KERALA TECHNOLOGICAL UNIVERSITY

ERNAKULAM – I CLUSTER

SCHEME AND SYLLABI

FOR

M. Tech. DEGREE PROGRAMME

IN

COMPUTER SCIENCE : SPECIALIZATION IN IMAGE PROCESSING

(2015 ADMISSION ONWARDS)
# SCHEME AND SYLLABI FOR M. Tech. DEGREE PROGRAMME IN COMPUTER SCIENCE : SPECIALIZATION IN Image Processing

## SEMESTER 1 (CREDITS: 23)

<table>
<thead>
<tr>
<th>Exam Slot</th>
<th>Course No</th>
<th>Course Title</th>
<th>Core/ Elective</th>
<th>L-T-P</th>
<th>Internal Marks</th>
<th>End Semester Exam Marks</th>
<th>Duration (hrs)</th>
<th>Credits</th>
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<tbody>
<tr>
<td>A</td>
<td>06 CS 6 01 7</td>
<td>Mathematical Foundation for Computer Science</td>
<td>Core</td>
<td>4-0-0</td>
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<tr>
<td>B</td>
<td>06 CS 6 02 7</td>
<td>Digital Image Processing</td>
<td>Core</td>
<td>4-0-0</td>
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<tr>
<td>C</td>
<td>06 CS 6 03 7</td>
<td>Advanced Data Structures &amp; Algorithms</td>
<td>Core</td>
<td>4-0-0</td>
<td>40</td>
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<tr>
<td>D</td>
<td>06 CS 6 04 7</td>
<td>Computer Graphics &amp; Volume Visualisation</td>
<td>Core</td>
<td>3-0-0</td>
<td>40</td>
<td>60</td>
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<td>E</td>
<td>06 CS 6 x5 7</td>
<td>Elective I</td>
<td>Elective</td>
<td>3-0-0</td>
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<td>Digital Image Processing Lab I</td>
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**24 Hrs**  
**23 Credits**

### Semester I - MCSIP Elective I

<table>
<thead>
<tr>
<th>Course No</th>
<th>Course Title</th>
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<tbody>
<tr>
<td>06 CS 6 15 7</td>
<td>Advanced Data Mining</td>
</tr>
<tr>
<td>06 CS 6 25 7</td>
<td>Human Computer Interaction</td>
</tr>
<tr>
<td>06 CS 6 35 7</td>
<td>Network Security and Cryptography</td>
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## SEMESTER 2 (CREDITS: 19)

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<th>Course No</th>
<th>Course Title</th>
<th>Core/ Elective</th>
<th>L-T-P</th>
<th>Internal Marks</th>
<th>End Semester Exam Marks</th>
<th>Duration (hrs)</th>
<th>Credits</th>
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<tbody>
<tr>
<td>A</td>
<td>06 CS 6 01 8</td>
<td>Advanced Digital Image Processing</td>
<td>Core</td>
<td>4-0-0</td>
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<tr>
<td>B</td>
<td>06 CS 6 02 8</td>
<td>Computer Vision</td>
<td>Core</td>
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<td>40</td>
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<tr>
<td>C</td>
<td>06 CS 6 03 8</td>
<td>Pattern Recognition</td>
<td>Core</td>
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<td>D</td>
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<td>3-0-0</td>
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<td>E</td>
<td>06 CS 6 x5 8</td>
<td>Elective III</td>
<td>Elective</td>
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<td>Mini Project</td>
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**22 Hrs**  
**19 Credits**
### Semester II - MCSIP Elective II

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<td>06 CS 6 14 8</td>
<td>Bioinformatics</td>
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<td>06 CS 6 24 8</td>
<td>Wireless Sensor Networks</td>
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<tr>
<td>06 CS 6 34 8</td>
<td>Data Compression</td>
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<tr>
<td>06 CS 6 15 8</td>
<td>Embedded Systems and Applications</td>
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<tr>
<td>06 CS 6 25 8</td>
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<tr>
<td>06 CS 6 35 8</td>
<td>Social Network Analysis</td>
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### SEMESTER 3 (CREDITS: 14)

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<td>06 CS 7 x1 7</td>
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<td>Elective V</td>
<td>Elective</td>
<td>3-0-0</td>
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<td></td>
<td>06 CS 7 04 7</td>
<td>Project – Phase I</td>
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<td>0-0-12</td>
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Total Credits: 20 Hrs

### Semester III - MCSIP Elective IV

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<th>Internal Marks</th>
<th>End Semester Exam Credits</th>
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<tbody>
<tr>
<td>06 CS 7 11 7</td>
<td>Natural Language Processing</td>
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<tr>
<td>06 CS 7 21 7</td>
<td>Digital Video Processing</td>
<td></td>
<td></td>
<td>70</td>
<td>30 0 12</td>
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<tr>
<td>06 CS 7 31 7</td>
<td>GIS and Remote Sensing</td>
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<td>70</td>
<td>30 0 12</td>
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### Semester III - MCSIP Elective V

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<th>L-T-P</th>
<th>Internal Marks</th>
<th>End Semester Exam Credits</th>
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<tbody>
<tr>
<td>06 CS 7 12 7</td>
<td>Imaging and Multimedia Systems</td>
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<td>70</td>
<td>30 0 12</td>
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<tr>
<td>06 CS 7 22 7</td>
<td>Medical Image Techniques and Analysis</td>
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<td>70</td>
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<tr>
<td>06 CS 7 32 7</td>
<td>High Performance Computing</td>
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### SEMESTER 4 (CREDITS: 12)

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<th>Exam Slot</th>
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<th>L-T-P</th>
<th>Internal Marks</th>
<th>End Semester Exam Credits</th>
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<tbody>
<tr>
<td>06 CS 7 01 8</td>
<td>Project – Phase II</td>
<td>Project</td>
<td>0-0-21</td>
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Total Credits: 21 Hrs

Total Credits for the Course: 68 credits
SEMESTER I
Course No. 06 CS 6 01 7  
Course Name MATHEMATICAL FOUNDATION FOR COMPUTER SCIENCE  
L-T-P-Credits 4-0-0-4  
Year of Introduction 2015

PREREQUISITES: Basics of probability and Calculus

COURSE OBJECTIVES:
- To understand the fundamental concepts of probability-statistics, Random processes and to develop a mathematical foundations on image processing.
- All kinds of operation performed on images in order to extract qualitative or quantitative data, perform measurements and apply statistical analysis.

SYLLABUS:

EXPECTED OUTCOME:
Students will get knowledge to perform measurements and apply statistical analysis on images.

TEXT BOOK:
1. Donald F. Stanat and David F. McAllister, Discrete mathematics in Computer Science.

REFERENCES:
1. Thomas Koshy, Elementary number theory with Applications, Elsevier
3. V. Krishnan Probability and Random Processes 2006, John Wiley & Sons
5. G. Chartrand and P. Zhang, Introduction to Graph Theory, McGraw-Hill Companies,

<table>
<thead>
<tr>
<th>Module</th>
<th>Contents</th>
<th>Hours</th>
<th>Sem Exam Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>Divisibility, gcd, prime numbers, fundamental theorem of arithmetic, primality testing, solution of congruences, Wilson's theorem. Congruences, Fermat's theorem, Euler function, Chinese remainder theorem.</td>
<td>10</td>
<td>25%</td>
</tr>
<tr>
<td>II</td>
<td>Groups, homomorphism theorems, cosets and normal subgroups, Lagrange’s theorem, Ring. Field. Polynomial arithmetic, quadratic residues, resiprocity, discrete logarithms, elliptic curve arithmetic.</td>
<td>10</td>
<td>25%</td>
</tr>
<tr>
<td>III</td>
<td>Probability axioms, conditional probability, discrete and continuous random variables, cumulative distribution function (CDF), probability mass function (PMF), probability density function (PDF), conditional PMF/PDF,</td>
<td>10</td>
<td>25%</td>
</tr>
</tbody>
</table>
expected value, variance, functions of a random variable, expected value of the derived random variable, multiple random variables, sums of random variables, moment generating function, random sums of random variables, joint CDF/PMF/PDF.

| IV | Random Processes- Introduction and Classification, Guassian Process, Poisson Process, Markov process. | 10 | 25% |
Course No. | Course Name | L-T-P-Credits | Year of Introduction |
---|---|---|---|
06 CS 6 02 7 | DIGITAL IMAGE PROCESSING | 4-0-0-4 | 2015 |

PREREQUISITES: NIL

COURSE OBJECTIVES:
- The objective of this course is to understand the basic principles and methods of digital image processing
- To be able to formulate solutions to general image processing problems and have a comprehensive background in image filtering.
- The primary goal of this course is to lay a solid foundation for students to study advanced image analysis topics such as computer vision systems, biomedical image analysis, and multimedia processing & retrieval.

