

**REVISED STUDY AND EVALUATION SCHEME**

**FROM**

**1<sup>st</sup> TO IV<sup>th</sup> SEMESTER**

**MASTER OF ENGINEERING PROGRAMME**

**REGULAR AND MODULAR PROGRAMME**

**IN**

**COMPUTER SCIENCE AND ENGINEERING**

**OFFERED BY**



**PANJAB UNIVERSITY, CHANDIGARH**  
(Examination 2015-16)

**Scheme of Evaluation (Semester-wise)**  
**M.E. (Computer Science & Engineering)**  
**(Examination 2015-16)**

**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**

<b>Sr.No</b>	<b>Course No.</b>	<b>Course Title</b>	<b>Hours / Week</b>	<b>Credits</b>	<b>University External Marks</b>	<b>Internal Sessional Marks</b>	<b>Total</b>
1.	CSE 8111	Advance Algorithms	4	4	50	50	100
2.	CSE 8112	Network Technologies	4	4	50	50	100
3.	CSE 8123	Digital Image Processing	4	4	50	50	100
4.	CSE 8114	Advanced Computer Architecture	4	4	50	50	100
5.	CSE 8115	Database Technologies	4	4	50	50	100
6.	CSE 8150	Software Lab-I	5	3	-	100	100
<b>Total</b>			25	23	250	350	600

**Second Semester**

<b>Sr.No</b>	<b>Course No.</b>	<b>Course Title</b>	<b>Hours / Week</b>	<b>Credits</b>	<b>University External Marks</b>	<b>Internal Sessional Marks</b>	<b>Total</b>
1	CSE 8221	Business Intelligence & Mining	4	4	50	50	100
2	CSE 8212	Research Methodology	4	4	50	50	100
3	CSE 8213	Software Testing and Quality Management	4	4	50	50	100
4	CSE 8250	Software Lab-II	6	3	-	100	100
5	Branch Elective – I CSE 8215 Parallel and Distributed Computing CSE 8216 Network Security CSE 8217 Modeling & Simulation		3	3	50	50	100
6	Branch Elective –II CSE 8218 Open Source Software Design CSE 8219 Multimedia System Design CSE 8220 Soft Computing		3	3	50	50	100
7.	CSE 8251	Research Seminar	2	1	-	100	100
<b>Total:</b>			26	22	250	450	700

### Third Semester

Sr. No.	Course No.	Course Title	Hours / Week	Credits	University External Marks	Internal Sessional Marks	Total
1		Elective III CSE 8311 Natural Language Processing CSE 8312 Cloud Computing CSE 8313 Machine Vision CSE 8314 Information Retrieval CSE 8315 Wireless Networks	3	3	50	50	100
2		Elective –IV CSE 8316 Project Management CSE 8317 Business Process Re-Engineering CSE 8318 Technology Management CSE 8319 Human Resources Development and Training Methods	3	3	50	50	100
3		CSE 8350 Preliminary Thesis Work	18	10	--	100	100
Total			24	16	100	200	300

### Fourth Semester

Sr. No.	Course No.	Course Title	Hours / Week	Credits	University External Marks	Internal Sessional Marks	Total
1		CSE 8450 Thesis	25	15	100	100	200
Total			25	15	100	100	200

#### Instructions for Examiners to award marks/grades for Thesis:-

S. No.      Grade      Condition

- 1      A+      Publication from Thesis in SCI indexed journal.
- 2      A      Publication from Thesis in Scopus indexed journal.
- 3      B+      Publication from Thesis in Proceedings of Conference which is Scopus indexed.
- 4      B      Presented paper in International Conference.
- 5      C+      Presented paper in National Conference.

### b) M. TECH/ME MODULAR PROGRAMMES



**Spell - 1**

Code No.	Subject	Total	Theory	Sessional Marks	Total	Credits
	Core Subject - 1	4	50	50	100	4
	Core Subject - 2	4	50	50	100	4
	Total	8	100	100	200	8

**Spell - 2**

Code No.	Subject	Total	Theory	Sessional Marks	Total	Credits
	Core Subject -3	4	50	50	100	4
	Core Subject - 4	4	50	50	100	4
	Software Lab-1	5	--	100	100	3
	Total	13	100	200	300	11

**Spell - 3**

Code No.	Subject	Total	Theory	Sessional Marks	Total	Credits
	Core Subject -5	4	50	50	100	4
	Core Subject - 6	4	50	50	100	4
	Research Seminar	-	--	100	100	2
	Total	8	100	200	300	10

**Spell - 4**

Code No.	Subject	Total	Theory	Sessional Marks	Total	Credits
	Core Subject -7	4	50	50	100	4
	Core Subject - 8	4	50	50	100	4
	Software Lab-II	6	--	100	100	3
	Total	14	100	200	300	11

