WEB TECHNOLOGY AND ITS APPLICATIONS
[As per Choice Based Credit System (CBCS) scheme]
(Effective from the academic year 2016 -2017)

SEMESTER – VII

<table>
<thead>
<tr>
<th>Subject Code</th>
<th>IA Marks</th>
<th>Number of Lecture Hours/Week</th>
<th>Exam Marks</th>
<th>Total Number of Lecture Hours</th>
<th>Exam Hours</th>
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<tbody>
<tr>
<td>15CS71</td>
<td>20</td>
<td>04</td>
<td>80</td>
<td>50</td>
<td>03</td>
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</tbody>
</table>

CREDITS – 04

Course Objectives: This course will enable students to

- Illustrate the Semantic Structure of HTML and CSS
- Compose forms and tables using HTML and CSS
- Design Client-Side programs using JavaScript and Server-Side programs using PHP
- Infer Object Oriented Programming capabilities of PHP
- Examine JavaScript frameworks such as jQuery and Backbone

Module – 1

10 Hours

Module – 2
HTML Tables and Forms, Introducing Tables, Styling Tables, Introducing Forms, Form Control Elements, Table and Form Accessibility, Microformats, Advanced CSS: Layout, Normal Flow, Positioning Elements, Floating Elements, Constructing Multicolumn Layouts, Approaches to CSS Layout, Responsive Design, CSS Frameworks.

10 Hours

Module – 3

10 Hours

Module – 4
PHP Arrays and Superglobals, Arrays, $_GET and $_POST Superglobal Arrays, $_SERVER Array, $_Files Array, Reading/Writing Files, PHP Classes and Objects, Object-Oriented Overview, Classes and Objects in PHP, Object Oriented Design, Error Handling and Validation, What are Errors and Exceptions?, PHP Error Reporting, PHP Error and Exception Handling.

10 Hours

Module – 5

10 Hours

Course Outcomes: After studying this course, students will be able to

- Adapt HTML and CSS syntax and semantics to build web pages.
- Construct and visually format tables and forms using HTML and CSS
- Develop Client-Side Scripts using JavaScript and Server-Side Scripts using PHP to generate and display the contents dynamically.
- Appraise the principles of object oriented development using PHP
- Inspect JavaScript frameworks like jQuery and Backbone which facilitates developer to focus on core features.

**Question paper pattern:**
The question paper will have ten questions.
There will be 2 questions from each module.
Each question will have questions covering all the topics under a module.
The students will have to answer 5 full questions, selecting one full question from each module.

**Text Books:**

**Reference Books:**
| Module – 2 | Hardware Technologies: Processors and Memory Hierarchy, Advanced Processor Technology, Superscalar and Vector Processors, Memory Hierarchy Technology, Virtual Memory Technology. | 10 Hours |
| Module – 5 | Software for parallel programming: Parallel Models, Languages, and Compilers, Parallel Programming Models, Parallel Languages and Compilers, Dependence Analysis of Data Arrays, Parallel Program Development and Environments, Synchronization and Multiprocessing Modes, Instruction and System Level Parallelism, Instruction Level Parallelism, Computer Architecture, Contents, Basic Design Issues, Problem Definition, Model of a Typical Processor, Compiler-detected Instruction Level Parallelism, Operand Forwarding, Reorder | 10 Hours |
Course outcomes: The students should be able to:

- Explain the concepts of parallel computing and hardware technologies
- Compare and contrast the parallel architectures
- Illustrate parallel programming concepts

Question paper pattern
The question paper will have ten questions.
There will be 2 questions from each module.
Each question will have questions covering all the topics under a module.
The students will have to answer 5 full questions, selecting one full question from each module.

Text Books:

Reference Books:
# MACHINE LEARNING

[As per Choice Based Credit System (CBCS) scheme]
(Effective from the academic year 2016 -2017)

## SEMESTER – VII

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<thead>
<tr>
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<td>15CS73</td>
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**CREDITS – 04**

### Course Objectives:
This course will enable students to
- Define machine learning and problems relevant to machine learning.
- Differentiate supervised, unsupervised and reinforcement learning
- Perform statistical analysis of machine learning techniques.

### Module – 1
**Introduction:** Well posed learning problems, Designing a Learning system, Perspective and Issues in Machine Learning.
**Concept Learning:** Concept learning task, Concept learning as search, Find-S algorithm, Version space, Candidate Elimination algorithm, Inductive Bias.

**Text Book1, Sections:** 1.1 – 1.3, 2.1-2.5, 2.7

**Module – 2**
**Decision Tree Learning:** Decision tree representation, Appropriate problems for decision tree learning, Basic decision tree learning algorithm, hypothesis space search in decision tree learning, Inductive bias in decision tree learning, Issues in decision tree learning.

**Text Book1, Sections:** 3.1-3.7

**Module – 3**
**Artificial Neural Networks:** Introduction, Neural Network representation, Appropriate problems, Perceptrons, Backpropagation algorithm.

**Text book 1, Sections:** 4.1 – 4.6

**Module – 4**
**Bayesian Learning:** Introduction, Bayes theorem, Bayes theorem and concept learning, ML and LS error hypothesis, ML for predicting probabilities, MDL principle, Naive Bayes classifier, Bayesian belief networks, EM algorithm

**Text book 1, Sections:** 6.1 – 6.6, 6.9, 6.11, 6.12

**Module – 5**
**Evaluating Hypothesis:** Motivation, Estimating hypothesis accuracy, Basics of sampling theorem, General approach for deriving confidence intervals, Difference in error of two hypothesis, Comparing learning algorithms.
**Instance Based Learning:** Introduction, k-nearest neighbor learning, locally weighted regression, radial basis function, case-based reasoning.
**Reinforcement Learning:** Introduction, Learning Task, Q Learning

**Text book 1, Sections:** 5.1-5.6, 8.1-8.5, 13.1-13.3

### Course Outcomes:
After studying this course, students will be able to
- Identify the problems for machine learning. And select the either supervised,
unsupervised or reinforcement learning.

- Explain theory of probability and statistics related to machine learning
- Investigate concept learning, ANN, Bayes classifier, k nearest neighbor, Q.