SYLLABUS:

EXPECTED OUTCOME:
- The ability to apply principles and techniques of digital image processing in applications related to digital imaging system design and analysis.
- The ability to analyze and implement image processing algorithms.
- To Gain hands-on experience in using software tools for processing digital images.

TEXT BOOK:

REFERENCES:

COURSE PLAN

<table>
<thead>
<tr>
<th>Module</th>
<th>Contents</th>
<th>Hours</th>
<th>Sem Exam Marks</th>
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<tbody>
<tr>
<td>IV</td>
<td>Image Compression: Fundamentals, Some Basic Compression Methods - Run Length Coding, Huffman Coding, Arithmetic Coding, Bit Plane Coding, Block Truncation Coding. JPEG Compression. Morphological Image Processing: Preliminaries, Erosion and Dilation, Opening and Closing, Hit or Miss Transformation, Some Basic Morphological Algorithms, Grey Scale Morphology.</td>
<td>14Hrs</td>
<td>25%</td>
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**Course No.** | **Course Name** | **L-T-P-Credits** | **Year of Introduction**
--- | --- | --- | ---
06 CS 6 03 7 | ADVANCED DATA STRUCTURES AND ALGORITHMS | 4-0-0-4 | 2015

**PREREQUISITES:** Algorithm, Analysis and Design

**COURSE OBJECTIVES:**
- The primary objective of this course is to introduce new and advanced data structures, algorithmic design and analysis.
- Also solve problems using different data structures and design techniques and compare their performance and tradeoffs.
- And also implement algorithms and data structures in C++.

**SYLLABUS:**

**EXPECTED OUTCOME:**
Get a broad understanding of how to design, write, and analyse the performance of C/C++ programs that handles structured data and perform more complex tasks, typical of larger software projects.

**TEXT BOOK:**

**REFERENCES:**

**COURSE PLAN**

<table>
<thead>
<tr>
<th>Module</th>
<th>Contents</th>
<th>Hours</th>
<th>Sem Exam Marks</th>
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<tbody>
<tr>
<td>I</td>
<td>Basics of Algorithm Analysis: Computational Tractability, Asymptotic Notation, A survey of common running times, Fundamental Data Structures- Trees: BST, B-Tree, AVL Tree, Splay Tree, Tries-Binary Tries, Multiway Tries, Priority Queue: ADT, Heaps, Leftist Trees, Application: Heap Sort; Binomial Heaps, Fibonacci Heaps</td>
<td>14Hrs</td>
<td>25%</td>
</tr>
<tr>
<td>II</td>
<td>Algorithm Design Methods: Greedy Method- 0/1 Knapsack Problem, Topological Sorting, Divide and Conquer- Strassen’s Matrix Multiplication, Closest Pair of Points, Dynamic Programming-Image Compression, All Pairs Shortest Path, Backtracking- Travelling Sales Person, 8 Queens Person, Branch and Bound- Max Clique, Nearest Neighbour Search(NNS).</td>
<td>14Hrs</td>
<td>25%</td>
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</table>
Course No. | Course Name | L-T-P-Credits | Year of Introduction
--- | --- | --- | ---
06 CS 6 04 7 | ADVANCED COMPUTER GRAPHICS & VOLUME VISUALISATION | 3-0-0-3 | 2015

PREREQUISITES: Basics of computer coordinate system and image creation in computers.

COURSE OBJECTIVES:
- To enable the students to acquire knowledge of image data creation by a computer specifically with help from specialized graphical hardware and softwares.
- It make the students aware about displaying art and image data effectively and beautifully to the user, and processing image data received from the physical world.

SYLLABUS:
- Introduction to Computer Graphics, Applications, Basic Primitives- Transformations— Clipping- Surfaces and Meshes-Projection-Advanced Rendering Techniques-Direct X-Open GL.

EXPECTED OUTCOME:
Students will get knowledge of image data creation by a computer specifically with help from specialized graphical hardware and softwares.

TEXT BOOKS:

REFERENCES:

COURSE PLAN

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<thead>
<tr>
<th>Module</th>
<th>Contents</th>
<th>Hours</th>
<th>Sem Exam Marks</th>
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<tbody>
<tr>
<td>I</td>
<td>Introduction to Computer Graphics, Applications, Basic Primitives: points, lines, circles. 3D Transformations, 3D rotation based on Arbitrary Axis, Composition of 3D transformation. Clipping: 3D Cyrus Beck clipping, 3D midpoint subdivision algorithm.</td>
<td>12Hrs</td>
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<tr>
<td>II</td>
<td>Surfaces and Meshes. Subdivision, Distance fields and</td>
<td>14 Hrs</td>
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<tr>
<td>III</td>
<td>Advanced Rendering Techniques: Photorealistic rendering: Global Illumination, Participating media rendering, Ray Tracing, Monte Carlo algorithm, Photon mapping. Volume Rendering: Volume graphics overview, Marching cubes, Direct volumerendering.</td>
<td>16 Hrs</td>
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<td>IV</td>
<td>Direct X: Direct 3D architecture, primitives – point, line, triangle, Overview of resources: Texture / vertex / buffers / index buffers / Surface / depth buffers / stencil buffers / render targets / Flichain states, state management. OpenGL: Introduction to OpenGL, OpenGL command syntax, OpenGL as state machine, OpenGL rendering pipeline, OpenGL related libraries, Describing points lines and polygon, Displaying points lines and polygon, Normal vector, Vertex arrays.</td>
<td>14 Hrs</td>
<td>25%</td>
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<td>Course No.</td>
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<td>L-T-P-Credits</td>
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<tr>
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<td>ADVANCED DATA MINING</td>
<td>3-0-0-3</td>
<td>2015</td>
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**PREREQUISITES:** Database Management Systems.

**COURSE OBJECTIVES:** The key objective of this course is to uncover the fundamental concepts of data mining, to demonstrate the potential of gathering large sets of data, and analyzing these data sets to gain useful business understanding.

**SYLLABUS:** Data Mining-Data Mining Functionalities-Association Rule Mining- Classification and Prediction-Classification Methods-Cluster Analysis- Outlier Analysis- Multidimensional Analysis and Descriptive Mining of Complex Data Objects- Multimedia Data Mining – Text Mining.

**EXPECTED OUTCOME:** Students will get knowledge to understand and apply most current data mining techniques and applications.