**Spell – 5**

Code No.	Subject	Total	Theory	Sessional Marks	Total	Credits
	Branch Elective Subject -1	3	50	50	100	3
	Branch Elective Subject - 2	3	50	50	100	3
	Preliminary Thesis CSE 8350	--	--	100	100	10
	Total	06	100	200	300	16

**Spell - 6**

Code No.	Subject	Total	Theory	Sessional Marks	Total	Credits
	Elective Subject -3	3	50	50	100	3
	Elective Subject –4	3	50	50	100	3
	CSE 8450 Thesis	--	100	100	200	15
	Total	06	200	200	400	21

<b>Title</b>	<b>ADVANCE ALGORITHMS</b>		<b>Credits</b>	04
<b>Code</b>	<b>CSE 8111</b>	<b>Semester:</b> - Ist	<b>L T P</b>	4 0 0
<b>Max. Marks</b>	<b>External:</b> - 50	<b>Internal:</b> - 50	<b>Elective</b>	N
<b>Pre-requisites</b>	ADA		<b>Contact Hours</b>	45
			<b>Time</b>	4 Hours
<b>Objectives</b>	This course will provide the in-depth knowledge of different algorithm design methodologies and the various research concepts involved			
<b>Note for Examiner</b>	The Semester question paper of a subject will be of 50 marks having 7 questions of equal marks. First question, covering the whole syllabus and having questions of conceptual nature, will be compulsory. Rest of the paper will be divided into two parts having three questions each and the candidate is required to attempt at least two questions from each part.			
<b>SECTION-A</b>				
<b>Models of Computation and Algorithms</b> Stored program model, Random Access Machines and Turing machines, Algorithms and their complexity, Performance analysis: - Time and space complexity, asymptotic notation. Analyzing recursive algorithms using recurrence relations: Substitution method, Recursion-tree method, Master method.				7
<b>Divide and Conquer, and Greedy Algorithm Design Methodologies</b> Introduction, Quick sort, Strassen’s matrix multiplication, Minimum spanning tree, Single source shortest path problem and their performance analysis.				8
<b>Branch-and-Bound, and Lower Bound Theory</b> Introduction, 0-1 knapsack problem, Traveling salesman problem, comparison trees for sorting, searching and merging.				7
<b>SECTION-B</b>				
<b>Dynamic Programming and Backtracking Algorithm Design Methodologies</b> Introduction, Traveling salesperson problem, Knapsack problem, multistage graphs, Floyd-Warshall algorithm, N-Queens problem, and their performance analysis.				7
<b>Parallel Random Access Machine Algorithms</b> Introduction, computation model, fundamental techniques and algorithms, selection, sorting, merging, graph problems.				6
<b>Advanced String Matching Algorithms</b> Naïve string matching algorithm, Robin-Karp algorithm, string matching with finite automata, Knuth-Morris-Pratt algorithm.				5
<b>P, NP and Approximation Algorithms</b> Basic Concepts, Non Deterministic algorithms, NP-Complete and NP-hard classes, introduction to approximation, absolute approximations, polynomial time approximation schemes.				5
<b>Suggested Books</b>		<div>1. Cormen, Leiserson, Rivest and Stein: Introduction to algorithms, Prentice-Hall of INDIA.</div> <div>2. Horowitz, Sahni and Rajsekaran: Fundamentals of Computer Algorithms, Galgotia.</div> <div>3. Aho, Hopcroft, Ullman: The Design and analysis of algorithms”, Pearson Education.</div>		

**Branch:** Computer Science and Engineering

<b>Title</b>	<b>NETWORK TECHNOLOGIES</b>		<b>Credits</b>	04
<b>Code</b>	<b>CSE 8112</b>	<b>Semester:</b> - 6 <sup>th</sup>	<b>L T P</b>	4 0 0
<b>Max. Marks</b>	<b>External:</b> - 50	<b>Internal:</b> - 50	<b>Elective</b>	N
<b>Pre-requisites</b>	Computer Networks		<b>Contact Hours</b>	45
			<b>Time</b>	4 Hours
<b>Objectives</b>	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.			
<b>Note for Examiner</b>	The Semester question paper of a subject will be of 50 marks having 7 questions of equal marks. First question, covering the whole syllabus and having questions of conceptual nature, will be compulsory. Rest of the paper will be divided into two parts having three questions each and the candidate is required to attempt at least two questions from each part.			
<b>SECTION-A</b>				
<b>Introduction:</b> Overview of Computer Networks, seven-layer architecture, ISO-OSI and TCP/IP reference models, MAC protocols for LANs, Gigabit Ethernet, Wireless LAN, ISDN, B-ISDN, ADSL				5
<b>IPv6:</b> Basic protocol, extensions and options, support for QoS, security, neighbor discovery, auto-configuration.				5
<b>Flow and Congestion Control:</b> Model, Classification, Open-loop, Closed-loop and Hybrid flow control.				5
<b>Quality of Service:</b> Techniques to improve QoS, Integrated services model and Differentiated Services Model.				4
<b>Traffic Management:</b> Economic Framework, Traffic Models, Traffic Classes, Scheduling, Renegotiation, Signaling, Admission Control, Peak Load Pricing and Capacity Planning				3
<b>SECTION-B</b>				
<b>Mobile Communication:</b> Mobile Communication, Mobile Computing, Mobile Computing Architecture, Mobile devices, mobility management.				5
<b>GSM:</b> GSM-services and system architecture, radio interfaces, Protocols, localization, calling, handover, security, GPRS.				4
<b>Mobility in networks:</b> Mobile IP and related issues like Route Optimization, Handoff, and Security Pratt algorithm.				4
<b>Transport Layer:</b> Conventional TCP, TCP extensions for wireless networks				4
<b>Ad Hoc Wireless Networks:</b> Introduction to Adhoc networks, Issues in Adhoc networks and Pro-active and Reactive routing protocols.				6
<b>Suggested Books</b>				
		1. W. R. Stevens: TCP/IP Illustrated, Volume 1: The protocols, Addison Wesley.  2. S. Keshav: An Engineering Approach to Computer Networking,		