**Question paper pattern:**

The question paper will have ten questions.
There will be 2 questions from each module.
Each question will have questions covering all the topics under a module.
The students will have to answer 5 full questions, selecting one full question from each module.

**Text Books:**


**Reference Books:**

2. Ethem Alpaydın, Introduction to machine learning, second edition, MIT press.
NATURAL LANGUAGE PROCESSING  
[As per Choice Based Credit System (CBCS) scheme]  
(Effective from the academic year 2016 -2017)  
SEMINER – VII  

<table>
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<th>Subject Code</th>
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<tbody>
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<td>15CS741</td>
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**Course objectives:** This course will enable students to  
- Learn the techniques in natural language processing.  
- Be familiar with the natural language generation.  
- Be exposed to Text Mining.  
- Understand the information retrieval techniques  

<table>
<thead>
<tr>
<th>Module – 1</th>
<th>Teaching Hours</th>
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</thead>
<tbody>
<tr>
<td><strong>Overview and language modeling:</strong> Overview: Origins and challenges of NLP-Language and Grammar-Processing Indian Languages- NLP Applications-Information Retrieval. Language Modeling: Various Grammar- based Language Models-Statistical Language Model.</td>
<td>8 Hours</td>
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</table>

<table>
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<tr>
<th>Module – 2</th>
<th>Teaching Hours</th>
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<table>
<thead>
<tr>
<th>Module – 3</th>
<th>Teaching Hours</th>
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</table>
| **Extracting Relations from Text: From Word Sequences to Dependency Paths:** Introduction, Subsequence Kernels for Relation Extraction, A Dependency-Path Kernel for Relation Extraction and Experimental Evaluation.  
**Mining Diagnostic Text Reports by Learning to Annotate Knowledge Roles:** Introduction, Domain Knowledge and Knowledge Roles, Frame Semantics and Semantic Role Labeling, Learning to Annotate Cases with Knowledge Roles and Evaluations.  
**A Case Study in Natural Language Based Web Search:** InFact System Overview, The GlobalSecurity.org Experience. | 8 Hours |

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<thead>
<tr>
<th>Module – 4</th>
<th>Teaching Hours</th>
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</thead>
</table>
**Automatic Document Separation:** A Combination of Probabilistic Classification and Finite-State Sequence Modeling: Introduction, Related Work, Data Preparation, Document Separation as a Sequence Mapping Problem, Results.  
**Evolving Explanatory Novel Patterns for Semantically-Based Text Mining:** Related Work, A Semantically Guided Model for Effective Text Mining. | 8 Hours |
<table>
<thead>
<tr>
<th>Module – 5</th>
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<tbody>
<tr>
<td><strong>Course outcomes:</strong> The students should be able to:</td>
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<tr>
<td>• Analyze the natural language text.</td>
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<tr>
<td>• Generate the natural language.</td>
</tr>
<tr>
<td>• Do Text mining.</td>
</tr>
<tr>
<td>• Apply information retrieval techniques.</td>
</tr>
<tr>
<td><strong>Question paper pattern:</strong></td>
</tr>
<tr>
<td>The question paper will have ten questions.</td>
</tr>
<tr>
<td>There will be 2 questions from each module.</td>
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<tr>
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<tr>
<td><strong>Text Books:</strong></td>
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<tr>
<td><strong>Reference Books:</strong></td>
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# CLOUD COMPUTING AND ITS APPLICATIONS

[As per Choice Based Credit System (CBCS) scheme]
(Effective from the academic year 2016-2017)

## SEMESTER – VII

<table>
<thead>
<tr>
<th>Subject Code</th>
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<td>15CS742</td>
<td>20</td>
<td>40</td>
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</table>

### CREDITS – 03

**Course objectives:** This course will enable students to

- Explain the fundamentals of cloud computing
- Illustrate the cloud application programming and aneka platform
- Contrast different cloud platforms used in industry

## Module – 1


<table>
<thead>
<tr>
<th>Module – 2</th>
<th>Teaching Hours</th>
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<td>8 Hours</td>
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## Module – 3


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<tr>
<td>Concurrent Computing</td>
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<tr>
<th>Module – 4</th>
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<tr>
<th>Module – 5</th>
<th>8 Hours</th>
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</table>

**Course outcomes:** The students should be able to:
- Explain cloud computing, virtualization and classify services of cloud computing
- Illustrate architecture and programming in cloud
- Describe the platforms for development of cloud applications and List the application of cloud.

**Question paper pattern:**
The question paper will have ten questions.
There will be 2 questions from each module.
Each question will have questions covering all the topics under a module.
The students will have to answer 5 full questions, selecting one full question from each module.

**Text Books:**

**Reference Books:**
**INFORMATION AND NETWORK SECURITY**  
[As per Choice Based Credit System (CBCS) scheme]  
(Effective from the academic year 2016 -2017)  
**SEMESTER – VII**

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<tr>
<td>Total Number of Lecture Hours</td>
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**Course objectives:** This course will enable students to

- Analyze the cryptographic processes.
- Summarize the digital security process.
- Indicate the location of a security process in the given system.

**Module – 1**


**Module – 2.**


**Module – 3**

Random number generation Providing freshness Fundamentals of entity authentication Passwords Dynamic password schemes Zero-knowledge mechanisms Further reading Cryptographic Protocols Protocol basics From objectives to a protocol Analysing a simple protocol Authentication and key establishment protocols

**Module – 4**

Key management fundamentals Key lengths and lifetimes Key generation Key establishment Key storage Key usage Governing key management Public-Key Management Certification of public keys The certificate lifecycle Public-key management models Alternative approaches

**Module – 5**

Cryptographic Applications Cryptography on the Internet Cryptography for wireless local area networks Cryptography for mobile telecommunications Cryptography for secure payment card transactions Cryptography for video broadcasting Cryptography for identity cards Cryptography for home users

**Course outcomes:** The students should be able to:

- Analyze the Digitals security lapses
- Illustrate the need of key management

**Question paper pattern:**

The question paper will have ten questions.
There will be 2 questions from each module.
Each question will have questions covering all the topics under a module.
The students will have to answer 5 full questions, selecting one full question from each module.
**Text Books:**