**Text Books:**

**References:**

**COURSE PLAN**

<table>
<thead>
<tr>
<th>Module</th>
<th>Contents</th>
<th>Hours</th>
<th>Sem Exam Marks</th>
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<tr>
<td>1</td>
<td>Data Mining: Data Mining Functionalities – Data Pre-processing – Data Cleaning – Data Integration and Transformation – Data Reduction – Data Discretization and Concept Hierarchy Generation- Architecture Of A Typical Data Mining Systems- Classification of Data Mining Systems- Association Rule Mining: - Efficient and Scalable Frequent Item set Mining Methods – Mining Various Kinds of Association Rules – Association Mining to Correlation Analysis – Constraint-Based Association Mining.</td>
<td>10</td>
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</tr>
<tr>
<td>II</td>
<td>Classification and Prediction: Issues Regarding Classification and Prediction – Classification by Decision Tree Introduction – Bayesian Classification – Rule Based Classification – Classification by Back propagation – Support Vector Machines – Associative Classification – Lazy Learners – Other Classification Methods – Prediction – Accuracy and Error Measures – Evaluating the Accuracy of a Classifier or Predictor – Ensemble Methods – Model Section.</td>
<td>10</td>
<td>25%</td>
</tr>
<tr>
<td>III</td>
<td>Cluster Analysis: Types of Data in Cluster Analysis – A Categorization of Major Clustering Methods – Partitioning Methods – Hierarchical methods – Density-Based Methods – Grid-Based Methods – Model-Based Clustering Methods – Clustering High-Dimensional Data – Constraint-Based Cluster Analysis – Outlier Analysis.</td>
<td>10</td>
<td>25%</td>
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<tr>
<td>IV</td>
<td>Mining Object, Spatial, Multimedia, Text and Web Data: Multidimensional Analysis and Descriptive Mining of Complex Data Objects – Spatial Data Mining – Multimedia Data Mining – Text Mining – Mining the World Wide Web.</td>
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Course No. 06 CS 6 25 7  
Course Name HUMAN COMPUTER INTERACTION  
L-T-P-Credits 3-0-0-  
Year of Introduction 2015

PREREQUISITES: Database Management Systems.

COURSE OBJECTIVES: The key objective of this course is to analyze how humans interact with the technology and also to recognize how a computer system may be modified to include human diversity.

SYLLABUS: HCI foundations-reasoning and problem solving-Interactive systems-Elements of the WIMP interface-Interaction design basics-Implementation support-Elements of windowing systems-Models and Theories.

EXPECTED OUTCOME: Students will get knowledge to gather meaningful feedback from users.

TEXT BOOK:  

REFERENCES:  
2. B. Shneiderman; Designing the User Interface, Addison Wesley 2000 (Indian Reprint).  
5. B. Shneiderman; Designing the User Interface, Addison Wesley 2000 (Indian Reprint).  
6. Selected research papers (details will be provided at the end of relevant materials).  

COURSE PLAN

<table>
<thead>
<tr>
<th>Module</th>
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<th>Hours</th>
<th>Sem Exam Marks</th>
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<tbody>
<tr>
<td>I</td>
<td>HCI foundations-The Human: Input–output channels, Human memory. Thinking: reasoning and problem</td>
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<td>Hours</td>
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<tr>
<td>II</td>
<td>Interactive systems- Models of interaction, Frameworks and HCI, Ergonomics, Interaction styles, Elements of the WIMP interface, The context of the interaction, Experience, engagement and fun. Paradigms for interaction.</td>
<td>10Hrs</td>
<td>25%</td>
</tr>
<tr>
<td>III</td>
<td>Design Process:- Interaction design basics-The process of design, User focus, Scenarios, Navigation design, Screen design and layout, Iteration and prototyping, Design for non-Mouse interfaces, HCI in the software process, Iterative design and prototyping, Design rules, Principles to support usability, Standards and Guidelines, Golden rules and heuristics, HCI patterns.</td>
<td>10Hrs</td>
<td>25%</td>
</tr>
<tr>
<td>IV</td>
<td>Implementation support - Elements of windowing systems, User interface management systems, Evaluation techniques, Evaluation through expert analysis, Evaluation through user participation, Universal design principles, User support-Requirements and approaches, Models and Theories - Cognitive models, Goal and task hierarchies, Linguistic models. Collaboration and communication - Face-to-face communication, Conversation, Text-based communication, Group working, Dialog design notations, Diagrammatic notations.</td>
<td>10Hrs</td>
<td>25%</td>
</tr>
<tr>
<td>Course No.</td>
<td>Course Name</td>
<td>L-T-P-Credits</td>
<td>Year of Introduction</td>
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</tr>
<tr>
<td>06 CS 6 35 7</td>
<td>NETWORK SECURITY AND CRYPTOGRAPHY</td>
<td>3-0-0-3</td>
<td>2015</td>
</tr>
</tbody>
</table>

**PREREQUISITES:** Basic Knowledge of Computer Networking, Number Theory

**COURSE OBJECTIVES:**
This course will explore the ISO OSI network stack and discuss common security weaknesses, vulnerabilities, attack methods and mitigation approaches. Provides students with a high level understanding of information security, threats, elements of cryptography, protocols, architectures, and technologies for secure systems and services.

**SYLLABUS:**

**EXPECTED OUTCOME:** Students will be familiar with network security threats and countermeasures and exposed to the importance of integrating people, processes, and technology.

**TEXT BOOK:**

**REFERENCES:**
2. Fundamentals of Network Security by Eric Maiwald (Dreamtech press)
6. Introduction to Cryptography, Buchmann, Springer

**COURSE PLAN**

<table>
<thead>
<tr>
<th>Module</th>
<th>Contents</th>
<th>Hours</th>
<th>Sem Exam Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>III</td>
<td>Number Theory: Prime and Relatively prime numbers, Modular arithmetic, Fermat’s and Euler’s theorems, Testing for primality, Euclid’s Algorithm, the Chinese remainder theorem, Discrete logarithms. Message authentication and Hash Functions: Authentication requirements and functions, Message Authentication, Hash functions, Security of Hash functions and MACs.</td>
<td>10Hrs</td>
<td>25%</td>
</tr>
</tbody>
</table>
### Course Information

<table>
<thead>
<tr>
<th>Course No.</th>
<th>Course Name</th>
<th>L-T-P-Credits</th>
<th>Year of Introduction</th>
</tr>
</thead>
<tbody>
<tr>
<td>06 CS 6 06 7</td>
<td>RESEARCH METHODOLOGY</td>
<td>0-2-0-2</td>
<td>2015</td>
</tr>
</tbody>
</table>

**PREREQUISITES:** NIL.

**COURSE OBJECTIVES:**
- To understand the steps involved in doing research.
- To formulate a research problem.
- To learn the basic statistical measures.
- To develop report writing skills.
- To know about the ethics in research and IP rights management.

**SYLLABUS:**

**EXPECTED OUTCOME:**
Students who successfully complete this course will have demonstrated an ability to:

- Understand the steps involved in research.
- Formulate a research problem.
- Assimilate the basic statistical measures.
- Create a well formed report.
- Interpret the dos and donts so that IP rights are not violated.

**TEXT BOOKS:**
2. R. Panneerselvam, Research Methodology (Prentice Hall of India, New Delhi, 2011).

**REFERENCES:**
1. Articles from ACM/IEEE Journals/Conference Proceedings and equivalent documents, standard textbooks and web based material, approved by the supervisor.