	<p>Pearson Education.</p> <ol style="list-style-type: none"> <li>3. C. Siva Ram Murthy and B.S Manoj: Adhoc Wireless networks, Pearson Education.</li> <li>4. Michael A. Gallo and William M. Hancock: Computer Communications and Networking Technologies, Thomson Brooks / Cole.</li> <li>5. Raj Kamal: Mobile Computing, Oxford.</li> <li>6. M. Gonsalves and K. Niles: IPv6 Networks, McGraw Hill.</li> <li>7. C. E. Perkins, B. Woolf, and S. R. Alpert: Mobile IP: Design Principles and Practices, Addison Wesley.</li> <li>8. Requests for Comments (RFCs) &amp; Internet Drafts, published by Internet Engineering Task Force (<a href="http://www.rfc-editor.org">www.rfc-editor.org</a>).</li> <li>9. Proceedings of: ACM SIGCOMM Conference; IEEE Infocom .</li> <li>10. Journals:</li> </ol> <p>IEEE Journal on Selected Areas in Communications  IEEE Transactions on Communication  ACM/IEEE Transactions on Networking</p>	
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**Branch:** Computer Science and Engineering

<b>Title</b>	<b>DIGITAL IMAGE PROCESSING</b>		<b>Credits</b>	04
<b>Code</b>	<b>CSE 8113</b>	<b>Semester:</b> - Ist	<b>L T P</b>	4 0 0
<b>Max. Marks</b>	<b>External:</b> - 50	<b>Internal:</b> - 50	<b>Elective</b>	N
<b>Pre-requisites</b>	Computer Graphics		<b>Contact Hours</b>	45
			<b>Time</b>	4 Hours
<b>Objectives</b>	To introduce the different low level and high level computer vision techniques. Students are also made aware about the different image processing techniques			
<b>Note for Examiner</b>	The Semester question paper of a subject will be of 50 marks having 7 questions of equal marks. First question, covering the whole syllabus and having questions of conceptual nature, will be compulsory. Rest of the paper will be divided into two parts having three questions each and the candidate is required to attempt at least two questions from each part.			
<b>SECTION-A</b>				
<b>Introduction to Image Processing:</b> Digital Image representation, Sampling & Quantization, Steps in image Processing, Image acquisition, color image representation.				6
<b>Image Transformation, Filtering &amp; Restoration:</b> 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
<b>Image Compression:</b> Coding redundancy, Interpixel redundancy, Psychovisual redundancy, Huffman Coding, Arithmetic coding, Lossy compression techniques, JPEG Compression.				6
<b>SECTION-B</b>				
<b>Image Morphological Processing:</b> Introduction to basic operation on binary and grayscale images: Dilation, Erosion, Opening & Closing, Morphological Algorithms: Boundary & Region Extraction, Convex Hull, Thinning, Thickening, Skeletons, Pruning.				6
<b>Image Segmentation, Representation &amp; Descriptions::</b> 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
<b>Object Recognition:</b> Patterns and Patterns classes, Recognition based on Decision Theoretic methods , Structural Methods				9
<b>Suggested Books</b>	<div><div></div><div><div>1. Gonzalez and Woods: Digital Image Processing ISDN 0-201-600-781, Addison Wesley 1992.</div><div>2. Forsyth and Ponce: Computer Vision A Modern Approach Pearson Education Latest Edition.</div><div>3. Pakhera Malay K: Digital Image Processing and Pattern Recognition, PHI.</div><div>4. Trucco&amp;Verri: Introductory Techniques for 3-D Computer Vision, Prentice Hall. Latest Edition.</div></div></div>			

