REVISED STUDY AND EVALUATION SCHEME

FROM

1st TO IVth SEMESTER

MASTER OF ENGINEERING PROGRAMME

REGULAR AND MODULAR PROGRAMME

IN

COMPUTER SCIENCE AND ENGINEERING

OFFERED BY

PANJAB UNIVERSITY, CHANDIGARH
(Examination 2012-13)
1. Duration of the Programmes

i) For Regular M.Tech./M.E. Programmes

The normal duration of M.Tech./ME programmes including Thesis will be 2 academic years (4 semesters). The maximum period of completion of the programme including Thesis shall be 3 academic years (6 semesters).

ii) For Modular M.Tech. /M.E. Programmes

The normal duration of Modular M.Tech. / M.E. Programmes including Thesis will be 3 academic years, (6 spells, each spell of 5 weeks duration including Saturdays/ & Sundays). The maximum period of completion of the programme including Thesis shall be 5 academic years (10 spells).
### Scheme for ME CSE

#### First Semester

<table>
<thead>
<tr>
<th>Sr. No</th>
<th>Course No.</th>
<th>Course Title</th>
<th>Hours / Week</th>
<th>Credits</th>
<th>University External Marks</th>
<th>Internal Sessional Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>CSE 8111</td>
<td>Advance Algorithms</td>
<td>4</td>
<td>4</td>
<td>50</td>
<td>50</td>
</tr>
<tr>
<td>2.</td>
<td>CSE 8112</td>
<td>Network Technologies</td>
<td>4</td>
<td>4</td>
<td>50</td>
<td>50</td>
</tr>
<tr>
<td>3.</td>
<td>CSE 8123</td>
<td>Digital Image Processing</td>
<td>4</td>
<td>4</td>
<td>50</td>
<td>50</td>
</tr>
<tr>
<td>4.</td>
<td>CSE 8114</td>
<td>Advanced Computer Architecture</td>
<td>4</td>
<td>4</td>
<td>50</td>
<td>50</td>
</tr>
<tr>
<td>5.</td>
<td>CSE 8115</td>
<td>Database Technologies</td>
<td>4</td>
<td>4</td>
<td>50</td>
<td>50</td>
</tr>
<tr>
<td>6.</td>
<td>CSE 8150</td>
<td>Software Lab-I</td>
<td>5</td>
<td>3</td>
<td>---</td>
<td>100</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td></td>
<td><strong>25</strong></td>
<td><strong>23</strong></td>
<td><strong>250</strong></td>
<td><strong>350</strong></td>
</tr>
</tbody>
</table>

#### Second Semester

<table>
<thead>
<tr>
<th>Sr. No</th>
<th>Course No.</th>
<th>Course Title</th>
<th>Hours / Week</th>
<th>Credits</th>
<th>University External Marks</th>
<th>Internal Sessional Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>CSE 8221</td>
<td>Business Intelligence &amp; Mining</td>
<td>4</td>
<td>4</td>
<td>50</td>
<td>50</td>
</tr>
<tr>
<td>2</td>
<td>CSE 8212</td>
<td>Research Methodology</td>
<td>4</td>
<td>4</td>
<td>50</td>
<td>50</td>
</tr>
<tr>
<td>3</td>
<td>CSE 8213</td>
<td>Software Testing and Quality Management</td>
<td>4</td>
<td>4</td>
<td>50</td>
<td>50</td>
</tr>
<tr>
<td>4</td>
<td>CSE 8250</td>
<td>Software Lab-II</td>
<td>6</td>
<td>3</td>
<td>---</td>
<td>100</td>
</tr>
<tr>
<td>5</td>
<td>Branch Elective – I CSE 8215 Parallel and Distributed Computing CSE 8216 Network Security CSE 8217 Modeling &amp; Simulation</td>
<td>3</td>
<td>3</td>
<td>50</td>
<td>50</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Branch Elective –II CSE 8218 Open Source Software Design CSE 8219 Multimedia System Design CSE 8220 Soft Computing</td>
<td>3</td>
<td>3</td>
<td>50</td>
<td>50</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>CSE 8251</td>
<td>Research Seminar</td>
<td>2</td>
<td>2</td>
<td>--</td>
<td>100</td>
</tr>
<tr>
<td><strong>Total:</strong></td>
<td></td>
<td></td>
<td><strong>26</strong></td>
<td><strong>23</strong></td>
<td><strong>250</strong></td>
<td><strong>450</strong></td>
</tr>
</tbody>
</table>
### Third Semester

<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>Course No.</th>
<th>Course Title</th>
<th>Hours / Week</th>
<th>Credits</th>
<th>University External Marks</th>
<th>Internal Sessional Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Elective III CSE 8311 Natural Language Processing CSE 8312 Cloud Computing CSE 8313 Machine Vision CSE 8314 Information Retrieval CSE 8315 Wireless Networks</td>
<td>3</td>
<td>3</td>
<td>50</td>
<td>50</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Elective –IV CSE 8316 Project Management CSE 8317 Business Process Re-Engineering CSE 8318 Technology Management CSE 8319 Human Resources Development and Training Methods</td>
<td>3</td>
<td>3</td>
<td>50</td>
<td>50</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>CSE 8350 Thesis work preliminary</td>
<td>18</td>
<td>10</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td></td>
<td>24</td>
<td>16</td>
<td>100</td>
<td>100</td>
</tr>
</tbody>
</table>

### Fourth Semester

<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>Course No.</th>
<th>Course Title</th>
<th>Hours / Week</th>
<th>Credits</th>
<th>University External Marks</th>
<th>Internal Sessional Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>CSE 8450 Thesis/Dissertation</td>
<td>25</td>
<td>15</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td></td>
<td>25</td>
<td>15</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>


b) M. TECH/ME MODULAR PROGRAMMES

**Spell - 1**

<table>
<thead>
<tr>
<th>Code No.</th>
<th>Subject</th>
<th>Total</th>
<th>Theory</th>
<th>Sessional Marks</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Core Subject - 1</td>
<td>4</td>
<td>50</td>
<td>50</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>Core Subject - 2</td>
<td>4</td>
<td>50</td>
<td>50</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td><strong>Total</strong></td>
<td><strong>8</strong></td>
<td><strong>100</strong></td>
<td><strong>100</strong></td>
<td><strong>8</strong></td>
</tr>
</tbody>
</table>