1. Information Security: Principles and Practice, 2nd Edition by Mark Stamp *Wiley*
2. Everyday Cryptography: Fundamental Principles and Applications Keith M. Martin *Oxford Scholarship Online: December 2013*

**Reference Books:**

### UNIX SYSTEM PROGRAMMING

[As per Choice Based Credit System (CBCS) scheme]
(Effective from the academic year 2016 -2017)

#### SEMESTER – VII

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<tr>
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**CREDITS – 03**

**Course objectives:** This course will enable students to

- Explain the fundamental design of the unix operating system
- Familiarize with the systems calls provided in the unix environment
- Design and build an application/service over the unix operating system

### Module – 1

**Teaching Hours**

| --- | --- |

### Module – 2

<table>
<thead>
<tr>
<th>UNIX Files and APIs: File Types, The UNIX and POSIX File System, The UNIX and POSIX File Attributes, Inodes in UNIX System V, Application Program Interface to Files, UNIX Kernel Support for Files, Relationship of C Stream Pointers and File Descriptors, Directory Files, Hard and Symbolic Links. UNIX File APIs: General File APIs, File and Record Locking, Directory File APIs, Device File APIs, FIFO File APIs, Symbolic Link File APIs.</th>
<th>8 Hours</th>
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### Module – 3

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### Module – 4

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### Module – 5

<table>
<thead>
<tr>
<th>Interprocess Communication : Overview of IPC Methods, Pipes, popen, pclose Functions, Coprocesses, FIFOs, System V IPC, Message Queues, Semaphores.</th>
<th>8 Hours</th>
</tr>
</thead>
</table>
## Course outcomes
The students should be able to:

- Ability to understand and reason out the working of Unix Systems
- Build an application/service over a Unix system.

## Question paper pattern:
The question paper will have ten questions.
There will be 2 questions from each module.
Each question will have questions covering all the topics under a module.
The students will have to answer 5 full questions, selecting one full question from each module.

## Text Books:


## Reference Books:

**SOFT AND EVOLUTIONARY COMPUTING**  
*As per Choice Based Credit System (CBCS) scheme*  
*(Effective from the academic year 2016 -2017)*  
**SEMESTER – VII**

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<td>3</td>
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**CREDITS – 03**

**Course objectives:** This course will enable students to
- Familiarize with the basic concept of soft computing and intelligent systems
- Compare with various intelligent systems
- Analyze the various soft computing techniques

**Module – 1**

**Introduction to soft computing:** ANN, FS, GA, SI, ES, Comparing among intelligent systems  
ANN: introduction, biological inspiration, BNN&ANN, classification, first Generation NN, perceptron, illustrative problems  
**Text Book 1:** Chapter 1: 1.1-1.8, Chapter 2: 2.1-2.6

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**Module – 2**

**Adaline, Medaline, ANN:** (2nd generation), introduction, BPN, KNN, HNN, BAM, RBF, SVM and illustrative problems  
**Text Book 1:** Chapter 2: 3.1, 3.2, 3.3, 3.6, 3.7, 3.10, 3.11

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**Module – 3**

**Fuzzy logic:** introduction, human learning ability, undecidability, probability theory, classical set and fuzzy set, fuzzy set operations, fuzzy relations, fuzzy compositions, natural language and fuzzy interpretations, structure of fuzzy inference system, illustrative problems  
**Text Book 1:** Chapter 5

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**Module – 4**

**Introduction to GA, GA, procedures, working of GA, GA applications, applicability, evolutionary programming, working of EP, GA based Machine learning classifier system, illustrative problems**  
**Text Book 1:** Chapter 7

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**Module – 5**

**Swarm Intelligent system:** Introduction, Background of SI, Ant colony system  
Working of ACO, Particle swarm Intelligence (PSO).  
**Text Book 1:** 8.1-8.4, 8.7

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**Course outcomes:** The students should be able to:
- Understand soft computing techniques
- Apply the learned techniques to solve realistic problems
- Differentiate soft computing with hard computing techniques

**Question paper pattern:**

The question paper will have ten questions.  
There will be 2 questions from each module.  
Each question will have questions covering all the topics under a module.  
The students will have to answer 5 full questions, selecting one full question from each module.
<table>
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</table>
**COMPUTER VISION AND ROBOTICS**  
[As per Choice Based Credit System (CBCS) scheme]  
(Effective from the academic year 2016 -2017)  
**SEMESTER – VII**

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**Course Objectives:** This course will enable students to

- Review image processing techniques for computer vision
- Explain shape and region analysis
- Illustrate Hough Transform and its applications to detect lines, circles, ellipses
- Contrast three-dimensional image analysis techniques, motion analysis and applications of computer vision algorithms

**Module – 1**

**CAMERAS:** Pinhole Cameras, **Radiometry – Measuring Light:** Light in Space, Light Surfaces, Important Special Cases, **Sources, Shadows, And Shading:** Qualitative Radiometry, Sources and Their Effects, Local Shading Models, Application: Photometric Stereo, Interreflections: Global Shading Models, **Color:** The Physics of Color, Human Color Perception, Representing Color, A Model for Image Color, Surface Color from Image Color.

**Module – 2**

**Linear Filters:** Linear Filters and Convolution, Shift Invariant Linear Systems, Spatial Frequency and Fourier Transforms, Sampling and Aliasing, Filters as Templates, **Edge Detection:** Noise, Estimating Derivatives, Detecting Edges, **Texture:** Representing Texture, Analysis (and Synthesis) Using Oriented Pyramids, Application: Synthesis by Sampling Local Models, Shape from Texture.

**Module – 3**

**The Geometry of Multiple Views:** Two Views, **Stereopsis:** Reconstruction, Human Stereopsis, Binocular Fusion, Using More Cameras, **Segmentation by Clustering:** What Is Segmentation?, Human Vision: Grouping and Gestalt, Applications: Shot Boundary Detection and Background Subtraction, Image Segmentation by Clustering Pixels, Segmentation by Graph-Theoretic Clustering.