	<ol style="list-style-type: none"> <li>5. Jayaraman and Veerakumara: Digital Image Processing, McGraw Hill.</li> <li>6. Low: Introductory Computer Vision and Image Processing, McGraw-Hill 1991, ISBN 0-07-707403-3.</li> <li>7. Jain, Kasturi and Schunk: Machine Vision, McGraw-Hill. 1995 ISBN 0070320187.</li> <li>8. Sonka, Hlavac, Boyle : Image -Processing, Analysis and Machine Vision 2nd ed. ISBN 0-534-95393-X, PWS Publishing,1999</li> </ol>	
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**Branch:** Computer Science and Engineering

<b>Title</b>	<b>ADVANCED COMPUTER ARCHITECTURE</b>		<b>Credits</b>	04
<b>Code</b>	<b>CSE 8114</b>	<b>Semester:</b> - Ist	<b>L T P</b>	4 0 0
<b>Max. Marks</b>	<b>External:</b> - 50	<b>Internal:</b> - 50	<b>Elective</b>	N
<b>Pre-requisites</b>	Computer Architecture and Organization		<b>Contact Hours</b>	45
			<b>Time</b>	4 Hours
<b>Objectives</b>	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.			
<b>Note for Examiner</b>	The Semester question paper of a subject will be of 50 marks having 7 questions of equal marks. First question, covering the whole syllabus and having questions of conceptual nature, will be compulsory. Rest of the paper will be divided into two parts having three questions each and the candidate is required to attempt at least two questions from each part.			
<b>SECTION-A</b>				
<b>Introduction to Parallel Computer Models:</b> The State of Computing, Multiprocessors and Multicomputers, A Taxonomy of MIMD Computers, Multi-vector and SIMD Computers, Vector Supercomputers, SIMD Supercomputers, Parallel Random Access Machines, VLSI Complexity Model, Architectural Development Tracks: Multiple – Processor Tracks, Multi-vector and SIMD Tracks, Multithreaded and Dataflow Tracks.				4
<b>Program and Networks Properties:</b> Conditions of Parallelism, Data and Resource Dependences, Hardware and Software Parallelism, The Role of Compilers, Program Partitioning and Scheduling: Grain Sizes and Latency, Grain Packing and Scheduling, Static Multiprocessor Scheduling, Program Flow Mechanisms: Control Flow Vs Data Flow, Demand-Driven Mechanism, Comparison of Flow Mechanisms, System Interconnect Architectures: Network Properties and Routing, Static Connection Networks, Dynamic Connection Networks.				6
<b>Principles of Scalable Performance:</b> Performance Metrics and Measures: Parallelism Profile in Programs, Harmonic Mean Performance, Efficiency, Utilization and Quality, Standard Performance Measures, Speedup Performance Laws: Amdahl’s Law for a Fixed Workload, Gustafson’s Law for Sealed Problems, Scalability Analysis and Approaches: Scalability Metrics and Goals, Evolution of Scalable Computers.				6
<b>Processors and Memory Hierarchy:</b> Advance Processor Technology: Instruction Set Architecture, CISC and RISC Scalar Processors, Superscalar and Vector Processors: Superscalar Processors, The VLIW Architecture, Vector and Symbolic Processors, Memory Hierarchy Technology: Hierarchical Memory Technology, Inclusion, Coherence and Locality, Memory Capacity Planning.				6
<b>SECTION-B</b>				
<b>Multiprocessors and Multicomputers:</b> Multiprocessor System Interconnects: Hierarchical Bus system, Crossbar Switch and Multiport Memory, Multistage and Combining Networks, Cache Coherence and Synchronization Mechanisms:The Cache Coherence Problem, Snoopy Bus Protocol, Hardware Synchronization Mechanisms.				6
<b>Multivector and SIMD Computers:</b> Vector Processing Principles: Vector Instruction Types, Vector Access Memory Schemes, Multivector Multiprocessors: Performance- Directed Design rules, Cray Y – MP, C-90 and MPP, SIMD Computer Organization: Implementation Models, The CM-2 architecture.				5
<b>Software for Parallel programming:</b>				6



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.		
<b>Parallel Programming Environment:</b> Software Tools and Environment, Y-MP, Paragon and CM-5 Environment, Visualization and Performance Tuning, Synchronization and Multiprocessing Modes: Principles of Synchronization, Multiprocessor Execution Modes, Shared-Variable Program Structures, Locks for Protected Access, Semaphores and Applications, Monitors and Applications, Message-passing Program Development, Distributing the Computation, Synchronous Message Passing, Asynchronous Message Passing, Mapping Programs on to Multicomputer: Domain Decomposition Techniques, Control Decomposition Techniques, Heterogeneous Processing.		6
<b>Suggested Books</b>	<ol style="list-style-type: none"> <li>1. Kai Hwang: Advanced Computer Architecture: Parallelism, Scalability, Programmability, Tata McGraw-Hill.</li> <li>2. Michael J. Quinn: Parallel Computing – Theory and Practice, 2<sup>nd</sup> Edition, McGraw hill.</li> <li>3. S.G. Akl : Design and Analysis of Parallel Algorithms, Prentice Hall.</li> <li>4. S. Lakshmivarahan and S.K. Dhall: Analysis and Design of Parallel Algorithms - Arithmetic and Matrix Problems, McGraw Hill International Edition.</li> <li>5. S.K. Ghosal : A Practical Approach to Parallel Computing, Universities Press (India) Limited</li> </ol>	