**Spell - 2**

<table>
<thead>
<tr>
<th>Code No.</th>
<th>Subject</th>
<th>Total</th>
<th>Theory</th>
<th>Sessional Marks</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Core Subject -3</td>
<td>4</td>
<td>50</td>
<td>50</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>Core Subject - 4</td>
<td>4</td>
<td>50</td>
<td>50</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>Software Lab-1</td>
<td>5</td>
<td>--</td>
<td>100</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td><strong>Total</strong></td>
<td><strong>13</strong></td>
<td><strong>100</strong></td>
<td><strong>200</strong></td>
<td><strong>11</strong></td>
</tr>
</tbody>
</table>

**Spell - 3**

<table>
<thead>
<tr>
<th>Code No.</th>
<th>Subject</th>
<th>Total</th>
<th>Theory</th>
<th>Sessional Marks</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Core Subject -5</td>
<td>4</td>
<td>50</td>
<td>50</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>Core Subject - 6</td>
<td>4</td>
<td>50</td>
<td>50</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>Research Seminar</td>
<td>-</td>
<td>--</td>
<td>100</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td><strong>Total</strong></td>
<td><strong>8</strong></td>
<td><strong>100</strong></td>
<td><strong>200</strong></td>
<td><strong>10</strong></td>
</tr>
</tbody>
</table>

**Spell - 4**

<table>
<thead>
<tr>
<th>Code No.</th>
<th>Subject</th>
<th>Total</th>
<th>Theory</th>
<th>Sessional Marks</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Core Subject -7</td>
<td>4</td>
<td>50</td>
<td>50</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>Core Subject - 8</td>
<td>4</td>
<td>50</td>
<td>50</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>Software Lab-II</td>
<td>6</td>
<td>--</td>
<td>100</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td><strong>Total</strong></td>
<td><strong>14</strong></td>
<td><strong>100</strong></td>
<td><strong>200</strong></td>
<td><strong>11</strong></td>
</tr>
</tbody>
</table>

**Spell – 5**

<table>
<thead>
<tr>
<th>Code No.</th>
<th>Subject</th>
<th>Total</th>
<th>Theory</th>
<th>Sessional Marks</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Branch Elective Subject - 1</td>
<td>3</td>
<td>50</td>
<td>50</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>Branch Elective Subject - 2</td>
<td>3</td>
<td>50</td>
<td>50</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>Thesis work – Preliminary CSE 8350</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>10</td>
</tr>
<tr>
<td></td>
<td><strong>Total</strong></td>
<td><strong>06</strong></td>
<td><strong>100</strong></td>
<td><strong>100</strong></td>
<td><strong>16</strong></td>
</tr>
</tbody>
</table>
### Spell - 6

<table>
<thead>
<tr>
<th>Code No.</th>
<th>Subject</th>
<th>Total</th>
<th>Theory</th>
<th>Sessional Marks</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Elective Subject -3</td>
<td>3</td>
<td>50</td>
<td>50</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>Elective Subject – 4</td>
<td>3</td>
<td>50</td>
<td>50</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>CSE 8450 Thesis/Dissertation</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>15</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>06</td>
<td>100</td>
<td>100</td>
<td>21</td>
</tr>
</tbody>
</table>
ADVANCE ALGORITHMS

**Paper Code:** CSE 8111  
**Max. Marks (Final Exam):** 50  
**Max. Marks (Sessional Exam):** 50  
**Credits:** 4  
**L T P :** 4 0 0  
**Total Lectures:** 45

**Note:** Examiner shall set eight questions covering four questions from each section. Candidate will be required to attempt five questions, at least two from each section.

**Objectives:** This course will provide the in-depth knowledge of different algorithm design methodologies and the various research concepts involved

### SECTION – A

#### Models of Computation and Algorithms

#### Divide and Conquer, and Greedy Algorithm Design Methodologies
Introduction, Quick sort, Strassen’s matrix multiplication, Minimum spanning tree, Single source shortest path problem and their performance analysis.

#### Branch-and-Bound, and Lower Bound Theory
Introduction, 0-1 knapsack problem, Traveling salesman problem, comparison trees for sorting, searching and merging.

### SECTION – B

#### Dynamic Programming and Backtracking Algorithm Design Methodologies

#### Parallel Random Access Machine Algorithms
Introduction, computation model, fundamental techniques and algorithms, selection, sorting, merging, graph problems.

#### Advanced String Matching Algorithms
Naïve string matching algorithm, Robin-Karp algorithm, string matching with finite automata, Knuth-Morris-Pratt algorithm.

#### P, NP and Approximation Algorithms
Basic Concepts, Non Deterministic algorithms, NP-Complete and NP-hard classes, introduction to approximation, absolute approximations, polynomial time approximation schemes.

### Text Book:

1. Cormen, Leiserson, Rivest and Stein  
   : Introduction to algorithms, Prentice-Hall of INDIA.
2. Horowitz, Sahni and Rajsekaran  

### References:

1. Aho, Hopcroft, Ullman  
   : The Design and analysis of algorithms”, Pearson Education.
NETWORK TECHNOLOGIES

Paper Code: CSE 8112
L T P : 4 0 0
Max. Marks (Final Exam): 50
Max. Marks (Sessional Exam): 50
Max. Marks (CSE 111): 50
Credits: 4
Total Lectures: 45

Note: Examiner shall set eight questions covering four questions from each section. Candidate will be required to attempt five questions, selecting at least two from each section.