**Module – 4**

**Segmentation by Fitting a Model:** The Hough Transform, Fitting Lines, Fitting Curves, Fitting as a Probabilistic Inference Problem, Robustness, **Segmentation and Fitting Using Probabilistic Methods:** Missing Data Problems, Fitting, and Segmentation, The EM Algorithm in Practice, **Tracking With Linear Dynamic Models:** Tracking as an Abstract Inference Problem, Linear Dynamic Models, Kalman Filtering, Data Association, Applications and Examples.

**Module – 5**

**Geometric Camera Models:** Elements of Analytical Euclidean Geometry, Camera Parameters and the Perspective Projection, Affine Cameras and Affine Projection Equations, **Geometric Camera Calibration:** Least-Squares Parameter Estimation, A Linear Approach to Camera Calibration, Taking Radial Distortion into Account, Analytical Photogrammetry, An Application: Mobile Robot Localization, **Model-Based Vision:** Initial Assumptions, Obtaining
Hypotheses by Pose Consistency, Obtaining Hypotheses by pose Clustering, Obtaining Hypotheses Using Invariants, Verification, Application: Registration In Medical Imaging Systems, Curved Surfaces and Alignment.

**Course outcomes:** The students should be able to:

- Implement fundamental image processing techniques required for computer vision
- Perform shape analysis
- Implement boundary tracking techniques
- Apply chain codes and other region descriptors
- Apply Hough Transform for line, circle, and ellipse detections.
- Apply 3D vision techniques.
- Implement motion related techniques.
- Develop applications using computer vision techniques.

**Question paper pattern:**
The question paper will have ten questions. There will be 2 questions from each module. Each question will have questions covering all the topics under a module. The students will have to answer 5 full questions, selecting one full question from each module.

**Text Books:**


**Reference Books:**

# DIGITAL IMAGE PROCESSING

[As per Choice Based Credit System (CBCS) scheme]
(Effective from the academic year 2016 -2017)

## SEMESTER – VII

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<thead>
<tr>
<th>Subject Code</th>
<th>IA Marks</th>
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<tr>
<td>15CS753</td>
<td>20</td>
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</table>

## CREDITS – 03

### Course objectives:
This course will enable students to
- Define the fundamental concepts in image processing
- Evaluate techniques followed in image enhancements
- Illustrate image segmentation and compression algorithms

### Module – 1
**Introduction**

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<th>Teaching Hours</th>
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### Module – 2
**Image Enhancement In The Spatial Domain:** Some Basic Gray Level Transformations, Histogram Processing, Enhancement Using Arithmetic/Logic Operations, Basics of Spatial Filtering, Smoothing Spatial Filters, Sharpening Spatial Filters, Combining Spatial Enhancement Methods.

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### Module – 3
**Image Enhancement In Frequency Domain:**
Introduction, Fourier Transform, Discrete Fourier Transform (DFT), properties of DFT, Discrete Cosine Transform (DCT), Image filtering in frequency domain.

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### Module – 4
**Image Segmentation:**
Introduction, Detection of isolated points, line detection, Edge detection, Edge linking, Region based segmentation- Region growing, split and merge technique, local processing, regional processing, Hough transform, Segmentation using Threshold.

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### Module – 5
**Image Compression:**
Introduction, coding Redundancy, Inter-pixel redundancy, image compression model, Lossy and Lossless compression, Huffman Coding, Arithmetic Coding, LZW coding, Transform Coding, Sub-image size selection, blocking, DCT implementation using FFT, Run length coding.

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<tr>
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<td>8 Hours</td>
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</table>

### Course outcomes:
The students should be able to:
- Explain fundamentals of image processing
- Compare transformation algorithms
- Contrast enhancement, segmentation and compression techniques

### Question paper pattern:
The question paper will have ten questions. There will be 2 questions from each module. Each question will have questions covering all the topics under a module. The students will have to answer 5 full questions, selecting one full question from each module.
<table>
<thead>
<tr>
<th><strong>Text Books:</strong></th>
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<table>
<thead>
<tr>
<th><strong>Reference Books:</strong></th>
</tr>
</thead>
</table>
STORAGE AREA NETWORKS
[As per Choice Based Credit System (CBCS) scheme]
(Effective from the academic year 2016 -2017)

<table>
<thead>
<tr>
<th>Subject Code</th>
<th>IA Marks</th>
<th>Exam Marks</th>
<th>Exam Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>15CS754</td>
<td>20</td>
<td>80</td>
<td>03</td>
</tr>
</tbody>
</table>

SEMESTER – VII

CREDITS – 03

Course objectives: This course will enable students to
- Evaluate storage architectures,
- Define backup, recovery, disaster recovery, business continuity, and replication
- Examine emerging technologies including IP-SAN
- Understand logical and physical components of a storage infrastructure
- Identify components of managing and monitoring the data center
- Define information security and identify different storage virtualization technologies

### Module – 1

**Teaching Hours**

<table>
<thead>
<tr>
<th>Storage System</th>
<th>Teaching Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Text Book-1 Ch1: 1.2 to 1.4, Ch2: 2.1, 2.3 to 2.5, Ch3: 3.1, 3.3 to 3.5, Ch4: 4.1 and 4.2</td>
<td></td>
</tr>
</tbody>
</table>

### Module – 2

**Teaching Hours**

<table>
<thead>
<tr>
<th>Storage Networking Technologies</th>
<th>Teaching Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fibre Channel Storage Area Networks: Components of FC SAN, FC connectivity, Fibre Channel Architecture, Zoning, FC SAN Topologies, Virtualization in SAN. IP SAN and FCoE: iSCSI, FCIP, FCoE. Network Attached Storage: Components of NAS, NAS I/O Operation, NAS File-Sharing Protocols, File-Level Virtualization, Object-Based Storage and Unified Storage: Object-Based Storage Devices, Content-Addressed Storage, Unified Storage.</td>
<td></td>
</tr>
<tr>
<td>Text Book-1 Ch5: 5.3, 5.4, 5.6, 5.9 to 5.11, Ch6: 6.1 to 6.3, Ch7: 7.4, 7.5, 7.7 and 7.9 Ch8: 8.1, 8.2 and 8.4</td>
<td></td>
</tr>
</tbody>
</table>

### Module – 3

**Teaching Hours**

<table>
<thead>
<tr>
<th>Backup, Archive and Replication</th>
<th>Teaching Hours</th>
</tr>
</thead>
</table>


Migration in a Virtualized Environment.