<b>Title</b>	<b>DATABASE TECHNOLOGIES</b>		<b>Credits</b>	04
<b>Code</b>	<b>CSE 8115</b>	<b>Semester:</b> - Ist	<b>L T P</b>	4 0 0
<b>Max. Marks</b>	<b>External:</b> - 50	<b>Internal:</b> - 50	<b>Elective</b>	N
<b>Pre-requisites</b>	Database management systems, Advanced database systems		<b>Contact Hours</b>	45
			<b>Time</b>	4 Hours
<b>Objectives</b>	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.			
<b>Note for Examiner</b>	The Semester question paper of a subject will be of 50 marks having 7 questions of equal marks. First question, covering the whole syllabus and having questions of conceptual nature, will be compulsory. Rest of the paper will be divided into two parts having three questions each and the candidate is required to attempt at least two questions from each part.			
<b>SECTION-A</b>				
<b>Introduction:</b> Database System Concepts and Architecture, Data Independence, Data Models, SQL: DDL, DML, DCL, Database Integrity, Normalization: 1NF, 2NF, 3NF, BCNF, 4NF, 5NF.				6
<b>Advanced Transaction Processing and Concurrency Control:</b> Transaction Concepts, Concurrency Control: Locking Methods, Timestamping Methods, Optimistic Methods for Concurrency Control, Concurrency Control in Distributed Systems.				6
<b>Object Oriented and Object Relational Databases:</b> Object Oriented Concepts with respect to Database Systems, Object Oriented Data Model, OODB, OODBMS, ODMG, ODL, OQL, ORDBMS, ORDBMS Design, ORDBMS Query Language.				5
<b>Parallel and Distributed Databases:</b> 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.				6
<b>SECTION-B</b>				
<b>Backup and Recovery Techniques:</b> 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.				5
<b>XML and Internet Databases:</b> Structured, Semi Structured, and Unstructured Data, XML Hierarchical Data Model, XML Documents, DTD, XML Schema, XML Querying: XPath, XQuery.				4
<b>Emerging Database Technologies:</b> Introduction to Deductive Database Systems, Temporal Databases, Multimedia Databases, Mobile Databases, Main Memory Databases, Spatial and Multidimensional Databases.				8
<b>Data Warehousing and Mining:</b> Introduction to OLAP, OLTP and differences between them, Data Warehouse, Data Warehouse Architecture, Data Marts, Data Mining, Data Mining Process, Knowledge Discovery.				5
<b>Suggested Books</b>				
		1. RamezElmasri, ShamkantNavathe: Fundamentals of Database Systems, Fifth Edition, Pearson Education, 2007. 2. C.J. Date: An Introduction to Database Systems, Eighth Edition, Pearson Education.		

	<p>3. S. K. Singh: Database Systems Concepts, Design and Applications, Pearson Education.</p> <p>4. Raghu Ramakrishnan, Johannes Gehrke: Database Management Systems, Tata McGraw-Hill.</p> <p>5. Abraham Silberschatz, Henry F. Korth, S. Sudarshan : Database System Concepts, Tata McGraw-Hill</p>	
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**Branch:** Computer Science and Engineering

<b>Title</b>	<b>SOFTWARE LAB-I</b>		<b>Credits</b>	03
<b>Code</b>	<b>CSE 8150</b>	<b>Semester:</b> - Ist	<b>L T P</b>	005
<b>Max. Marks</b>	<b>100</b>	<b>Internal:</b> - 100	<b>Elective</b>	N
<b>Pre-requisites</b>	Testing techniques, models			
			<b>Time</b>	5 Hours

**Branch:** Computer Science and Engineering

<b>Title</b>	<b>Business Intelligence &amp; Mining</b>		<b>Credits</b>	04
<b>Code</b>	<b>CSE 8221</b>	<b>Semester:</b> - IInd	<b>L T P</b>	4 0 0