Objectives: This course is designed to discuss recent developments in various fields of networking, including but not limited to, routing, flow control, performance evaluation, transport protocols, application protocols, real-time protocols, and network architectures.

SECTION – A

Introduction:
Overview of Computer Networks, seven-layer architecture, ISO-OSI and TCP/IP reference models, MAC protocols for high-speed LAN, Gigabit Ethernet, Wireless LAN, ISDN, B-ISDN, ADSL.

IPv6:
Basic protocol, extensions and options, support for QoS, security, neighbor discovery, auto-configuration.

Flow and Congestion Control:
Model, Classification, Open-loop, Closed-loop and Hybrid flow control.

Quality of Service:
Techniques to improve QoS, Integrated services model and Differentiated Services Model.

SECTION – B

Mobility in networks:
Mobile IP network layers and related issues like Route Optimization, Handoff, and Security

Transport Layer:
Conventional TCP, TCP extensions for high-speed networks, New options in TCP

Network security at various layers:
Secure-HTTP, SSL, ESP, Authentication header, Key distribution protocols, Digital signatures, Digital certificates.

Traffic Management:
Economic Framework, Traffic Models, Traffic Classes, Scheduling, Admission Control, Peak Load Pricing

Ad Hoc Wireless Networks:
Introduction and issues in MAC, Routing, Transport Layer Protocols, Security and QoS

Text Books:
1. W. R. Stevens : TCP/IP Illustrated, Volume 1: The protocols, Addison Wesley
2. S. Keshav : An Engineering Approach to Computer Networking, Pearson Education
5. Raj Kamal : Mobile Computing, Oxford

References:
3. Requests for Comments (RFCs) & Internet Drafts, published by Internet Engineering Task Force (www.rfc-editor.org)
   IEEE Infocom;
5. Journals:
   IEEE Journal on Selected Areas in Communications
   IEEE Transactions on Communication
   ACM/IEEE Transactions on Networking

DIGITAL IMAGE PROCESSING
Note: Examiner shall set eight questions covering four questions from each section. Candidate will be required to attempt five questions, at least two from each section.

Objectives: To introduce the different low level and high level computer vision techniques. Students are also made aware of the different image processing techniques

SECTION – A

Introduction to Image Processing:
Digital Image representation, Sampling & Quantization, Steps in image Processing, Image acquisition, color image representation, (6)

Image Transformation, Filtering & Restoration:
Intensity transform functions, histogram processing, Spatial filtering, fourier transforms and its properties, frequency domain filters, Homomorphic Filtering, color models, Pseudo coloring, color transforms, Basics of Wavelet Transforms, Image Noise and Restorations, Inverse Filtering (12)

Image Compression:
Coding redundancy, Interpixel redundancy, Psychovisual redundancy, Huffman Coding, Arithmetic coding, Lossy compression techniques, JPEG Compression (6)

SECTION – B

Image Morphological Processing:
Introduction to basic operation on binary and grayscale images: Dilation, Erosion, Opening & Closing, Morphological Algorithms: Boundary & Region Extraction, Convex Hull, Thinning, Thickening,Skeletons, Pruning.

Image Segmentation, Representation & Descriptions:
Point, Line and Edge Detection, Thresholding, Edge and Boundary linking, Hough transforms, Region Based Segmentation, Contour following, Boundary representations, Region Representations, shape properties, Boundary Descriptors, Regional Descriptors, Texture representations, Object Descriptions (6)

Objective Recognition:
Patterns and Patterns classes, Recognition based on Decision Theoretic methods, Structural Methods (6) (9)

Text Book:

References:
ADVANCED COMPUTER ARCHITECTURE

Paper Code: CSE-8114 Max. Marks (Final Exam): 50
L T P : 4 0 0 Max. Marks (Sessional Exam): 50 Credits: 4
Total Lectures: 45

Note: Examiner shall set eight questions covering four questions from each section. Candidate will be required to attempt five questions by selecting at least two from each section.

Objectives: This course offers a good understanding of various functional units of a computer system and prepares the students to be in a position to design a basic computer system.

SECTION – A

Introduction to Parallel Computer Models:

Program and Networks Properties:

Principles of Scalable Performance:

Processors and Memory Hierarchy:

SECTION – B

Multiprocessors and Multicomputers:

Multivector and SIMD Computers:

Software for Parallel Programming:
Shared-variable Model, Message-passing Model, Data-parallel Model, Object-Oriented Model, Functional and Logic Models, Parallel Languages and Compilers: Language Features for Parallelism, Parallel Language Constructs, Optimizing Compilers for Parallelism.

Parallel Programming Environment:

Text Book:

References:
2. S.G. Akl : Design and Analysis of Parallel Algorithms, Prentice Hall,
4. S.K. Ghosal : A Practical Approach to Parallel Computing, Universities Press (India) Limited
DATABASE TECHNOLOGIES

Paper Code: CSE 8115
L T P : 4 0 0
Max. Marks (Final Exam): 50
Max. Marks (Sessional Exam): 50
Total Lectures: 45
Credits: 4

Note: Examiner will set eight questions covering four questions from each section. Candidates will be required to attempt five questions, selecting at least two from each section.

Objectives: This course offers a good understanding of emerging database technologies and prepares students to be in a position to design databases in variety of technologies like xml, object oriented etc.