**Text Book-1 Ch10:** 10.5, 10.8, 10.10 to 10.13, **Ch11:** 11.1, 11.2, 11.4 and 11.8, **Ch12:** 12.2, 12.3 and 12.5

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### Module – 4

**Cloud Computing and Virtualization**

**Text Book-1 Ch13:** 13.1 to 13.8. **Text Book-2 Ch9:** 9.1 to 9.5 **Ch13:** 13.1 to 13.3

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### Module – 5

**Securing and Managing Storage Infrastructure**
Monitoring the Storage Infrastructure, Storage Infrastructure Management activities, Storage Infrastructure Management Challenges, Information Lifecycle management, Storage Tiering.

**Text Book-1 Ch14:** 14.1 to 14.5, **Ch15:** 15.1 to 15.3, 15.5 and 15.6

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### Course outcomes:
The students should be able to:

- Identify key challenges in managing information and analyze different storage networking technologies and virtualization
- Explain components and the implementation of NAS
- Describe CAS architecture and types of archives and forms of virtualization
- Illustrate the storage infrastructure and management activities

### Question paper pattern:
The question paper will have ten questions. There will be 2 questions from each module. Each question will have questions covering all the topics under a module. The students will have to answer 5 full questions, selecting one full question from each module.

### Text Books:
1. Information Storage and Management, Author: EMC Education Services, Publisher: Wiley ISBN: 9781118094839

### Reference Books:
NIL
MACHINE LEARNING LABORATORY
[As per Choice Based Credit System (CBCS) scheme]
(Effective from the academic year 2016 -2017)

SEMESTER – VII

Subject Code 15CSL76 IA Marks 20
Number of Lecture Hours/Week 01I + 02P Exam Marks 80
Total Number of Lecture Hours 40 Exam Hours 03

CREDITS – 02

Course objectives: This course will enable students to
1. Make use of Data sets in implementing the machine learning algorithms
2. Implement the machine learning concepts and algorithms in any suitable language of choice.

Description (If any):
1. The programs can be implemented in either JAVA or Python.
2. For Problems 1 to 6 and 10, programs are to be developed without using the built-in classes or APIs of Java/Python.
3. Data sets can be taken from standard repositories (https://archive.ics.uci.edu/ml/datasets.html) or constructed by the students.

Lab Experiments:
1. Implement and demonstrate the **FIND-S algorithm** for finding the most specific hypothesis based on a given set of training data samples. Read the training data from a .CSV file.
2. For a given set of training data examples stored in a .CSV file, implement and demonstrate the **Candidate-Elimination algorithm** to output a description of the set of all hypotheses consistent with the training examples.
3. Write a program to demonstrate the working of the decision tree based **ID3 algorithm**. Use an appropriate data set for building the decision tree and apply this knowledge to classify a new sample.
4. Build an Artificial Neural Network by implementing the **Backpropagation algorithm** and test the same using appropriate data sets.
5. Write a program to implement the **naïve Bayesian classifier** for a sample training data set stored as a .CSV file. Compute the accuracy of the classifier, considering few test data sets.
6. Assuming a set of documents that need to be classified, use the **naïve Bayesian Classifier** model to perform this task. Built-in Java classes/API can be used to write the program. Calculate the accuracy, precision, and recall for your data set.
7. Write a program to construct a **Bayesian network** considering medical data. Use this model to demonstrate the diagnosis of heart patients using standard Heart Disease Data Set. You can use Java/Python ML library classes/API.
8. Apply **EM algorithm** to cluster a set of data stored in a .CSV file. Use the same data set for clustering using **k-Means algorithm**. Compare the results of these two algorithms and comment on the quality of clustering. You can add Java/Python ML library classes/API in the program.
9. Write a program to implement the **k-Nearest Neighbour algorithm** to classify the iris data set. Print both correct and wrong predictions. Java/Python ML library classes can be used for this problem.
10. Implement the non-parametric **Locally Weighted Regression algorithm** in order to fit data points. Select appropriate data set for your experiment and draw graphs.
<table>
<thead>
<tr>
<th>Study Experiment / Project:</th>
<th>NIL</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Course outcomes:</strong> The students should be able to:</td>
<td></td>
</tr>
<tr>
<td>1. Understand the implementation procedures for the machine learning algorithms.</td>
<td></td>
</tr>
<tr>
<td>2. Design Java/Python programs for various Learning algorithms.</td>
<td></td>
</tr>
<tr>
<td>3. Apply appropriate data sets to the Machine Learning algorithms.</td>
<td></td>
</tr>
<tr>
<td>4. Identify and apply Machine Learning algorithms to solve real world problems.</td>
<td></td>
</tr>
</tbody>
</table>

**Conduction of Practical Examination:**
- All laboratory experiments are to be included for practical examination.
- Students are allowed to pick one experiment from the lot.
- Strictly follow the instructions as printed on the cover page of answer script.
- Marks distribution: Procedure + Conduction + Viva: 20 + 50 + 10 (80)

**Change of experiment is allowed only once and marks allotted to the procedure part to be made zero.**
WEB TECHNOLOGY LABORATORY WITH MINI PROJECT
[As per Choice Based Credit System (CBCS) scheme]
(Effective from the academic year 2016-2017)

<table>
<thead>
<tr>
<th>Subject Code</th>
<th>IA Marks</th>
<th>Exam Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>15CSL77</td>
<td>20</td>
<td>80</td>
</tr>
</tbody>
</table>

CREDITS – 02

Course objectives: This course will enable students to

1. Design and develop static and dynamic web pages.
2. Familiarize with Client-Side Programming, Server-Side Programming, Active server Pages.
3. Learn Database Connectivity to web applications.