<b>Max. Marks</b>	<b>External:</b> - 50	<b>Internal:</b> - 50	<b>Elective</b>	N
<b>Pre-requisites</b>	Database systems, Data mining		<b>Contact Hours</b>	45
			<b>Time</b>	4 Hours
<b>Objectives</b>	To impart knowledge of data warehousing and data mining for Business Processes.			
<b>Note for Examiner</b>	The Semester question paper of a subject will be of 50 marks having 7 questions of equal marks. First question, covering the whole syllabus and having questions of conceptual nature, will be compulsory. Rest of the paper will be divided into two parts having three questions each and the candidate is required to attempt at least two questions from each part.			
<b>SECTION-A</b>				
<b>Introduction to Business Intelligence:</b> Introduction to OLTP and OLAP, BI Definitions & Concepts, Business Applications of BI, BI Framework, Role of Data Warehousing in BI, BI Infrastructure Components – BI Process, BI Technology, BI Roles & Responsibilities				6
<b>Basics of Data Integration (Extraction Transformation Loading)</b> 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.				8
<b>Introduction to Multi-Dimensional Data Modeling,</b> 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				8
<b>SECTION-B</b>				
<b>Basics of Enterprise Reporting</b> Introduction to enterprise reporting, concepts of dashboards, balanced scorecards, and overall architecture.				5
<b>Data Mining Functionalities:</b> 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				10
<b>Introduction of Mining Complex Data:</b> Complex data objects, Mining spatial databases, Multimedia databases, Time Series and sequence databases, Text databases and World Wide Web.				8
<b>Suggested Books</b>	<div><div></div><div><div>1. Mike Biere : Business intelligence for the enterprise by Addison Weseley, Augsut 2010</div><div>2. J.Han and M. Kamber: Data Mining: Concepts and Techniques By Morgan.</div><div>3. David Loshin : Business Intelligence: The Savvy Manager's Guide., Latest Edition By Knowledge Enterprise.</div><div>4. Larissa Terpeluk Moss, ShakuAtre : Business Intelligence roadmap by Addison Weseley.</div><div>5. CindiHowson: Successful Business Intelligence: Secrets to making</div></div></div>			

**Branch:** Computer Science and Engineering

<b>Title</b>	RESEARCH METHODOLOGY		<b>Credits</b>	04
<b>Code</b>	CSE 8212	<b>Semester:</b> - IIInd	<b>L T P</b>	4 0 0

<b>Max. Marks</b>	<b>External: - 50</b>	<b>Internal: - 50</b>	<b>Elective</b>	N
<b>Pre-requisites</b>	Mathematics		<b>Contact Hours</b>	45
			<b>Time</b>	4 Hours
<b>Objectives</b>	To make students familiar with various methodologies of research.			
<b>Note for Examiner</b>	The Semester question paper of a subject will be of 50 marks having 7 questions of equal marks. First question, covering the whole syllabus and having questions of conceptual nature, will be compulsory. Rest of the paper will be divided into two parts having three questions each and the candidate is required to attempt at least two questions from each part.			
<b>SECTION-A</b>				
<b>Introduction to Educational Research</b> Concept, types-basic, applied and action, Need for educational research				4
<b>Reviewing Literature</b> Need, Sources-Primary and Secondary, Purposes of Review, Scope of Review, Steps in conducting review				4
<b>Identifying and defining research problem</b> Locating. Analyzing stating and evaluating problem, Generating different types of hypotheses and evaluating them.				4
<b>Method of Research</b> Descriptive research design-survey, case study, content analysis, Ex-post Facto Research, Correlational and Experimental Research				6
<b>Sampling Techniques</b> 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.				6
<b>SECTION-B</b>				
<b>Design and development of measuring instruments,</b> Tests, questionnaires, checklists, observation schedules, evaluating research instruments, selecting a standardized test.				8
<b>Procedure of data collection</b> Aspects of data collection, coding data for analysis				4
<b>Statistical Methods of Analysis</b> Descriptive statistics: Meaning, graphical representations, mean, range and standard deviation, characteristics and uses of normal curve. Inferential statistics: t-test. Chi-square tests. Correlation (rank difference and product moment), ANOVA (one way)				4
<b>Procedure for writing a research proposal</b> Purpose, types and components of research proposal				2
<b>Procedure for writing a research report</b> Audiences and types of research reports, Format of Research report and journal. Strategies for evaluating, research, disseminating and utilizing research- An Overview.				3
<b>Suggested Books</b>				
<div>1. Borg, W and Gall, M. Educational Research: An Introduction, New York, Longman, 2003</div> <div>2. Cohen, L. Educational Research in class rooms and schools! A Manual of Materials and Methods NY: Harper and Row Publishers,2000</div> <div>3. CPSC: Developing Skills in Technican Education Research Modules 1 to 11 Singapore, ColomboPlanStaffCollege for Technician Education</div> <div>4. Garrett, HE and Woodworth, RS Statistics in Psychology and</div>				

	<p>Education, Educational Research, Bombay: Vakils Fetter and Simons Ltd. 2003</p> <p>5. Gay, LR, Educational Research, Ohio: Charles E. Merrill Publishing Company 2000</p> <p>Wiersma William Research Methods in Education- An Introduction</p> <p>London, Allyn and Bacon, Inc. 2000</p>	
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**Branch:** Computer Science and Engineering