SECTION – A

Introduction:
Database System Concepts and Architecture, Data Independence, Data Models, SQL: DDL, DML, DCL, Database Integrity, Normalization: 1NF, 2NF, 3NF, BCNF, 4NF, 5NF. (06)

Advanced Transaction Processing and Concurrency Control:
Transaction Concepts, Concurrency Control: Locking Methods, Timestamping Methods, Optimistic Methods for Concurrency Control, Concurrency Control in Distributed Systems. (06)

Object Oriented and Object Relational Databases:
Object Oriented Concepts with respect to Database Systems, Object Oriented Data Model, OODB, OODBMS, ODMG, ODL, OQL, ORDBMS, ORDBMS Design, ORDBMS Query Language. (05)

Parallel and Distributed Databases:
Parallel Databases, Distributed Databases, Differences between them, Architecture of Distributed Databases, Architecture of Parallel Databases, Key elements of Parallel Database Processing, Fragmentation, Replication and Allocation for distributed databases, Intra-query parallelism, Inter-query parallelism, Intra-operation parallelism, Inter-operation parallelism. (06)

SECTION – B

Backup and Recovery Techniques:
Backup and Recovery Concepts, Types of Database Failures, Types of Database Recovery, Recovery Techniques: Deferred Update, Immediate Update, Shadow Paging, Checkpoints, Buffer Management, Recovery Control in Distributed Systems. (05)

XML and Internet Databases:

Emerging Database Technologies:
Introduction to Deductive Database Systems, Temporal Databases, Multimedia Databases, Mobile Databases, Main Memory Databases, Spatial and Multidimensional Databases. (08)

Data Warehousing and Mining:
Introduction to OLAP, OLTP and differences between them, Data Warehouse, Data Warehouse Architecture, Data Marts, Data Mining, Data Mining Process, Knowledge Discovery. (05)

Text Book:

References:
SOFTWARE LAB-I

Paper Code: CSE 8150
L T P : 0 0 5

Max. Marks (Sessional Exam): 100
Credits: 03

Note: Students are required to perform at least 10 experiments/ case studies / programming assignments belonging to the semester theory subjects selecting at least two from each subject.
Paper Title: Business Intelligence & Mining

**Paper Code:** CSE 8221  
**Max. Marks (Final Exam):** 50  
**Credits:** 4

**L T P:** 4 0 0  
**Max. Marks (Sessional Exam):** 50  
**Total Lectures:** 45

**Note:** Examiner shall set eight questions covering four questions from each section. Candidate will be required to attempt five questions, at least two from each section.

**Objectives:** To impart knowledge of data warehousing and data mining for Business Processes.

### SECTION – A

**Introduction to Business Intelligence:** 6


**Basics of Data Integration (Extraction Transformation Loading):** 8

Concepts of data integration need and advantages of using data integration, introduction to common data integration approaches, introduction to ETL, Introduction to data quality, data profiling concepts and applications.

**Introduction to Multi-Dimensional Data Modeling:** 8

Introduction to data and dimension modeling, multidimensional data model, ER Modeling vs. multi dimensional modeling, concepts of dimensions, facts, cubes, attribute, hierarchies, star and snowflake schema, introduction to business metrics and KPIs, creating cubes using SSAS

### SECTION – B

**Basics of Enterprise Reporting** 5

Introduction to enterprise reporting, concepts of dashboards, balanced scorecards, and overall architecture.

**Data Mining Functionalities:** 10

Association rules mining, Mining Association rules from single level, multilevel transaction databases, Classification and prediction, Decision tree induction, Bayesian classification, k-nearest neighbor classification, Cluster analysis, Types of data in clustering, categorization of clustering methods

**Introduction of Mining Complex Data:** 8

Complex data objects, Mining spatial databases, Multimedia databases, Time Series and sequence databases, Text databases and World Wide Web

**Text Book:**

1. Mike Biere  
   : Business intelligence for the enterprise by Addison Wesley, August 2010

2. J.Han and M. Kamber  

**References:**

1. David Loshin  

2. Larissa Terpeluk Moss, Shaku Atre  
   : Business Intelligence roadmap by Addison Weseley

3. Cindi Howson  
   : Successful Business Intelligence: Secrets to making Killer BI Applications by Tata McGraw Hill
Note: Examiner shall set eight questions covering four questions from each section. Candidate will be required to attempt five questions, selecting at least two from each section.

SECTION – A

Introduction to Educational Research
Concept, types-basic, applied and action, Need for educational research (04)

Reviewing Literature
Need, Sources-Primary and Secondary, Purposes of Review, Scope of Review, Steps in conducting review (04)

Identifying and defining research problem
Locating, Analyzing stating and evaluating problem, Generating different types of hypotheses and evaluating them. (04)

Method of Research
Descriptive research design-survey, case study, content analysis, Ex-post Facto Research, Correlational and Experimental Research (06)

Sampling Techniques
Concept of population and sample’ sampling techniques-simple random sampling, stratified random sampling, systematic sampling and cluster sampling, snow ball sampling, purposive sampling, quota sampling techniques determining size of sample (06)

SECTION – B

Design and development of measuring instruments, Tests, questionnaires, checklists, observation schedules, evaluating research instruments, selecting a standardized test. (08)

Procedure of data collection
Aspects of data collection, coding data for analysis (04)

Statistical Methods of Analysis
Descriptive statistics: Meaning, graphical representations, mean, range and standard deviation, characteristics and uses of normal curve. (04)

Inferential statistics: t-test. Chi-square tests. Correlation (rank difference and product moment), ANOVA (one way)

Procedure for writing a research proposal
Purpose, types and components of research proposal (02)

Procedure for writing a research report
Audiences and types of research reports, Format of Research report and journal

Strategies for evaluating, research, disseminating and utilizing research- An Overview

3. CPSC: Developing Skills in Technican Education Research Modules 1 to 11 Singapore, Colombo Plan Staff College for Technician Education
SOFTWARE TESTING AND QUALITY MANAGEMENT

**Paper Code:** CSE 8213  
**Max. Marks (Final Exam):** 50  
**Credits: 4**

**L T P:** 4 0 0  
**Max. Marks (Sessional Exam):** 50  
**Total Lectures:** 45

*Note:* Examiner will set eight questions covering four questions from each section. Candidates will be required to attempt five questions, selecting at least two from each section.

**Objectives:** This course offers a good understanding of methods and techniques of software testing and quality management concepts and prepares students to be in a position to develop error free and quality software.