### COURSE PLAN

<table>
<thead>
<tr>
<th>Module</th>
<th>Contents</th>
<th>Hours</th>
<th>Internal Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>Introduction - Meaning of Research, Objectives, Motivation, Types of Research, Research process-Problem definition-Objectives of Research- Research design- Data collection –Data Analysis –Interpretation of Results- Validation of Results. Formulation of a Research problem.</td>
<td>6 Hrs</td>
<td>25%</td>
</tr>
<tr>
<td>II</td>
<td>Basic Statistical measures - Measures of central tendency</td>
<td>8 Hrs</td>
<td>25%</td>
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</tr>
<tr>
<td>IV</td>
<td>Guidelines for writing a PhD thesis - Guidelines for writing the abstract, introduction, methodology, results and discussion, conclusion sections of a manuscript. Impact factor - Validity, Merits, limitations. Other measurements of impact: h-index-advantages, criticism of h-index-modification of h-index, Intellectual property rights (IPR) - forms of IPR- patents-copyrights-Trademarks-Industrial design-geographical indication.</td>
<td>10 Hrs</td>
<td>25%</td>
</tr>
<tr>
<td>Course No.</td>
<td>Course Name</td>
<td>L-T-P-Credits</td>
<td>Year of Introduction</td>
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</tr>
<tr>
<td>06 CS 6 07 7</td>
<td>SEMINAR</td>
<td>0-0-2-2</td>
<td>2015</td>
</tr>
</tbody>
</table>

**COURSE OBJECTIVES:**
- To introduce the students to research, understand research papers and prepare presentation material
- To understand cutting edge technology in the chosen area
- To improve oral communication skills through presentation
- To prepare original technical write up on the presentation

**SYLLABUS:**
The aim of this course is to introduce the student to research, and to acquaint him with the process of presenting his work through seminars and technical reports. Students have to register for the seminar and select a topic in consultation with any faculty member offering courses for the programme. The student is expected to do an extensive literature survey and analysis in an area related to computer science (other than the area of specialization). The study should preferably result in design ideas, designs, algorithms, and theoretical contributions in the form of theorems and proofs, new methods of proof, new techniques or heuristics with analytical studies, implementations and analysis of results.

The presentation shall be of 30 minutes duration and a committee with the Head of the Department as the chairman and two faculty members from the department as members shall evaluate the seminar based on the coverage of the topic, presentation and ability to answer the questions put forward by the committee.

Students shall individually prepare and submit a seminar report based on experimental study / industrial training on the corresponding topic, in the prescribed format given by the Department. The reference shall include standard journals (ACM/IEEE), conference proceedings and equivalent documents, reputed magazines and textbooks, technical reports and web based material, approved by the supervisor. The references shall be incorporated in the report following IEEE standards reflecting the state-of-the-art in the topic selected.

**EXPECTED OUTCOME:**
- Improvement in proficiency in English
- Improvement in presentation skills
- Improvement in analytical and reasoning ability
- Improvement in technical writing
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<tr>
<th>Course No.</th>
<th>Course Name</th>
<th>L-T-P-Credits</th>
<th>Year of Introduction</th>
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<tbody>
<tr>
<td>06 CS 6 08 7</td>
<td>DIGITAL IMAGE PROCESSING LAB- I</td>
<td>0-0-2-1</td>
<td>2015</td>
</tr>
</tbody>
</table>

**COURSE OBJECTIVES:**
- To implement basic and advanced image processing algorithms.

**SYLLABUS:** Following experiments, related to image processing concepts need to be implemented: Use of open-source image processing tools is encouraged to do experiments.
1. Introductory Cycle to familiarize the working environment/tool.
2. Cycle 1: Digital Signal Processing Basics
3. Cycle 2: Image Transforms
5. Cycle 4: Image Restoration and Denoising
6. Cycle 5: Binary Image Processing

Laboratory Softwares to be used:
- GNU Octave 3.8 or higher
- Scilab 5.5 or higher
- Choice of any open-source tool with the prior permission obtained from the department.

**EXPECTED OUTCOME:**
Students will get ability to:
- Understand discrete transform works including concepts of basic images.
- Understand about quantisation in both spatial and frequency domain.

**REFERENCES:**
SEMESTER 2
<table>
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<tr>
<th>Course No.</th>
<th>Course Name</th>
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<th>Year of Introduction</th>
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<tr>
<td>06 CS 6 01 8</td>
<td>ADVANCED DIGITAL</td>
<td>4-0-0-4</td>
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<td></td>
<td>IMAGE PROCESSING</td>
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</table>

PREREQUISITES: Programming experience, background in image processing, graphics or computer vision, familiarity with the basic concepts of Linear Algebra, calculus and probability.

COURSE OBJECTIVES:
- The objective of this course is to discuss advanced topics in image processing and analysis that build on the introduction course.
- To understand about scientific methodology which includes reading of scientific publications and book chapters, summarizing the contents, developing strategies to implement the algorithms, and finally presenting the theory, tests, and applications.
- To implement solutions for complex image processing problems.

SYLLABUS:
Image Segmentation: Fundamentals, Classification of Image-segmentation Techniques, Representation, Description, Colour Image Processing, Wavelet-based Image Processing, Object Recognition, Applications of Object Recognition, Sources of 3D data, 3D data sets, Image processing in 3D, Measurements on 3D images.

EXPECTED OUTCOME:
The ability to apply principles and techniques of digital image processing in applications related to advanced topics in digital imaging system design and analysis. The ability to analyze and implement advanced image processing algorithms and the ability to modify it.

TEXT BOOKS:

REFERENCES:

COURSE PLAN

<table>
<thead>
<tr>
<th>Module</th>
<th>Contents</th>
<th>Hours</th>
<th>Sem Exam Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>Digital Image Segmentation: Fundamentals, Classification of Image-segmentation Techniques, Thresholding, Region-Based Segmentation, Edge Linking, Hough Transform, Active Contour, Watershed Transformation, Use of Motion in Segmentation Representation: Boundary Following, Chain Codes, Signatures, Boundary Segments, Skeletons. Description: Boundary Descriptors- Shape Numbers.</td>
<td>10Hrs</td>
<td>25%</td>
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<tr>
<td>IV</td>
<td>3D Visualization: Sources of 3D data, Serial sections, Optical sectioning, Sequential removal, Stereo measurement, 3D data sets, Slicing the data set, Arbitrary section planes, The use of color, Volumetric display, Stereo viewing, Special display hardware, Ray tracing, Reflection, Surfaces, Multiply connected surfaces, Image processing in 3D, Measurements on 3D images.</td>
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</tbody>
</table>
Course No. | Course Name | L-T-P-Credits | Year of Introduction
--- | --- | --- | ---
06 CS 6 02 8 | COMPUTER VISION | 3-0-0-3 | 2015

**PREREQUISITES:**Basics of Digital image processing

**COURSE OBJECTIVES:**
- Students will be able to understand the methods for acquiring, processing, analyzing, and understanding images.
- It will give an insight to the theory behind artificial systems that extract information from images.

**SYLLABUS:**

**EXPECTED OUTCOME:**
Students will get knowledge to perform scene reconstruction, event detection, video tracking, object recognition, object pose estimation, learning, indexing, motion estimation, and image restoration.

**TEXT BOOKS:**

**REFERENCES:**

**COURSE PLAN**

<table>
<thead>
<tr>
<th>Module</th>
<th>Contents</th>
<th>Hours</th>
<th>Sem Exam Marks</th>
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</thead>
<tbody>
<tr>
<td>I</td>
<td><strong>Introduction:</strong> Components of a vision system, Imaging systems, Signal processing for computer vision, Pattern recognition for computer vision, Performance evaluation of algorithms. <strong>Radiation and Illumination:</strong> Introduction, Fundamentals of electromagnetic radiation, Radiometric quantities, Fundamental concepts of photometry, Interaction of radiation with matter, Illumination techniques. <strong>Imaging Optics:</strong> Introduction, Basic concepts of geometric optics, Lenses, Optical properties of glasses, Aberrations, Optical image formation, Wave and Fourier optics.</td>
<td>10 Hrs</td>
<td>25%</td>
</tr>
<tr>
<td>II</td>
<td><strong>Radiometry of Imaging:</strong> Introduction, Observing surfaces, Propagating radiance, Radiance of imaging, Detecting</td>
<td>11 Hrs</td>
<td>25%</td>
</tr>
</tbody>
</table>
### Solid-State Image Sensing
Introduction, Fundamentals of solid-state photosensing, Photocurrent processing, Transportation of photosignals, Electronic signal detection, Architectures of image sensors, Color vision and color imaging, Practical limitations of semiconductor photosensors.