<b>Title</b>	<b>SOFTWARE TESTING AND QUALITY MANAGEMENT</b>		<b>Credits</b>	04
<b>Code</b>	<b>CSE 8213</b>	<b>Semester:</b> - IIInd	<b>L T P</b>	4 0 0

<b>Max. Marks</b>	<b>External:</b> - 50	<b>Internal:</b> - 50	<b>Elective</b>	N
<b>Pre-requisites</b>	Software Engineering		<b>Contact Hours</b>	45
			<b>Time</b>	4 Hours
<b>Objectives</b>	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.			
<b>Note for Examiner</b>	The Semester question paper of a subject will be of 50 marks having 7 questions of equal marks. First question, covering the whole syllabus and having questions of conceptual nature, will be compulsory. Rest of the paper will be divided into two parts having three questions each and the candidate is required to attempt at least two questions from each part.			
<b>SECTION-A</b>				
<b>Introduction:</b> Software Engineering, Software Process Models, Management Process, Scheduling, Estimation, Software Metrics.				5
<b>Software Quality:</b> Quality Concepts,Quality Control,Quality Assurance,Cost of Quality, SQA Activities, Total Quality Management Principles,Software Reviews,Formal Technical Reviews,Software Reliability,Software Safety, ISO Approaches to Quality Assurance Systems.				5
<b>Standards, Practices, Conventions and Metrics:</b> Quality Assurance Standards, ISO 9000,ISO 9001:2000, ISO 9126 Quality Factors, CMM, Six Sigma, Software Quality Assurance Metrics,Advantages, QA Techniques, Introduction to SPICE.				6
<b>Risk and Software Configuration Management:</b> Software Risks, The RMMM Plan, Software Configuration Management Process: Version Control, Change Control.				5
<b>SECTION-B</b>				
<b>Software Testing:</b> Testing, Test Strategies for Conventional and Object Oriented Software, Unit and Integration Testing, Validation Testing, System Testing, Metrics for Source Code, Metrics for Testing, Debugging.				5
<b>Testing Techniques for Conventional and Object Oriented Software:</b> Black Box and White Box Testing, Basis Path Testing, Control Structure Testing, Object Oriented Testing Methods: Applicability of Conventional Test Case Design Methods, Testing Methods Applicable at the Class Level.				6
<b>Testing Process:</b> Test Plan development, Requirement Phase Testing, Design Phase Testing, Program Phase Testing, Execute Test and Record Results.				6
<b>Testing Specialized Systems and Applications:</b> Testing Client/Server Systems, Testing Web based Systems, Testing in Multiplatform Environment, Testing Off-the-Shelf Software, Testing for Real Time Systems, Testing Security.				7
<b>Suggested Books</b>	<div><div></div><div><div>1. Ian Somerville: Software Engineering, Seventh Edition, Pearson Education.</div><div>2. William E. Perry: Effective Methods for Software Testing, Second Edition, John Wiley &amp; Sons.</div><div>3. R.S. Pressman: Software Engineering: A Practitioner's Approach, Sixth Edition, Tata McGraw-Hill.</div><div>4. Boris Beizer: Software Testing Techniques, Second Edition, Dreamtech.</div><div>5. Nina S Godbole: Software Quality Assurance – Principles and</div></div></div>			



	Practice, Narosa. 6. S.L. Pfleeger, J.M. Atlee: Software Engineering: Theory and Practice, Second Edition, Pearson Education. 7. K.K. Aggarwal, Yogesh Singh: Software Engineering, Second Edition, New Age International. 8. PankajJalote: An Integrated Approach to Software Engineering, Second dition, Narosa.	
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**Branch:** Computer Science and Engineering

<b>Title</b>	<b>SOFTWARE LAB-II</b>		<b>Credits</b>	03
<b>Code</b>	<b>CSE 8250</b>	<b>Semester:</b> - IInd	<b>L T P</b>	<b>0 0 6</b>
<b>Max. Marks</b>	<b>100</b>	<b>Internal:</b> - 100	<b>Elective</b>	N
<b>Pre-requisites</b>	Software testing skills and some testing techniques			
			<b>Time</b>	6 Hours

**Branch:** Computer Science and Engineering

<b>Title</b>	<b>PARALLEL AND DISTRIBUTED COMPUTING</b>		<b>Credits</b>	03
<b>Code</b>	<b>CSE 8215</b>	<b>Semester:</b> - IInd	<b>L T P</b>	<b>3 0 0</b>