**SECTION – A**

**Introduction:**

**Software Quality:**

**Standards, Practices, Conventions and Metrics:**

**Risk and Software Configuration Management:**

**SECTION – B**

**Software Testing:**

**Testing Techniques for Conventional and Object Oriented Software:**

**Testing Process:**
Test Plan development, Requirement Phase Testing, Design Phase Testing, Program Phase Testing, Execute Test and Record Results.

**Testing Specialized Systems and Applications:**

**Text Books:**


**References:**

Note: Students are required to perform at least 10 experiments/case studies/programming assignments belonging to the semester theory subjects selecting at least two from each subject.
PARALLEL AND DISTRIBUTED COMPUTING

Paper Code: CSE 8215  Max. Marks (Final Exam): 50  Credits: 3
LTP: 3 0 0  Max. Marks (Sessional Exam): 50  Total Lectures: 45

Note: Examiner shall set eight questions covering four questions from each section. Candidate will be required to attempt five questions at least two questions from each section.

Objectives: Students will learn about programming paradigms used in parallel computation, about the organization of parallel systems, and about the application of programs and systems to solve interesting problems.

SECTION – A

Fundamental Issues  (8 hrs)
Basic issues and model Asynchrony, delay, failure concurrency, Communication topology, load balancing, scaling

Basic Approaches  (12 hrs)
Agreement and consensus problems, transactions, Algorithms for reduction, scans (also non-parallel issues). Analysis: work/time complexity.

SECTION – B

Shared Memory  (10 hrs)
Models and primitives, PRAM, VRAM, semaphores, spin-locks, Barriers’ implementations, NESL, Threads, distributed shared memory

Parallel Architectures  (3 hrs)
Survey of Architectures KSR, TMC, MasPar, workstation clusters

Algorithm Development and Analysis  (12 hrs)
Parallel algorithms, Connected components (dense and sparse case), Sorting, distributed algorithms, Clock synchronization

Text Book:


References:


2. Joseph Ja Ja : An Introduction to Parallel algorithms, Addison Wesley.

3. Patterson : Computer Architecture-Quantitative Analysis
NETWORK SECURITY

Paper Code: CSE 8216
Max. Marks (Final Exam): 50
Credits: 3
L T P : 3 0 0
Max. Marks (Sessional Exam): 50
Total Lectures: 45

Note: Examiner shall set eight questions covering four questions from each section. Candidate will be required to attempt five questions, at least two from each section.

Objectives: Upon completion of this course, participants will have gained knowledge of information security concepts and the following: Understanding of Information Security (InfoSec) principles and approaches
• Understanding of the basic components of InfoSec
• Understanding of basic InfoSec applications
• Ability to remain current with InfoSec literature
• Ability to progress to independent work in the field

SECTION – A


Symmetric Key Cryptography:

Asymmetric Key Cryptography:

Message Authentication:
Authentication requirements and functions. Message Authentication Code. Hash functions. Hash and MAC algorithms: MD5, Secure Hash Algorithm (SHA) and HMAC. (4 hrs)

SECTION – B

Digital Signatures and Authentication:

Email Security:
Pretty Good Privacy (PGP) operation. S/MIME specifications and functionality. (3 hrs)

IP Security:

Web Security:

Firewalls:
Design Principles, Characteristics, types of firewalls, firewall configuration, trusted system.’ Intrusion Defense Mechanisms: Intrusion Detection techniques. (2 hrs)

Text Book:
1. Stallings, Willam
2. Kahate, Atul
3. Tanenbaum, A.S.
4. Forouzan, B.A.
Note: Examiner shall set eight questions covering four questions from each section. Candidate will be required to attempt five questions, at least two from each section.

Objectives: This course should provide the students with good understanding of various techniques of Simulation. At the end of this course students will be having good knowledge of simulation concepts and simulation languages.

SECTION – A

Introduction:
What is modeling and simulation. application areas, definition and types of system, model and simulation, introduction to discrete-event and continuous simulation. (2 hrs)

Simulation Methods:
Discrete-event Simulation, Time advance Mechanisms, Components and organization of Discrete-event simulation, Flowchart of next-event time advance approach, Continuous Simulation, Random Number generation methods. (10 hrs)

Queuing Models:
Single server queueing system, introduction to arrival and departure time, flowcharts for arrival and departure routine. Event graphs of queueing model. Determining the events and variables. (8 hrs)

SECTION – B

Distribution Functions:
Stochastic activities, Discrete probability functions, Cumulative distribution function, Continuous probability functions. Generation of random numbers following binomial distribution, poisson distribution, continuous distribution, normal distribution, exponential distribution, uniform distribution. (10 hrs)

Programming in MATLAB:
Introduction, Branching statements, loops, functions, additional data types, plots, arrays, inputs/outputs etc. (7 hrs)

Programming in GPSS and C/C++:
Basic Introduction to Special Simulation Languages:-GPSS and Implementation of Queuing Models using C/C++. (6 hrs)

Introduction to Simulators: Introduction regarding features and usage of any Network simulator. (2 hrs)

Text Books:

References:
2. Rudra Pratap: “Getting Started with MATLAB 7”, Oxford University Press.
OPEN SOURCE SOFTWARE

**Paper Code:** CSE 8218  
**Max. Marks (Final Exam):** 50  
**Credits:** 3

**L T P :** 3 0 0  
**Max. Marks (Sessional Exam):** 50  
**Total Lectures:** 45

*Note:* Examiner shall set eight questions covering four questions from each section. Candidate will be required to attempt five questions, selecting at least two from each section.

**Objectives:** This course should provide the students with a fairly good knowledge and understanding of Open Source Software. After completion of this subject students should be able to use copyright free Open Source Software (OSS) products in research and collaborate in enhancement of these OSS products.