### Geometric Calibration of Digital Imaging Systems
Introduction, Calibration terminology, Parameters influencing geometrical performance, Optical systems model of image formation, Camera models, Calibration and orientation techniques, Photogrammetric applications.

### Three-Dimensional Imaging Techniques
Introduction, Characteristics of 3-D sensors, Triangulation, Time-of-flight (TOF) of modulated light, Optical Interferometry (OF).

**Motion:** Introduction, Basics: flow and correspondence, Optical flow-based motion estimation, Quadrature filter techniques, Correlation and matching, Modeling of flow fields

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<tr>
<td>IV</td>
<td><strong>Probabilistic Modelling in Computer Vision:</strong> Introduction. Why probabilistic models, Object recognition as probabilistic modelling, Model densities, Practical issues. <strong>Fuzzy Image Processing:</strong> Introduction, Fuzzy image understanding, Fuzzy image processing systems, Theoretical components of fuzzy image processing, Selected application examples. <strong>Case Study:</strong> Any two applications- Object Recognition with Intelligent Cameras/ Fast 3-D Full Body Scanning for Humans and Other Objects/ Motion Tracking/ Multicolor Classification of Astronomical Objects.</td>
<td>10 Hrs</td>
<td>25%</td>
</tr>
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</table>
Course No. | Course Name | L-T-P-Credits | Year of Introduction
--- | --- | --- | ---
06 CS 6 03 8 | PATTERN RECOGNITION | 3-0-0-3 | 2015

**PREREQUISITES:** Basic knowledge of probability, statistics and random variables, linear algebra

**COURSE OBJECTIVES:**
- To equip with basic mathematical and statistical techniques commonly used in pattern recognition.
- Achieving this objective will not only help you understand, compare and contrast various pattern recognition techniques, but also provide you with an adequate background on probability theory, statistics, and optimization theory to tackle a wide spectrum of engineering problems.
- To provide a detailed overview of some advanced topics in pattern recognition and a project opportunity to conduct independent, cutting-edge and publishable research.

**SYLLABUS:**
Pattern Recognition Systems, Design cycle, Learning and Adaptation, Applications of pattern recognition, Bayesian Decision Theory, Minimum-Error-Rate Classification, Bayesian parameter Estimation, Problems of Dimensionality, Non Parametric Techniques, Linear Discriminant Functions and Decision Surfaces, Generalized Linear Discriminant Functions, Multilayer Neural Networks, Nonmetric Methods, Algorithm-Independent Machine Learning, MDL Principle, Clustering

**EXPECTED OUTCOME:**
- Student understands the fundamental pattern recognition and machine learning theories.
- Student acquires the ability to design and implement certain important pattern recognition techniques.

**TEXT BOOK:**

**REFERENCES:**

### COURSE PLAN

<table>
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<tr>
<th>Module</th>
<th>Contents</th>
<th>Hours</th>
<th>Sem Exam Marks</th>
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<td>Semester</td>
<td>Course Topics</td>
<td>Credits</td>
<td>Percentage</td>
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<tr>
<td>II</td>
<td>ML Estimation, Bayesian Estimation, Bayesian parameter Estimation: Gaussian Case and General Theory, Problems of Dimensionality, PCA, Fisher</td>
<td>11 Hrs</td>
<td>25%</td>
</tr>
<tr>
<td></td>
<td>Linear Discriminant Functions and Decision Surfaces, Generalized Linear Discriminant Functions, Two Category Linearly Separable Case,</td>
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<tr>
<td></td>
<td>Perceptron Criterion Function, Minimum Squared-Error Procedures, Ho-Kashyap Procedures, SVM.</td>
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<tr>
<td></td>
<td>Multilayer Neural Networks: Backpropagation Algorithm, Convolutional Networks, Recurrent Networks.</td>
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<tr>
<td></td>
<td>Theorem, Minimum Description Length (MDL), MDL Principle.</td>
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<tr>
<td></td>
<td>Clustering: k-Means, Fuzzy k-Means, Hierarchical Clustering, Criterion Functions for Clustering, Cluster Validity.</td>
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<tr>
<td>IV</td>
<td>Theory Continuous and Discrete Features, Minimum-Error-Rate Classification, Classifiers, Discriminant Functions, Decision Surfaces, Normal</td>
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<tr>
<td></td>
<td>Density, Discriminant Functions for Normal Density, Bayesian Belief networks.</td>
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</tbody>
</table>
Course No. | Course Name | L-T-P-Credits | Year of Introduction
--- | --- | --- | ---
06 CS 6 14 8 | BIOINFORMATICS | 3-0-0-3 | 2015

PREREQUISITES: Basics of Bioinformatics

COURSE OBJECTIVES: The key objective of this course is to understand the inherent structure of biological information. It includes the analysis of gene and protein sequences to reveal protein evolution and splicing.


EXPECTED OUTCOME: Students will get knowledge about biology and biotechnology. Analyse legal, social and ethical considerations related to bioinformatics.

TEXT BOOKS:

REFERENCES:

COURSE PLAN

<table>
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<tr>
<th>Module</th>
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<th>Hours</th>
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</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>Molecular biology primer, gene structure and information content, Bioinformatics tools and databases, genomic information content, Sequence Alignment, Algorithms for global and local alignments, Scoring matrices, Dynamic Programming algorithms.</td>
<td>10Hrs</td>
<td>25%</td>
</tr>
<tr>
<td>II</td>
<td>Introduction to Bio-programming languages, Restriction Mapping and Motif finding, Gene Prediction, Molecular Phylogenetics, Phylogenetic trees, Algorithms for Phylogenetic Tree construction.</td>
<td>10 Hrs</td>
<td>25%</td>
</tr>
<tr>
<td>III</td>
<td>Combinatorial pattern matching, Repeat finding, Keyword Trees, Suffix Trees, Heuristic similarity search</td>
<td>10Hrs</td>
<td>25%</td>
</tr>
<tr>
<td>IV</td>
<td>Microarrays, Gene expression, Algorithms for Analyzing Gene Expression data, Protein and RNA structure prediction, Algorithms for structure prediction. Emerging trends in bioinformatics algorithms and databases. Case Study: Use 'R' to perform statistical computations and comparisons on samples available from any of the standard repository like Gene Expression Omnibus (GEO).</td>
<td>10Hrs</td>
<td>25%</td>
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</tbody>
</table>
Course No. 06 CS 6 24 8

Course Name WIRELESS SENSOR NETWORKS

L-T-P-Credits 3-0-0-3

Year of Introduction 2015

PREREQUISITES: Basics of Computer Networking

COURSE OBJECTIVES: The objective of this course is to present an overview on wireless sensor networks. It aims to develop create an understanding of MAC protocols, routing protocols and operating system for wireless sensor networks.


EXPECTED OUTCOME: Students will understand different MAC protocols, routing protocols, corresponding operating systems and respective applications.

TEXT BOOKS:

REFERENCES:

COURSE PLAN

<table>
<thead>
<tr>
<th>Module</th>
<th>Contents</th>
<th>Hours</th>
<th>Sem Exam Marks</th>
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</thead>
<tbody>
<tr>
<td>I</td>
<td>Introduction to wireless sensor networks: Overview, Technological Background, Network architectures and Protocol Stack: Network Architectures for WSN, Classification for WSN, Protocol Stack for WSN. Architecture: Single-node architecture: Hardware components &amp; design constraints, Operating systems and execution environments, Network architecture:</td>
<td>10Hrs</td>
<td>25%</td>
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</table>

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Optimization goals and figures of merit, Design principles for WSNs, Service interfaces of WSNs, Gateway concepts.