Description (If any):
NIL

Lab Experiments:

PART A

1. Write a JavaScript to design a simple calculator to perform the following operations: sum, product, difference and quotient.
2. Write a JavaScript that calculates the squares and cubes of the numbers from 0 to 10 and outputs HTML text that displays the resulting values in an HTML table format.
3. Write a JavaScript code that displays text “TEXT-GROWING” with increasing font size in the interval of 100ms in RED COLOR, when the font size reaches 50pt it displays “TEXT-SHRINKING” in BLUE color. Then the font size decreases to 5pt.
4. Develop and demonstrate a HTML5 file that includes JavaScript script that uses functions for the following problems:
   a. Parameter: A string
   b. Output: The position in the string of the left-most vowel
   c. Parameter: A number
   d. Output: The number with its digits in the reverse order
5. Design an XML document to store information about a student in an engineering college affiliated to VTU. The information must include USN, Name, and Name of the College, Branch, Year of Joining, and email id. Make up sample data for 3 students. Create a CSS style sheet and use it to display the document.
6. Write a PHP program to keep track of the number of visitors visiting the web page and to display this count of visitors, with proper headings.
7. Write a PHP program to display a digital clock which displays the current time of the server.
8. Write the PHP programs to do the following:
   a. Implement simple calculator operations.
   b. Find the transpose of a matrix.
   c. Multiplication of two matrices.
   d. Addition of two matrices.
9. Write a PHP program named states.py that declares a variable states with value "Mississippi Alabama Texas Massachusetts Kansas". Write a PHP program that does the following:
   a. Search for a word in variable states that ends in xas. Store this word in element 0 of a list named statesList.
   b. Search for a word in states that begins with k and ends in s. Perform a case-insensitive comparison. [Note: Passing re.I as a second parameter to method compile performs a case-insensitive comparison.] Store this word in element 1 of statesList.
   c. Search for a word in states that begins with M and ends in s. Store this word in element 2 of the list.
   d. Search for a word in states that ends in a. Store this word in element 3 of the list.

10. Write a PHP program to sort the student records which are stored in the database using selection sort.

**Study Experiment / Project:**

Develop a web application project using the languages and concepts learnt in the theory and exercises listed in part A with a good look and feel effects. You can use any web technologies and frameworks and databases.

**Note:**

1. In the examination each student picks one question from part A.

2. A team of two or three students must develop the mini project. However during the examination, each student must demonstrate the project individually.

3. The team must submit a brief project report (15-20 pages) that must include the following
   a. Introduction
   b. Requirement Analysis
   c. Software Requirement Specification
   d. Analysis and Design
   e. Implementation
   f. Testing

**Course outcomes:** The students should be able to:

- Design and develop dynamic web pages with good aesthetic sense of designing and latest technical know-how.
- Have a good understanding of Web Application Terminologies, Internet Tools other web services.
- Learn how to link and publish web sites

**Conduction of Practical Examination:**

1. All laboratory experiments from part A are to be included for practical examination.
2. Mini project has to be evaluated for 30 Marks.
3. Report should be prepared in a standard format prescribed for project work.
4. Students are allowed to pick one experiment from the lot.
5. Strictly follow the instructions as printed on the cover page of answer script.
6. Marks distribution:
   a) Part A: Procedure + Conduction + Viva: 10 + 35 + 5 = 50 Marks
   b) Part B: Demonstration + Report + Viva voce = 15 + 10 + 05 = 30 Marks
Change of experiment is allowed only once and marks allotted to the procedure part to be made zero.
**INTERNET OF THINGS TECHNOLOGY [As per Choice Based Credit System (CBCS) scheme] (Effective from the academic year 2016 -2017) SEMESTER – VIII**

<table>
<thead>
<tr>
<th>Subject Code</th>
<th>IA Marks</th>
<th>Number of Lecture Hours/Week</th>
<th>Exam Marks</th>
<th>Total Number of Lecture Hours</th>
<th>Exam Hours</th>
</tr>
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<tbody>
<tr>
<td>15CS81</td>
<td>20</td>
<td>04</td>
<td>80</td>
<td>50</td>
<td>03</td>
</tr>
</tbody>
</table>

**CREDITS – 04**

**Course Objectives:** This course will enable students to

- Assess the genesis and impact of IoT applications, architectures in real world.
- Illustrate diverse methods of deploying smart objects and connect them to network.
- Compare different Application protocols for IoT.
- Infer the role of Data Analytics and Security in IoT.
- Identifiesensor technologies for sensing real world entities and understand the role of IoT in various domains of Industry.

**Module – 1**


**Module – 2**


**Module – 3**


**Module – 4**


**Module – 5**

<table>
<thead>
<tr>
<th>Course Outcomes: After studying this course, students will be able to</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Interpret the impact and challenges posed by IoT networks leading to new architectural models.</td>
</tr>
<tr>
<td>• Compare and contrast the deployment of smart objects and the technologies to connect them to network.</td>
</tr>
<tr>
<td>• Appraise the role of IoT protocols for efficient network communication.</td>
</tr>
<tr>
<td>• Elaborate the need for Data Analytics and Security in IoT.</td>
</tr>
<tr>
<td>• Illustrate different sensor technologies for sensing real world entities and identify the applications of IoT in Industry.</td>
</tr>
</tbody>
</table>

**Question paper pattern:**

The question paper will have ten questions.
There will be 2 questions from each module.
Each question will have questions covering all the topics under a module.
The students will have to answer 5 full questions, selecting one full question from each module.

**Text Books:**


**Reference Books:**

<table>
<thead>
<tr>
<th>Subject Code</th>
<th>IA Marks</th>
<th>Exam Marks</th>
<th>Total Number of Lecture Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>15CS82</td>
<td>20</td>
<td>80</td>
<td>50</td>
</tr>
</tbody>
</table>

**CREDITS – 04**

**Course objectives:** This course will enable students to

- Understand Hadoop Distributed File system and examine MapReduce Programming
- Explore Hadoop tools and manage Hadoop with Ambari
- Appraise the role of Business intelligence and its applications across industries
- Assess core data mining techniques for data analytics
- Identify various Text Mining techniques

**Module – 1**

Hadoop Distributed File System Basics, Running Example Programs and Benchmarks, Hadoop MapReduce Framework, MapReduce Programming

10 Hours

**Module – 2**

Essential Hadoop Tools, Hadoop YARN Applications, Managing Hadoop with Apache Ambari, Basic Hadoop Administration Procedures

10 Hours

**Module – 3**

Business Intelligence Concepts and Application, Data Warehousing, Data Mining, Data Visualization

10 Hours

**Module – 4**

Decision Trees, Regression, Artificial Neural Networks, Cluster Analysis, Association Rule Mining

10 Hours

**Module – 5**

Text Mining, Naïve-Bayes Analysis, Support Vector Machines, Web Mining, Social Network Analysis

10 Hours

**Course outcomes:** The students should be able to:

- Master the concepts of HDFS and MapReduce framework
- Investigate Hadoop related tools for Big Data Analytics and perform basic Hadoop Administration
- Recognize the role of Business Intelligence, Data warehousing and Visualization in decision making
- Infer the importance of core data mining techniques for data analytics
- Compare and contrast different Text Mining Techniques

**Question paper pattern:**

The question paper will have ten questions. There will be 2 questions from each module. Each question will have questions covering all the topics under a module. The students will have to answer 5 full questions, selecting one full question from each module.