**SECTION – A**

**Introduction:**
Open Source origins, Differences among Open Source, freeware, proprietary and other software. Principle & Techniques of Open Source Development, Issues in Open Source Software Development

**Legal issues:**
Copyright and IPR, Open Source Licenses, Open Standards

**Open Source Operating Systems:** Linux's History and flavors, Installation of Linux: File system of linux, Network & packages Configuration, LILO, GRUB, Linux's fdisk. Overview of Linux structure, general purpose Linux commands; working with editor. Introduction to Open Office, Introduction to c/c++ programming in linux environment, shell programming

**SECTION – B**

**Internet - The technology:**
Open standards, W3C Protocols. Role of XML in Open Source Software Development

**Open Source Database:**
Introduction to MySQL, Database design and development using MySQL

**Open Source Web Development Tools:**
PHP syntax (variables, control structures, functions), File Handling: Uploading files. Using PHP to open, read, write and close external files and manipulate data. Security: Avoiding security pitfalls by careful coding.

Case Studies related to successful implementation of open source software.

**Text Book:**
2. Graham Glass, King Ablas: Unix for Programmers and Users, Pearson Education

**References:**
1. www.opensource.org
2. www.w3.org
MULTIMEDIA SYSTEM DESIGN

**Paper Code:** CSE 8219
**L T P:** 3 0 0
**Max. Marks (Final Exam):** 50 **Credits:** 3
**Max. Marks (Sessional Exam):** 50 **Total Lectures:** 45

**Note:** Examiner shall set eight questions covering four questions from each section. Candidate will be required to attempt five questions, at least two from each section.

**Objectives:** This Course introduces the multimedia systems and their applications to students. This course covers the different compression standards used in multimedia, some current technology and related issues.

**SECTION – A**

**Introduction:**
Multimedia and its types, Introduction to Hypermedia, Hyper Text, Multimedia Systems and their Characteristics, Challenges, Desirable Features, Components and Applications, Trends in Multimedia (4)

**Multimedia Technology:**

**Storage Media :**
Magnetic and Optical Media, RAID and its levels, Compact Disc and its standards, DVD and its standards, Multimedia Servers (4)

**Image, Graphics and Video:**

**SECTION – B**

**Video and Audio Compression :**

**Multimedia Communication:**

**System Design issues:**
Design considerations, Design steps, Feasibility analysis and Performance Evaluations, Different ways to analyze performance, Multimedia System architecture and different components (6)

**Text Book:**
1. Ralf Steinmetz and Klara Nahrstedt: Multimedia Computing Communications and Applications By Pearson Educactions

**References:**
SOFT COMPUTING

Paper Code: CSE 8220   Max. Marks (Final Exam): 50   Credits: 3
L T P : 3 0 0   Max. Marks (Sessional Exam): 50   Total Lectures: 45

Note: Examiner shall set eight questions covering four questions from each section. Candidate will be required to attempt five questions, at least two from each section.

Objectives: To get basic knowledge of different soft computing techniques. Different problem solving techniques and their implementations and applications are explained. Intelligent systems and learning techniques are introduced.

SECTION – A

Intelligent Agents:
Agents Behavior and Environments, Structure of Agents, Planning Problem, Planning with state Space Search, Partial order Planning, GRAPHPLAN, Planning in logic, Planning in non-deterministic domains, hierarchical task planning, Multi agent planning, execution.

Probabilistic Reasoning Fuzzy Logic:
Knowledge representation under uncertainty, Bayesian theorem, Bayesian Networks, Dempster Shafer theory, Representing vagueness, Fuzzy sets, operation on fuzzy sets, reasoning with fuzzy logic, Fuzzy Automata, Fuzzy Control methods, Fuzzy decision making, inference in temporal models, Hidden Markov Models, Kalman Filters

SECTION – B

Neural Networks:

Genetic Algorithms:

Text Book:

References:
3. Hagan, M.T., Demuth, Mark Beale : Neural Network Design By Cengage Learning
NATURAL LANGUAGE PROCESSING

**Paper Code:** CSE 8311  
**Max. Marks (Final Exam):** 50  
**LTP : 3 0 0**  
**Max. Marks (Sessional Exam):** 50  
**Credits: 3**  
**Total Lectures: 45**

*Note:* Examiner shall set eight questions covering four questions from each section. Candidate will be required to attempt five questions, at least two from each section.

**Objectives:** This course is designed to introduce students to the fundamental concepts and ideas in natural language processing (NLP), and to get them up to speed with current research in the area.

**SECTION – A**

**Introduction to NLP:** Introduction and Survey of applications, Levels of linguistic processing: morphology, syntax, semantics  
(4 hrs)

**Language processors and Understanding:** recognizers, transducers, parsers, generators, Language as a rule-based system, Language understanding as an inferential activity.  
(10 Hrs)

**Resources for NLP:** Introduction to lexicons and knowledge bases.  
(2hrs)

**Computational morphology:** lemmatization, Part-of-Speech Tagging, Finite-State Analysis.  
(5 Hrs)

**SECTION – B**

**Syntactic Processing:** Basic parsing: Top Down and Bottom Up parsing, Chart parsing, Deterministic parsing, Statistical parsing, Grammars with features, Unification Grammars, The Lexicon.  
(8 hrs)

**Semantic Interpretation:** Lexical semantics, Semantics and logical form, Resolving ambiguities: Word Sense Disambiguation, Linking syntax and semantics, Linking syntax and semantics in restricted domains  
(8 hrs)

**Context and World Knowledge:** Discourse: linguistic context, Ellipsis; World knowledge, Discourse structure Conversation and co-operation, Implementing "co-operative responses", Information Retrieval and Information Extraction  
(8 hrs)

**Text Book:**

1. Allen, J.  

**References:**

1. Covington, M.A  

2. Jurafsky, D. and Martin  
   : Speech and Language Processing, (2000), Prentice Hall

3. Gazdar, G. & Mellish, C.  
   : Natural Language Processing in Prolog: An Introduction to Computational Linguistics,(1989), Addison Wesley
Objectives: This course offers a good understanding of cloud computing concepts and prepares students to be in a position to design cloud based applications for distributed systems.