<table>
<thead>
<tr>
<th>Course No.</th>
<th>Course Name</th>
<th>L-T-P-Credits</th>
<th>Year of Introduction</th>
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<tbody>
<tr>
<td>06 CS 6 34 8</td>
<td>DATA COMPRESSION</td>
<td>3-0-0-3</td>
<td>2015</td>
</tr>
</tbody>
</table>

**PREREQUISITES:** Basics of Digital image processing.

**COURSE OBJECTIVES:** Students will be able to understand different compression techniques available.

**SYLLABUS:** Introduction Compression Techniques-Different Methods of Compression Basic Techniques-Dictionary methods-Image Compression Intuitive Methods, Image Transforms-Video Compression-Audio Compression.

**EXPECTED OUTCOME:** Students will get knowledge to apply different compression techniques on image, audio and video data.
TEXT BOOKS:

REFERENCES:
1. “The Data compression Book”, Mark Nelson and Jean-Loup Gailly, Mark Nelson and Jean-Loup Gailly,
BPB publications (2nd Edition), 1995

COURSE PLAN

<table>
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<tr>
<th>Module</th>
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<th>Hours</th>
<th>Sem Exam Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>Introduction Compression Techniques - Lossy compression &amp; Lossless compression, modeling and compression Mathematical modeling for Lossless compression- Physical models probability models, Markov Models and composite source models. Mathematical modeling for Lossy compression - physical models, Probability models and linear systems models.</td>
<td>10 Hrs</td>
<td>25%</td>
</tr>
<tr>
<td>III</td>
<td>Image Compression Intuitive Methods, Image Transforms, JPEG, Progressive Image compression, Vector quantization, Adaptive Vector Quantization, Block Matching, Block Truncation coding. Context Tree weighting, Block Decomposition, Binary Tree predictive coding, Quad Trees and Finite Automata Methods.</td>
<td>10 Hrs</td>
<td>25%</td>
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</table>
Course No. | Course Name | L-T-P-Credits | Year of Introduction |
---|---|---|---|
06 CS 6 15 8 | EMBEDDED SYSTEMS | 3-0-0-3 | 2015 |

PREREQUISITES: Fundamentals of embedded systems paradigms

COURSE OBJECTIVES:
- To develop an understanding of the technologies behind the embedded computing system.

SYLLABUS:
Introduction to Embedded Systems-Devices and Communication Buses for Devices Network-Embedded Programming-Interprocess Communication-RTOS.

EXPECTED OUTCOME:
Students who successfully complete this course will have demonstrated an ability to
- distinguish between embedded and general purpose system.

TEXT BOOK:

REFERENCES:

COURSE PLAN

<table>
<thead>
<tr>
<th>Module</th>
<th>Contents</th>
<th>Hours</th>
<th>Sem Exam Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>Introduction to Embedded Systems: Embedded Systems, Processor embedded into a system, Embedded Hardware Units and Devices in a system, Embedded Software in a system, Examples of embedded systems, Design Process in embedded systems, Formalization of System Design, Classification of Embedded Systems.</td>
<td>10 Hrs</td>
<td>25%</td>
</tr>
<tr>
<td>III</td>
<td>ISR Concept, Interrupt Sources, Interrupt Servicing</td>
<td>10 Hrs</td>
<td>25%</td>
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<tr>
<td>Course No.</td>
<td>Course Name</td>
<td>L-T-P-Credits</td>
<td>Year of Introduction</td>
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<tr>
<td>06 CS 6 25 8</td>
<td>SOFT COMPUTING</td>
<td>3-0-0-3</td>
<td>2015</td>
</tr>
</tbody>
</table>

**PREREQUISITES:** Good understanding of distributed systems will be appreciated.

**COURSE OBJECTIVES:**
- Lay a foundation on obtaining working solutions quickly, accepting approximations and unconventional approaches.

**SYLLABUS:**

**EXPECTED OUTCOME:**
Students who successfully complete this course will have demonstrated an ability to
- identify and select a suitable soft computing technology to solve the problem;
- construct a solution and implement a soft computing solution.

**TEXT BOOK:**

**REFERENCE:**

**COURSE PLAN**

<table>
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<tr>
<th>Module</th>
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### II

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### III

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### IV

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<th>IV</th>
<th>10 Hrs</th>
<th>25%</th>
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</table>
PREREQUISITES: NIL

COURSE OBJECTIVES:
- To study the mapping and measuring of relationships and flows between people, groups, organizations, computers, urls and other connected information or knowledge entities.

SYLLABUS:

EXPECTED OUTCOME:
Students who complete the course will have demonstrated the ability to do the following:
- Get idea about the strategy for investigating social structures through the use of network and graph theories.

TEXT BOOKS:

REFERENCES:
III Visualizing Social Networks: A Taxonomy of Visualizations. Data Mining in Social Media: Data Mining Methods for Social Media, Ethnography and Netnography, Event Maps. Text Mining in Social Networks: Keyword Search, Classification and Clustering Algorithms, Transfer Learning in Heterogeneous Networks. 10 Hrs 25%

IV Multimedia Information Networks in Social Media: Network of Personal Photo Albums, Network of Geographical Information, Inference Methods. Social Tagging and Applications: Tags: Why and What, Tagging System Design, Tag analysis, Visualization of Tags, Applications of Tags. 10 Hrs 25%
Course No. | Course Name | L-T-P-Credits | Year of Introduction
--- | --- | --- | ---
06 CS 6 06 8 | MINI PROJECT | 0-0-4-2 | 2015

**SYLLABUS:**
The mini project is designed to develop practical ability and knowledge about tools/techniques in order to solve the actual problems related to the industry, academic institutions or similar area. Students can take up any application level/system level experimental design / implementation tasks of relatively minor intensity and scope as compared to the major-project, pertaining to a relevant domain of study, preferably based on security. Projects can be chosen either from the list provided by the faculty or in the field of interest of the student. At the end of each phase, presentation and demonstration of the project should be conducted, which will be evaluated by a panel of examiners. A detailed project report duly approved by the guide in the prescribed format should be submitted by the student for final evaluation.

*Publishing the work in Conference Proceedings/ Journals with National/ International status with the consent of the guide will carry an additional weightage in the review process.*
<table>
<thead>
<tr>
<th>Course No.</th>
<th>Course Name</th>
<th>L-T-P-Credits</th>
<th>Year of Introduction</th>
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<tbody>
<tr>
<td>06 CS 6 07 8</td>
<td>DIGITAL IMAGE PROCESSING LAB II</td>
<td>0-0-2-1</td>
<td>2015</td>
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</table>

**COURSE OBJECTIVES:**
- To learn about compression and coding schemes.

**SYLLABUS:** This lab is divided into two sections:
(a) Advanced Digital Image Processing
(b) Data Compression

- Students are required to do experiments on both sections compulsory and use of open-source tools is encouraged to do the experiments.

### Advanced Digital Image Processing
- Cycle 1: Image Segmentation
- Cycle 2: Colour Image Processing
- Cycle 3: Wavelet based Image Processing
- Cycle 4: Object Recognition and Neural Network Simulation.

### Data Compression
- RLE
- Huffman and Adaptive Huffman Coding
- Arithmetic and adaptive Arithmetic Coding
- LZ77, LZSS, LZ78, LZW
- Scalar and Vector Quantisation
- Block Matching, BTC and Block Decomposition
- JPEG

**Laboratory Softwares to be used**
- GNU Octave 3.8 or higher
- Scilab 5.5 or higher
- Choice of any open-source tool with the prior permission obtained from the department.

**EXPECTED OUTCOME:**
Students will be able to:
- Gain practical knowledge in Digital Image Processing which will pave the way to do their projects.

**REFERENCES:**
SEMESTER 3
Course No. 06 CS 7 11 7
Course Name NATURAL LANGUAGE PROCESSING
L-T-P-Credits 3-0-0-3
Year of Introduction 2015

PREREQUISITES: Basics of language processors, grammars.

