dither’, map1)
36
37 figure
38 ShowColorImage (RGB, ’RGB Color Image’)
39 YIQ = rgb2ntsc (RGB);
40 figure
41 ShowColorImage (YIQ, ’NTSC image YIQ’)
42 RGB = ntsc2rgb (YIQ);
43 YCC = rgb2ycbcr (RGB);
44 figure
45 ShowColorImage (YCC, ’equivalent HSV image YCbCr’)
46 RGB = ycbcr2rgb (YCC);
47 HSV = rgb2hsv (RGB);
48 figure
49 ShowColorImage (HSV, ’equivalent HSV image’)
50 RGB = hsv2rgb (HSV)
Title of Course: Grand Viva  
Course Code: EC881  
L-T-P Scheme: 0P  
Course Credits: 4

Aims and Objectives
1. To compare the traditional viva examination (TVE) with OSVE (Objective Structured Viva Examination).
2. To obtain the students’ opinion regarding OSVE as an assessment tool.
3. A suggestion to include OSVE as a part of university examination.

Materials and Methods
The study was carried out in November 2012, at K.J. Somaiya Medical College, in the department of Anatomy. 50 students were exposed to different stations of viva as well as OSVE. A comparison was made of the student’s performance and a feedback was taken from the students regarding the same.

As the OSVE was being conducted for the first time, the students were notified in advance regarding the plan for conducting the part ending practical assessment – by both the TVE and OSVE. The OSVE was planned for 20 marks, viva voce of 20 marks.

Purpose and Format of the Viva Voce Examination

Literally, "viva voce" means by or with the living voice - i.e., by word of mouth as opposed to writing. So the viva examination is where you will give a verbal defence of your thesis.

Put simply, you should think of it as a verbal counterpart to your written thesis. Your thesis demonstrates your skill at presenting your research in writing. In the viva examination, you will demonstrate your ability to participate in academic discussion with research colleagues.

Purpose of the Exam

The purpose of the viva examination is to:

- demonstrate that the thesis is your own work
- confirm that you understand what you have written and can defend it verbally
- investigate your awareness of where your original work sits in relation to the wider research field
Course Description

- establish whether the thesis is of sufficiently high standard to merit the award of the degree for which it is submitted

- allow you to clarify and develop the written thesis in response to the examiners' questions

The Examiners and Exam Chair

You will normally have two examiners:

- an internal examiner who will be a member of academic staff of the University, usually from your School/Department but not one of your supervisors

- an external examiner who will normally be a member of academic staff of another institution or occasionally a professional in another field with expertise in your area of research (candidates who are also members of University staff will normally have two external examiners in place of an internal and an external examiner)

Your supervisor should let you know who your examiners will be as it is important that you ensure you are familiar with their work and any particular approach that they may take when examining your thesis.

In some cases there may also be a Chair person for the examination. A Chair is appointed if the Graduate Dean or either of the examiners feels this is appropriate, for example where the examining team has relatively little experience of examining UK research degrees. The Chair is there to ensure the examination is conducted in line with University regulations and is not there to examine your thesis. If there is a Chair person, it will usually be a senior member of the academic staff of your School/Department.

Normally no one else is present in the exam.

Exam Venue and Arrangements

Your internal examiner is responsible for arranging your viva exam and they will contact you with the relevant details - date, time, venue, etc.

Usually the viva exam will take place in your School/Department, though occasionally another University location may be used. If you are unsure where you need to go, make sure you check this before the day of your exam.
If you returned your Notice of Intention to Submit Your Thesis three months before your submission date, your viva exam should normally take place quite soon after submission. Almost all viva exams take place within three months of thesis submission and in many cases it is within one month.

**Format of the Exam**

All viva examinations are different, so it is not possible to describe exactly what will happen - but there are general points which can be made which may be helpful, and you should have the opportunity before your examination to discuss what will happen with your supervisor or to attend the University's pre-viva examination workshop.

The purpose of the viva is to establish that your work is of a sufficiently high standard to merit the award of the degree for which it is submitted. In order to be awarded a research degree, the thesis should demonstrate an original contribution to knowledge and contain work which is deemed worthy of publication.

In order to do this, examiners may:

- ask you to justify your arguments
- ask you to justify not only things which you have included in your thesis but also things which you may have left out
- ask you questions about the wider research context in which the work has been undertaken
- argue certain points with you
- expect you to discuss any developments which may flow from your work in the future

Inevitably, your thesis will have strengths and weaknesses and the examiners will want to discuss these. It is considered a positive thing, indeed an essential thing, that you can discuss both the strengths and the weaknesses. You can think of the weaknesses as an opportunity to demonstrate your skill at critical appraisal.

Remember that examiners seek to find and discuss weaknesses in all theses - you should not interpret criticism as an indication that the examination will not end successfully.
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**Course Description**

**Title of Course:** Project Part-II  
**Course Code:** EC882  
**L-T-P Scheme:** 12P  
**Course Credits:** 12

Project: an activity where the participants have some degree of *choice* in the outcome. The result is complete and functional, that is, it has a beginning, middle and end. Usually, it spans multiple lab periods and requires work outside scheduled lab periods. Since there are choices in implementation, *design* is inherently a component of a project. A project is inherently different from an *analysis* or *exercise*, in which the solution has a predictable form. Projects span a wide variety of possibilities: design and build, identify a system, do a forensic analysis, evaluate a product or assess some environmental situation.

**Program Objective 1**  
Graduates shall make their way to the society with proper scientific and technical knowledge in mechanical engineering.

**Program Objective 2**  
Graduates shall work in design and analysis of mechanical systems with strong fundamentals and methods of synthesis.

**Program Objective 3**  
Graduates shall adapt to the rapidly changing environment in the areas of mechanical engineering and scale new heights in their profession through lifelong learning.

**Program Objective 4**  
Graduates shall excel in career by their ability to work and communicate effectively as a team member and/or leader to complete the task with minimal resources, meeting deadlines.

**Program Outcomes:**

1. Ability to apply knowledge of mathematics, science and mechanical engineering fundamentals for solving problems.
2. Ability to identify, formulate and analyze mechanical engineering problems arriving at meaningful conclusions involving mathematical inferences.
3. Ability to design and develop mechanical components and processes to meet desired needs considering public health, safety, cultural, social, and environmental aspects.
4. Ability to understand and investigate complex mechanical engineering problems experimentally.
5. Ability to apply modern engineering tools, techniques and resources to solve complex mechanical engineering activities with an understanding of the limitations.
6. Ability to understand the effect of mechanical engineering solutions on legal, cultural, social, public health and safety aspects.
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Course Description

7. Ability to develop sustainable solutions and understand their impact on society and environment.
8. Ability to apply ethical principles to engineering practices and professional responsibilities.
9. Ability to function effectively as an individual and as a member or leader in diverse teams and in multidisciplinary settings.
10. Ability to comprehend, design documentation, write effective reports, make effective presentations to the engineering community and society at large.
11. Ability to apply knowledge of engineering and management principles to lead teams and manage projects in multidisciplinary environments.
12. Ability to engage in independent and life-long learning in the broad context of technological changes and advancements.