**Text Books:**


<table>
<thead>
<tr>
<th>Reference Books:</th>
</tr>
</thead>
</table>
### Course Information

**Subject Code:** 15CS831  
**IA Marks:** 20  
**Number of Lecture Hours/Week:** 3  
**Exam Marks:** 80  
**Total Number of Lecture Hours:** 40  
**Exam Hours:** 03  
**CREDITS – 03**

#### CREDITS – 03

**Course objectives:** This course will enable students to
- Introduce students the design, analysis, and implementation, of high performance computational science and engineering applications.
- Illustrate on advanced computer architectures, parallel algorithms, parallel languages, and performance-oriented computing.

#### Module – 1

**Introduction: Computational Science and Engineering:**  
Computational Science and Engineering Applications; characteristics and requirements, Review of Computational Complexity, Performance: metrics and measurements, Granularity and Partitioning, Locality: temporal/spatial/stream/kernel, Basic methods for parallel programming, Real-world case studies (drawn from multi-scale, multi-discipline applications)

#### Module – 2


#### Module – 3


#### Module – 4

**Parallel Programming:** Revealing concurrency in applications, Task and Functional Parallelism, Task Scheduling, Synchronization Methods, Parallel Primitives (collective operations), SPMD Programming (threads, OpenMP, MPI), I/O and File Systems, Parallel Matlabs (Parallel Matlab, Star-P, Matlab MPI), Partitioning Global Address Space (PGAS) languages (UPC, Titanium, Global Arrays)

#### Module – 5

**Achieving Performance:** Measuring performance, Identifying performance bottlenecks, Restructuring applications for deep memory hierarchies, Partitioning applications for heterogeneous resources, using existing libraries, tools, and frameworks

#### Course outcomes:
- Illustrate the key factors affecting performance of CSE applications, and
- Make mapping of applications to high-performance computing systems, and
- Apply hardware/software co-design for achieving performance on real-world applications

**Question paper pattern:**
The question paper will have ten questions.
There will be 2 questions from each module.
Each question will have questions covering all the topics under a module.
The students will have to answer 5 full questions, selecting one full question from each module.

**Text Books:**

**Reference Books:**
MODERN INTERFACE DESIGN
[As per Choice Based Credit System (CBCS) scheme]
(Effective from the academic year 2016-2017)

SEMESTER – VIII

Subject Code: 15CS832
IA Marks: 20
Number of Lecture Hours/Week: 03
Exam Marks: 80
Total Number of Lecture Hours: 40
Exam Hours: 03

CREDITS – 03

Course Objectives: This course will enable students

- To study the concept of menus, windows, interfaces.
- To study about business functions.
- To study the characteristics and components of windows and the various controls for the windows.
- To study about various problems in window design with text, graphics.
- To study the testing methods.

<table>
<thead>
<tr>
<th>Module –1</th>
<th>Teaching Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>The User Interface-Introduction, Overview, The importance of user interface – Defining the user interface, The importance of Good design, Characteristics of graphical and web user interfaces, Principles of user interface design.</td>
<td>08 Hours</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Module –2</th>
<th>Teaching Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>The User Interface Design process- Obstacles, Usability, Human characteristics in Design, Human Interaction speeds, Business functions-Business definition and requirement analysis, Basic business functions, Design standards.</td>
<td>08 Hours</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Module –3</th>
<th>Teaching Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>System menus and navigation schemes- Structures of menus, Functions of menus, Contents of menus, Formatting of menus, Phrasing the menu, Selecting menu choices, Navigating menus, Kinds of graphical menus.</td>
<td>08 Hours</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Module –4</th>
<th>Teaching Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Windows - Characteristics, Components of window, Window presentation styles, Types of window, Window management, Organizing window functions, Window operations, Web systems, Characteristics of device based controls.</td>
<td>08 Hours</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Module –5</th>
<th>Teaching Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Screen based controls- Operable control, Text control, Selection control, Custom control, Presentation control, Windows Tests-prototypes, kinds of tests.</td>
<td>08 Hours</td>
</tr>
</tbody>
</table>

Course outcomes: The Students should be able to:

- Design the User Interface, design, menu creation, windows creation and connection between menus and windows.

Question paper pattern:
The question paper will have ten questions.
There will be 2 questions from each module.
Each question will have questions covering all the topics under a module.
The students will have to answer 5 full questions, selecting one full question from each module.

Text Book:
Reference Books:
NETWORK MANAGEMENT
[As per Choice Based Credit System (CBCS) scheme]
(Effective from the academic year 2016 -2017)

SEMESTER – VIII

<table>
<thead>
<tr>
<th>Subject Code</th>
<th>IA Marks</th>
<th>Exam Marks</th>
<th>CREDITS – 03</th>
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</thead>
<tbody>
<tr>
<td>15CS833</td>
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<tr>
<td>Number of Lecture Hours/Week</td>
<td>3</td>
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</tr>
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<td>Total Number of Lecture Hours</td>
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<td></td>
<td></td>
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</tbody>
</table>

Course objectives: This course will enable students to

- To understand the need for interoperable network management.
- To learn to the concepts and architecture behind standards based network management.
- To understand the concepts and terminology associated with SNMP and TMN
- To understand network management as a typical distributed application

Module – 1


Module – 2

Basic Foundations: Standards, Models, and Language: Network Management Standards, Network Management Model, Organization Model, Information Model – Management Information Trees, Managed Object Perspectives, Communication Model; ASN.1- Terminology, Symbols, and Conventions, Objects and Data Types, Object Names, An Example of ASN.1 from ISO 8824; Encoding Structure; Macros, Functional Model.