COURSE OBJECTIVES:
- To uncover the concepts of natural language processing, grammars, parsing and ambiguity resolution in grammars.

SYLLABUS:

EXPECTED OUTCOME:
After the completion of this course the student will be able to:
- Will understand concept of natural language processing, it's applications, different parsers, grammars and methods for ambiguity resolution.

TEXT BOOKS:

REFERENCES:

COURSE PLAN

<table>
<thead>
<tr>
<th>Module</th>
<th>Contents</th>
<th>Hours</th>
<th>Sem Exam Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>Introduction to Natural Language Understanding: The study of Language, Applications of NLP, Evaluating Language Understanding Systems, Different levels of Language Analysis, Representations and Understanding, Organization of Natural language Understanding Systems, Linguistic Background: An outline of English syntax</td>
<td>10 Hrs</td>
<td>25%</td>
</tr>
<tr>
<td>II</td>
<td>Grammars and Parsing: Grammars and sentence Structure, Top-Down and Bottom-Up Parsers, Transition Network Grammars, Top-Down Chart Parsing, Feature Systems and Augmented Grammars: Basic Feature system for English, Morphological Analysis and the Lexicon, Parsing with Features, Augmented Transition Networks</td>
<td>12 Hrs</td>
<td>25%</td>
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<tr>
<td>III</td>
<td>Grammars for Natural Language: Auxiliary Verbs and Verb Phrases, Movement Phenomenon in Language, Handling</td>
<td>12 Hrs</td>
<td>25%</td>
</tr>
</tbody>
</table>

questions in Context-Free Grammars, Hold mechanisms in ATNs. Human preferences in Parsing, Encoding uncertainty, Deterministic Parser.
### Course No. 06 CS 7 21 7

**Course Name** DIGITAL VIDEO PROCESSING  
**L-T-P-Credits** 3-0-0-3  
**Year of Introduction** 2015

**PREREQUISITES:**
Basic video understanding and knowledge about Digital Image Processing

**COURSE OBJECTIVES:**
- To understand the fundamental concepts of Video processing like Video Enhancement and Restoration, Motion tracking and video streaming.

**SYLLABUS:**

**EXPECTED OUTCOME:**
After the completion of this course the student will be able to:
- Get knowledge to perform operations on videos.

**TEXT BOOK:**

**REFERENCES:**

**COURSE PLAN**

<table>
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<tbody>
<tr>
<td>I</td>
<td>Introduction to video processing: Principles of colour video processing, Video display, Composite versus component video, Progressive and interlaced scan, Sampling of video signals. Motion Estimation and Detection, Basic of video coding: Categorization of video coding schemes, Information Theory for source coding, Binary encoding, Scalar quantization, Vector quantization, Wave form based coding, Block-based transform coding, Predictive coding, Temporal prediction and transform coding</td>
<td>8 Hrs</td>
<td>25%</td>
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<tr>
<td>II</td>
<td>Video Enhancement and Restoration, Video Quality Assessment, Video Segmentation.</td>
<td>12 Hrs</td>
<td>25%</td>
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<tr>
<td>III</td>
<td>Tracking: Motion Tracking in Video, Optimisation: Pel-Recursive Methods, Bayesian Methods. Video Surveillance.</td>
<td>12 Hrs</td>
<td>25%</td>
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<tr>
<td>IV</td>
<td>Streaming video over the internet and wireless IP networks: Architecture for video streaming systems,</td>
<td>10 Hrs</td>
<td>25%</td>
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<tr>
<td>Video compression, Application layer QoS control for streaming video, Continuous media Distribution services, Streaming servers, Media synchronization, Protocols for streaming video, Streaming video over wireless IP networks.</td>
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</table>
Course No. | Course Name | L-T-P-Credits | Year of Introduction |
---|---|---|---|
06 CS 7 31 7 | GIS AND REMOTE SENSING | 3-0-0-3 | 2015 |

**PREREQUISITES:** Basic concepts in physics

**COURSE OBJECTIVES:**
The Student will be able to:
- Get a foundation in the fundamentals of with image processing methods and techniques as applied in solving environmental and urban problems and application of GIS methods and techniques in solving practical problems.

**SYLLABUS:**

**EXPECTED OUTCOME:**
Students who successfully complete this course will have demonstrated an ability to understand aerospace remote sensing foundations and the use of remote sensor data and image interpretation and processing techniques for environmental applications.

**TEXT BOOKS:**

**REFERENCES:**
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<tbody>
<tr>
<td>II</td>
<td>Data Display and Cartography: Cartographic Symbolization, Types of maps, Typography, Map Design, Map Production, Data Exploration, Attribute data Query, Spatial Data Query, Raster Data Query, Geographic Visualization. Vector Data Analysis, Raster Data Analysis. Digital Terrain Modelling- approaches to digital terrain data, Acquisition of digital terrain data and – Data Analysis, Processing and Visualization- Applications of digital terrain models.</td>
<td>11 Hrs</td>
<td>25%</td>
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<tr>
<td>IV</td>
<td>Data fusion related to GIS and remote sensing- Why GIS remote sensing fusion, Problems in GIS- remote sensing data fusion, Present and Future solutions. Global Positioning System (GPS), Image registration and Multi Image fusion, Image Rectification, Thematic Classification- Classification Process, Feature Extraction, Training the Classifier, Subpixel Classification, Hyper spectral Image analysis. Case Studies in GIS, GIS design, Research Areas in GIS, Familiarization with any GIS software.</td>
<td>10 Hrs</td>
<td>25%</td>
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<td>Course No.</td>
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<tr>
<td>06 CS 7 12 7</td>
<td>IMAGING AND MULTIMEDIA SYSTEM</td>
<td>3-0-0-3</td>
<td>2015</td>
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</table>

**PREREQUISITES:**
Basics of multimedia system.

**COURSE OBJECTIVES:**
The Student will be able to:
- To equip with fundamental knowledge of digital media system.

**SYLLABUS:**
Introduction to Multimedia-Data and File Format Standards-Input and Output Technologies-Distributed Multimedia systems

**EXPECTED OUTCOME:**
Students who successfully complete this course will have demonstrated with an ability to analyze different media and design issues related to multimedia system.

**TEXT BOOKS:**

**REFERENCES:**

**COURSE PLAN**

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<td>11 Hrs</td>
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<td>10 Hrs</td>
<td>25%</td>
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<tr>
<td><strong>IV</strong></td>
<td>Distributed Multimedia systems: Architectures and issues for Distributed Multimedia systems Synchronization, and QOS Architecture, The role of Standards, A frame work for Multimedia systems Operating systems Support for Continuous Media Applications Limitation of work station Operating systems, New OS support, Experiments Using Real Time Mach Goals of Multimedia Systems services, Multimedia systems services Architecture, Media stream protocol Multimedia Devices, Presentation Services, and the User Interface. Client control of continuous multimedia, Device control, Temporal coordination and composition, toolkits, hyper applications.</td>
<td></td>
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<td>10 Hrs</td>
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</table>
PREREQUISITES:
Basics of digital image processing.

COURSE OBJECTIVES:
The Student will be able to:-
- Get an overview on medical image techniques and analysis.
- Develop create an understanding of medical image modalities, storage, segmentation and registration

SYLLABUS:

EXPECTED OUTCOME:
Students who successfully complete this course will have demonstrated an ability to familiarize principles of different imaging modalities, storage applications, segmentation techniques and high level image processing registration.