SECTION – A

Cloud Computing Basics
Cloud Computing Overview; Characteristics; Applications; Internet and Cloud; Benefits; Limitations; Challenges. (06)

Cloud Computing Services and Deployment Models
Infrastructure as a Service; Platform as a Service; Software as a Service; Private Cloud; Public Cloud; Community Cloud; Hybrid Cloud. (06)

Cloud Computing vs Other Computing Technologies
Overview of Grid, Peer-to-Peer, Pervasive and Utility Computing technologies; their characteristics and comparison between them. (06)

Accessing the Cloud
Hardware and Infrastructure requirements; Access Mechanisms: Web Applications, Web APIs, Web Browsers. (06)

SECTION – B

Cloud Storage and Cloud Standards
Overview; Storage as a Service; Cloud Storage Issues; Challenges; Standards. (07)

Security Issues
Securing the Cloud, Securing Data, Establishing identity and presence. (07)

Developing Applications
Major Players in Cloud Business; Overview of Service Oriented Architecture; Tools for developing cloud services and applications. (07)

Text Book:

References:

MACHINE VISION
Note: Examiner shall set eight questions covering four questions from each section. Candidate will be required to attempt five questions, at least two from each section.

Objectives: To introduce the different low level and high level computer vision techniques. Students are also made aware about the different pattern recognition approaches.

SECTION – A

Introduction:
Camera Models, & Views, basics of image processing, introductions to image segmentation and representation.

Early Vision:
Vision goals, Linear Filters, Edge Detection, Texture, The Geometry of Multiple Views, Stereopsis, Affine Structure from Motion, Projective Structure from Motion,

Mid Level Vision:
Segmentation By Clustering, Segmentation By Fitting a Model, Segmentation and Fitting Using Probabilistic Methods, Tracking with Linear Dynamic Models.

SECTION – B

High-level Vision: Geometric Methods
Model-Based Vision, Smooth Surfaces and their Outlines, Aspect Graphs, Range Data

High-level Vision: Probabilistic and Inferential Methods:
Finding Templates using Classifiers, Recognition by Relations between Templates, Geometric Templates from Spatial Relations

Applications:
Digital Libraries, Image Rendering, Medical applications, Human activity recognition, Face Recognition

Text Book:

References:
Information Retrieval

CSE 8314  Max. Marks (Final Exam): 50  Credits: 3
L T P: 3 0 0  Max. Marks (Sessional Exam): 50  Total Lectures: 45

Note: - Examiner shall set eight questions covering four questions from each section. Candidate will be required to attempt five questions, at least two from each section.

Objectives: This subject will provide the knowledge of various concepts involved in efficient information retrieval that leads to the development of efficient Web crawling techniques.

SECTION – A

Introduction
Introduction to Information Retrieval. Inverted indices and boolean queries. Query optimization. The nature of unstructured and semi-structured text.

The term vocabulary and postings lists

Dictionaries and tolerant retrieval

Index construction
Postings size estimation, sort-based indexing, dynamic indexing, positional indexes, n-gram indexes, distributed indexing, real-world issues.

SECTION – B

Scoring

Computing scores in a complete search system
Components of an IR system. Efficient vector space scoring. Nearest neighbor techniques, reduced dimensionality approximations, random projection.

Classification

Web Crawling
What makes the web different? Web search overview, web structure, the user, paid placement, search engine optimization. Web size measurement, Crawling and web indexes. Near-duplicate detection, Link analysis, Learning to rank, focused web crawler and its different architectures.

Text Book:
WIRELESS NETWORKS

Note: Examiner shall set eight questions covering four questions from each section. Candidate will be required to attempt five questions, at least two from each section.

Objectives: This challenging and comprehensive course provides a broad perspective on the wireless networks.

SECTION – A

Overview of wireless networks:
Introduction to wireless communication, architecture of wireless networks – 802.11, 2G, 3G, WLL, Wireless ATM, 802.16 and 802.20.

Global System for Mobile Communication (GSM):
Evolution, mobile service, system architecture, radio interface, protocols, handover and security.

Introduction to GPRS, EDGE and CDMA2000 technologies and architectures.

WiMAX Networks:
Uses, architecture, MAC layer, physical layer, spectrum allocation issues, comparison with WiFi and limitations.

SECTION – B

Mobile Ad hoc Networks (MANETs):
Introduction to Ad hoc wireless networks and sensor networks, applications of Ad hoc networks, Power management.

Media Access Control Protocols in Ad-hoc:
Issues in designing MAC protocols, design goals and classifications of MAC protocols.

Transport layer issues in Ad-hoc networks:
Design goals of transport layer protocols, classification of transport layer solutions and TCP over Ad hoc wireless networks.

QoS and Security issues in MANETs:
Network security requirements, issues and challenges in security and QoS provisioning, classifications of QoS solutions.

Routing Protocols:
Issues in designing protocols, classifications of routing protocols, operation of multicast routing protocols.

Introduction to simulators:
NS2 and Qualnet.

Text Book:
1. William Stallings
2. C. Siva Ram Murthy and B. S Manoj

References:
1. C. Demorais and D. P Aggarwal
2. Jochen Schiller
PROJECT MANAGEMENT

Paper Code: CSE 8316
L T P : 3 0 0

Max. Marks (Final Exam): 50
Max. Marks (Sessional Exam): 50
Credits: 3
Total Lectures: 45

Note: There are two sections in the syllabus. Paper setter will have to set 8 questions from them. Students must attempt 5 questions such that at least 2 from each section.

Objectives: The objective of the subject is to provide a strategic perspective and demonstrating means to manage projects. Emphasizing on various project aspects and problems related to them.