Module – 3


Module – 4

Broadband Access Networks, Broadband Access Technology; HFCT

<table>
<thead>
<tr>
<th></th>
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<th>Teaching Hours</th>
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<tbody>
<tr>
<td></td>
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<td>8 Hours</td>
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<th></th>
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<th>8 Hours</th>
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<td></td>
<td></td>
<td>8 Hours</td>
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</tbody>
</table>

Module – 5


Course outcomes: The students should be able to:
• Analyze the issues and challenges pertaining to management of emerging network technologies such as wired/wireless networks and high-speed internets.
• Apply network management standards to manage practical networks
• Formulate possible approaches for managing OSI network model.
• Use on SNMP for managing the network
• Use RMON for monitoring the behavior of the network
• Identify the various components of network and formulate the scheme for the managing them

Question paper pattern:
The question paper will have ten questions.
There will be 2 questions from each module.
Each question will have questions covering all the topics under a module.
The students will have to answer 5 full questions, selecting one full question from each module.

Text Books:

Reference Books:
### Course objectives:
This course will enable students to
- Explain the basic system concept and definitions of system;
- Discuss techniques to model and to simulate various systems;
- Analyze a system and to make use of the information to improve the performance.

<table>
<thead>
<tr>
<th>Module – 1</th>
<th>Teaching Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Introduction:</strong> When simulation is the appropriate tool and when it is not appropriate, Advantages and disadvantages of Simulation; Areas of application, Systems and system environment; Components of a system; Discrete and continuous systems, Model of a system; Types of Models, Discrete-Event System Simulation Simulation examples: Simulation of queuing systems. <strong>General Principles, Simulation Software:</strong> Concepts in Discrete-Event Simulation. The Event-Scheduling / Time-Advance Algorithm, Manual simulation Using Event Scheduling</td>
<td>10 Hours</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Module – 2</th>
<th>Teaching Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Statistical Models in Simulation:</strong> Review of terminology and concepts, Useful statistical models, Discrete distributions, Continuous distributions, Poisson process, Empirical distributions. <strong>Queuing Models:</strong> Characteristics of queuing systems, Queueing notation, Long-run measures of performance of queuing systems, Long-run measures of performance of queuing systems cont…, Steady-state behavior of M /G/1 queue, Networks of queues.</td>
<td>10 Hours</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Module – 3</th>
<th>Teaching Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Random-Number Generation:</strong> Properties of random numbers; Generation of pseudo-random numbers, Techniques for generating random numbers, Tests for Random Numbers, <strong>Random-Variate Generation:</strong> Inverse transform technique Acceptance-Rejection technique.</td>
<td>10 Hours</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Module – 4</th>
<th>Teaching Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Input Modeling:</strong> Data Collection; Identifying the distribution with data, Parameter estimation, Goodness of Fit Tests, Fitting a non-stationary Poisson process, Selecting input models without data, Multivariate and Time-Series input models. <strong>Estimation of Absolute Performance:</strong> Types of simulations with respect to output analysis, Stochastic nature of output data, Measures of performance and their estimation, Contd..</td>
<td>10 Hours</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Module – 5</th>
<th>Teaching Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Measures of performance and their estimation, Output analysis for terminating simulations Continued.. Output analysis for steady-state simulations. <strong>Verification, Calibration And Validation:</strong> Optimization: Model building, verification and validation, Verification of simulation models, Verification of</td>
<td>10 Hours</td>
</tr>
</tbody>
</table>
simulation models, Calibration and validation of models, Optimization via Simulation.

<table>
<thead>
<tr>
<th>Course outcomes: The students should be able to:</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Explain the system concept and apply functional modeling method to model the activities of a static system</td>
</tr>
<tr>
<td>• Describe the behavior of a dynamic system and create an analogous model for a dynamic system;</td>
</tr>
<tr>
<td>• Simulate the operation of a dynamic system and make improvement according to the simulation results.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Question paper pattern:</th>
</tr>
</thead>
<tbody>
<tr>
<td>The question paper will have ten questions.</td>
</tr>
<tr>
<td>There will be 2 questions from each module.</td>
</tr>
<tr>
<td>Each question will have questions covering all the topics under a module.</td>
</tr>
<tr>
<td>The students will have to answer 5 full questions, selecting one full question from each module.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Text Books:</th>
</tr>
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<table>
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<tr>
<th>Reference Books:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Subject Code</td>
</tr>
<tr>
<td>--------------------</td>
</tr>
<tr>
<td>15CS84</td>
</tr>
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</table>

**CREDITS – 02**

**Course objectives:** This course will enable students to

**Description (If any):**

**Course outcomes:** The students should be able to:

**Evaluation of Internship:**
<table>
<thead>
<tr>
<th>Subject Code</th>
<th>15CSP85</th>
<th>IA Marks</th>
<th>100</th>
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<tbody>
<tr>
<td>Number of Lecture Hours/Week</td>
<td>06</td>
<td>Exam Marks</td>
<td>100</td>
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<tr>
<td>Total Number of Lecture Hours</td>
<td>--</td>
<td>Exam Hours</td>
<td>03</td>
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</table>

**CREDITS – 05**

**Course objectives:** This course will enable students to

**Description (If any):**

**Course outcomes:** The students should be able to:

**Conduction of Practical Examination:**
<table>
<thead>
<tr>
<th>Subject Code</th>
<th>15CSS86</th>
<th>IA Marks</th>
<th>100</th>
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<tr>
<td>Number of Lecture Hours/Week</td>
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<td>Exam Marks</td>
<td>--</td>
</tr>
<tr>
<td>Total Number of Lecture Hours</td>
<td>--</td>
<td>Exam Hours</td>
<td>--</td>
</tr>
</tbody>
</table>

**CREDITS – 02**

**Course objectives:** This course will enable students to

- 

**Description:**

- 

**Course outcomes:** The students should be able to:

- 

**Evaluation of seminar:**