TEXT BOOK:

REFERENCES:

COURSE PLAN

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<tr>
<td>I</td>
<td>Medical Image Processing: Introduction to medical imaging, importance, applications, trends, challenges; Medical Image Formation Principles: X-Ray and Computed Tomography(CT) imaging, Basic principles of CT, Imaging Modalities: Magnetic Resonance Imaging (MRI) Mathematics of MR, spin physics, NMR spectroscopy, imaging principles, Nuclear Imaging- positron emission tomography (PET), single photon emission Tomography (SPECT), Ultrasound Imaging, mathematical principles, applications.</td>
<td>11 Hrs</td>
<td>25%</td>
</tr>
<tr>
<td>II</td>
<td>Medical Image Storage: Archiving and Communication Systems and Formats Picture archiving and communication</td>
<td>11 Hrs</td>
<td>25%</td>
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system (PACS), Formats -DICOM, Radiology Information Systems (RIS) and Hospital Information Systems (HIS); Medical Image Visualiza
tion: Fundamentals of visualization, surface and volume rendering/visualiza
tion.

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<tr>
<th>III</th>
<th>Medical Image Segmentation: Histogram-based methods, Region growing, watersheds, Multispectral Techniques, Segmentation by Fuzzy clustering methods and issues, Segmentation with Neural Networks, Segmentation with deformable models.</th>
<th>10 Hrs</th>
<th>25%</th>
</tr>
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<tr>
<td>IV</td>
<td>Medical Image Registration: Introduction, Intensity-based methods, Joint histograms, Information theory measures, cost functions, clinical applications of Image registration; Medical Image Search and Retrieval: Current technology in medical image search, content-based image retrieval, new trends; Applications: Image Guided Surgery, Image Guided Therapy, Computer Aided Diagnosis/Diagnostic Support Systems</td>
<td>10 Hrs</td>
<td>25%</td>
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</tbody>
</table>
Course No. | Course Name                     | L-T-P-Credits | Year of Introduction |
------------|---------------------------------|---------------|----------------------|
06 CS 7 32 7 | HIGH PERFORMANCE COMPUTING     | 3-0-0-3       | 2015                 |

PREREQUISITES:
Basics of parallel computing.

COURSE OBJECTIVES:
The Student will be able to:-
- Uncover the fundamental concepts of parallel architecture, their algorithms.
- Develop create an overview of cluster based distributed computing, GPUs and CUDA architecture and applications.

SYLLABUS:

EXPECTED OUTCOME:
Students who successfully complete this course will have demonstrated an ability to
- To understand an overview of parallel architecture, GPUs and CUDA systems, their architecture and applications.

TEXT BOOK:

REFERENCES:
6. NVIDIA CUDA C- Programming Guide.
7. CUDA C- Best Practices Guide, NVIDIA.

COURSE PLAN

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<tr>
<td>06 CS 7 03 7</td>
<td>SEMINAR</td>
<td>0-0-2-2</td>
<td>2015</td>
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</table>

**COURSE OBJECTIVE:**
- To introduce the students to research, understand research papers and prepare presentation material
- To understand cutting edge technology in the chosen area
- To improve oral communication skills through presentation
- To prepare original technical write up on the presentation

**SYLLABUS:**
The aim of this course is to introduce the student to research, and to acquaint him with the process of presenting his work through seminars and technical reports. Students have to register for the seminar and select a topic in consultation with any faculty member offering courses for the programme. The student is expected to do an extensive literature survey and analysis in an area related to *Image Processing*. The study should preferably result in design ideas, designs, algorithms, and theoretical contributions in the form of theorems and proofs, new methods of proof, new techniques or heuristics with analytical studies, implementations
and analysis of results.

The presentation shall be of 30 minutes duration and a committee with the Head of the Department as the chairman and two faculty members from the department as members shall evaluate the seminar based on the coverage of the topic, presentation and ability to answer the questions put forward by the committee.

Students shall individually prepare and submit a seminar report based on experimental study / industrial training on the corresponding topic, in the prescribed format given by the Department. The reference shall include standard journals (ACM/IEEE), conference proceedings and equivalent documents, reputed magazines and textbooks, technical reports and web based material, approved by the supervisor. The references shall be incorporated in the report following IEEE standards reflecting the state-of-the-art in the topic selected.

**EXPECTED OUTCOME:**
- Improvement in proficiency in English
- Improvement in presentation skills
- Improvement in analytical and reasoning ability
- Improvement in technical writing
Course No. | Course Name | L-T-P-Credits | Year of Introduction
---|---|---|---
06 CS 7 04 7 | PROJECT – PHASE I | 0-0-12-6 | 2015

SYLLABUS:

Every student should carry out project, related to areas of Information Security, under the supervision of a Supervisor(s). The project work shall commence in the third semester and shall be completed by the end of fourth semester. Candidates are required to undertake a suitable research project work; the topic shall be approved by a committee constituted by the Head of the concerned Department. Every student will be required to present the topic at the beginning of the Phase-I to illustrate the scope of the work and to finalize the topic. The third semester includes the design phase and the fourth semester includes the implementation and final thesis submission.

The student should report the status of their progress weekly to the concerned supervisor. Students should submit the project report at the end of the respective semesters, on dates announced by the college/department. Project evaluation will be based on presentations, viva voce, demonstration, review reports, design reports and final thesis. Progress of the project work is to be evaluated at the end of the third semester. For this a committee headed by the head of the department with two other faculty members in the area of the project, of which one shall be the project supervisor. If the project is done outside the college, the external supervisor associated with the student will also be a member of the committee.

Normally students are expected to do the project within the college. However they are permitted to do the project in an industry or in a government research institute under a qualified supervisor from that organization. This is only possible in the fourth semester and the topic of investigation should be in line with the project part planned in the 3rd semester. Student should apply for this through the project supervisor indicating the reason for this well in advance, preferably at the beginning of the 3rd semester.

Project evaluation marks shall be as follows:-

- Total marks for the Project: 150
- In the 3rd Semester: Marks:50
- Project Progress evaluation:
  - Progress evaluation by the Project Supervisor : 20 Marks
  - Presentation and evaluation by the committee : 30 Marks
SEMESTER 4
SYLLABUS:
The Phase II work shall be based on the work in Phase I. Normally students are expected to do the project within the college. However they are permitted to do the project in an industry or in a government research institute under a qualified supervisor from that organization; the topic of investigation should be in line with the project part planned in the 3rd semester. Student should apply for this through the project supervisor indicating the reason for this well in advance, preferably at the beginning of the 3rd semester. This application is to be vetted by a departmental committee constituted for the same by the Principal and based on the recommendation of the committee the student is permitted to do the project outside the college. The same committee should ensure the progress of the work periodically and keep a record of this. The application for this shall include the following:-

Topic of the Project, Project work plan in the 3rd Semester, Reason for doing the project outside, Institution/Organization where the project is to be done, External Supervisor Name, Designation , Qualification and Experience, Letter of consent of the External Supervisor as well as from the organization.

Final evaluation of the project will be taken up only on completion of the project in the fourth semester. This shall be done by a committee constituted for the purpose by the principal of the college. The concerned head of the department shall be the chairman of this committee. It shall have two senior faculty members from the same department, project supervisor and the external supervisor, if any, of the student and an external expert either from an academic/R&D organization or from Industry as members. Final project grading shall take into account the progress evaluation done in the third semester and the project evaluation in the fourth semester. If the quantum of work done by the candidate is found to be unsatisfactory, the committee may extend the duration of the project up to one more semester, giving reasons for this in writing to the student. Normally further extension will not be granted and there shall be no provision to register again for the project.

Project work is to be evaluated both in the third and the fourth semesters. Based on these evaluations the grade is finalized in the fourth semester.

Project evaluation marks shall be as follows:-

Total marks for the Project: 150
In the 4th Semester: Marks:100
  Project evaluation by the supervisor/s : 30 Marks
  Presentation& evaluation by the Committee : 40 Marks
  Evaluation by the External expert : 30 Marks

*Students are required to publish their work in reputed national/ International Journals/ Conference Proceedings etc which will carry weightage in final marks.*