SECTION – A

Introduction to project management:
Introduction, Importance of software project management, Project and different types of project, What is management?, Problems with software projects, Environmental Appraisal with Projects, Requirement Specification, Management Control, Steps in project planning

Programme management and project evaluation:
Programme Management, Managing resources within programme, Strategic programme management, Aids to programme management, Evaluation / Assessment of projects, Cost-benefit Analysis, Cash flow forecasting, Cost-benefit evaluation techniques, Risk evaluation

Project approach and Software effort estimation:
Selection of an appropriate project technology, Choice of process model, Data Structure, Delivery Model, Basis for software estimation, Problem with over and under estimates, Estimation Techniques, Expert judgment, Albrecht Function Point Analysis, Function points Mark II, COSMIC Function point, COCOMO Model

SECTION – B

Activity Planning:

Risk Management:
Risk, Risk categories, identification, assessment, planning, management PERT and CPM Models, Monte Carlo Simulation

Resource Allocation, Monitoring and Control:

Managing people and Organizing teams:
Management Spectrum, Associating human resource with job, Motivation, Oldham- job Characteristics Model, Decision Making, Leadership, Stress, Health and Safety

Text Book:

References:
2. Jeffrey Pinto : Project Management, Pearson Publications
BUSINESS PROCESS REENGINEERING

Objectives: Upon completion of this course, students should be able:

- To use information technology (IT) for redesigning business processes and organizations
- To understand the assumptions embedded in changing business with IT
- To evaluate problems in the planning and implementation of organizational change
- To assess the relationship of process reengineering to other initiatives to improve the performance of organizations
- To evaluate a variety of approaches to using IT to improve organizations
- To understand the behavioral and political issues surrounding the use of IT in organizational change.

SECTION – A

Introduction: (5 hrs)
Definition of Business Process Reengineering

Implementation of Business Process Reengineering: (10 hrs)
Development of Process Objectives, Identification of Processes to be reengineered, Measurement of existing Processes, Utilization of Information Technology, Design and Evaluation of Process Prototypes

The Reengineering Structure: (10 hrs)
The Business Process Reengineering Leader, The Process Owner, The Reengineering Teams, Other Employees involved

SECTION – B

Change Management as an Enabler of Business Process Reengineering: (10 hrs)

Common Mistakes in Business Process Reengineering: (10 hrs)
Reengineering too many Processes, Inadequate Training of Process Owners and Team Members, Improper Monitoring, Wastage of Time, Delay in Showing Results, Discontinuance after Achievement

Text Book:
1. B.R. Dey : Business Process reengineering and change management, Wiley

References:
1. Jennifer Joksch : Business Process Reengineering and the important Role of Change Management
TECHNOLOGY MANAGEMENT

Paper Code: CSE 8318  
L T P: 3 0 0  
Max. Marks (Final Exam): 50  
Max. Marks (Sessional Exam): 50  
Credits: 3  
Total Lectures: 45

Note: Examiner shall set eight questions covering four questions from each section. Candidate will be required to attempt five questions at least two questions from each section.

Objectives: To make the students aware of latest techniques for managing the upcoming technologies in the software field.

SECTION – A

Introduction to Technology Management

Technology Forecasting
Techniques of Forecasting, Technology Forecasting alliance and Relevance strategic Practicality and Technology transfer.

Management of Research, Development and Innovation
Technology mapping, Comparison of types of R&D projects and development approaches - radical platform and Incremental projects, Innovation process. Management of Intellectual Property Rights Strategic value of patents, Trade secrets and licensing

SECTION – B

Managing Scientist and Technologists
Identification, Recruitment, Retention, Team work and Result orientation. Investment in Technology

Management roles and skills for New Technology

Technology for managerial productivity and Effectiveness, Just in time

Venture capital and Technology development

Text Book:

3. S.A. Bergn, R&D Management, Basil Blackwell Inc.,
6. C. Marie Crawford, New Product Management, IR WIN, USA
8. Technology and Management, Cassell Educational Ltd., London
HUMAN RESOURCE DEVELOPMENT & TRAINING METHODS

**Paper Code:** CSE 8319  
**Max. Marks (Final Exam):** 50  
**Max. Marks (Sessional Exam):** 50  
**Credits:** 3  
**L T P:** 3 0 0  
**Total Lectures:** 45

**Note:** Examiner shall set eight questions covering four questions from each section. Candidate will be required to attempt five questions at least two questions from each section.

**Objectives:** This course will provide students with an understanding of human development as a continual process, with an ongoing requirement of adapting and adjusting to the environment. The course will also assist students in developing a practical understanding of the process of human development.

**SECTION – A**

**Introduction to Human Resource Development:**
Evolution, Mission and Purpose Components of HRD, HRD problems and issues related to Indian Industry and technical education, HRD in the context of new Industrial Policy

**Staff Development, Professional Development and Career Development:**
Stages of HRD, Initial or Induction Training, Training for job-related/professional development, Training for horizontal and vertical mobility of employees

**Concept of Training:**
Assumptions for prevailing and alternative concept of training, action through training or action through force.

**Training Strategy:**
Strategic issues; Basic phases; Modalities in training; formulating a coherent strategy.

**SECTION – B**

**Training Methods:**
Learning on the job - Training in the fields, Simulating real life - role playing and games, Incidents and cases - Individualized training, Seminars and syndicates; Lecture method

**Developing Group and the Climate:**
The Social process; Indicators of group development; training climate

**Evaluation of Training:**
Issues for evaluations; Role of the Training System with evaluators from other constituencies

**Systems Approach to HRD:**
Definition and importance of needs assessment, methods employed in needs assessment, (Interviews, Questionnaire, Tests, Records and Reports Study, Job Analysis and Performance Reviews), strategies for HRD; on the job, off the job, Programme Planning, Design, Implementation and Evaluation.

**Text Book:**
1. JW Gilley and SA Eggland : Principles of Human Resource Development

**References:**
1. PP Arya and BB Tandon : Human Resource Development
2. RF Mayer and Peter Pipe : HRD Training and Development