<b>Max. Marks</b>	<b>External:</b> - 50	<b>Internal:</b> - 50	<b>Elective</b>	Y
<b>Pre-requisites</b>	Software engineering, testing tools		<b>Contact Hours</b>	45
			<b>Time</b>	3 Hours
<b>Objectives</b>	The course tells 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.			
<b>Note for Examiner</b>	The Semester question paper of a subject will be of 50 marks having 7 questions of equal marks. First question, covering the whole syllabus and having questions of conceptual nature, will be compulsory. Rest of the paper will be divided into two parts having three questions each and the candidate is required to attempt at least two questions from each part.			
<b>SECTION-A</b>				
<b>Introduction</b>	Basic issues and model Asynchrony, delay, failure concurrency, Communication topology, load balancing, scaling			5
<b>Basic Approaches</b>	Agreement and consensus problems, transactions, Algorithms for reduction, scans (also non-parallel issues). Analysis: work/time complexity.			12
<b>SECTION-B</b>				
<b>Shared Memory</b>	Models and primitives, PRAM, VRAM, semaphores, spin-locks, Barriers’ implementations, NESL, Threads, distributed shared memory.			10
<b>Parallel Architectures</b>	Survey of Architectures KSR, TMC, MasPar, workstation clusters			3
<b>Algorithm Development and Analysis</b>	Parallel algorithms, Connected components (dense and sparse case), Sorting, distributed algorithms, Clock synchronization			12
<b>Suggested Books</b>	<div><div>1. Kai, Hwang: Computer Architecture and parallel processing, Tata McGraw Hill Co.</div><div>2. F.T.Leighto: Introduction to Parallel Algorithms and Architectures: Arrays, Trees,</div><div>3. Hypercubes, Morgan Kaufinann Publishers, San Mateo, California Joseph JaJa: An Introduction to Parallel algorithms, Addison Wesley.</div><div>4. Patterson: Computer Architecture-Quantitative Analysis</div></div>			

**Branch:** Computer Science and Engineering

<b>Title</b>	<b>NETWORK SECURITY</b>	<b>Credits</b>	03
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<b>Code</b>	<b>CSE 8216</b>	<b>Semester: - IInd</b>	<b>L T P</b>	3 0 0
<b>Max. Marks</b>	<b>External: - 50</b>	<b>Internal: - 50</b>	<b>Elective</b>	Y
<b>Pre-requisites</b>	Network fundamentals, IP’s introduction		<b>Contact Hours</b>	45
			<b>Time</b>	3 Hours
<b>Objectives</b>	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 <ul style="list-style-type: none"><li>• Understanding of the basic components of InfoSec</li><li>• Understanding of basic InfoSec applications</li><li>• Ability to remain current with InfoSec literature</li><li>• Ability to progress to independent work in the field</li></ul>			
<b>Note for Examiner</b>	The Semester question paper of a subject will be of 50 marks having 7 questions of equal marks. First question, covering the whole syllabus and having questions of conceptual nature, will be compulsory. Rest of the paper will be divided into two parts having three questions each and the candidate is required to attempt at least two questions from each part.			
<b>SECTION-A</b>				
<b>Introduction</b>				3
Network and computer security issues. Security attacks, Security Services, and Security Mechanisms. Network security models. Basic concept of symmetric and asymmetric cryptography.				
<b>Symmetric Key Cryptography</b>				10
Substitution and Transposition techniques. Block cipher principles. Data Encryption Standard (DES), Triple DES. Block cipher modes of operation. Stream cipher structure and RC4 algorithm. Confidentiality using symmetric key encryption. Symmetric key distribution.				
<b>Asymmetric Key Cryptography</b>				8
Prime numbers overview. Fermat’s and Euler’s theorems. Principles of public key cryptosystems. RSA algorithm. Distribution of public keys. Diffie-Hellman key exchange.				
<b>Message Authentication</b>				4
Authentication requirements and functions. Message Authentication Code. Hash functions. Hash and MAC algorithms: MD5, Secure Hash Algorithm (SHA) and HMAC.				
<b>SECTION-B</b>				
<b>Digital Signatures and Authentication</b>				4
Digital Signatures. Authentication protocols. Digital Signature Standard. Authentication Applications: Kerberos.				
<b>Email Security</b>				4
Pretty Good Privacy (PGP) operation. S/MIME specifications and functionality.				
<b>IP Security</b>				5
Architecture, Authentication Header, Encapsulating, Security, Payload, Security associations, Key Management.				
<b>Firewalls</b>				3
Design Principles, Characteristics, types of firewalls, firewall configuration, trusted system.				
Intrusion Defense Mechanisms:Intrusion Detection techniques.				4
<b>Suggested Books</b>				

	<ol style="list-style-type: none"> <li>1. Stallings, Willam: Cryptography and Network Security-Principles and Practices, 4th <b>edition. Pearson Education, PHI.</b></li> <li>2. Kahate, Atul: Cryptography and Network Security, 2nd Edition, TMH</li> <li>3. Tanenbaum, A.S.: <b>Computer Networks, 4th Edition, Pearson Education</b></li> <li>4. Forouzan, B.A.: Cryptography and Network Security, McGraw-Hill.</li> </ol>	
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<b>Title</b>	<b>MODELING AND SIMULATION</b>		<b>Credits</b>	03
<b>Code</b>	<b>CSE 8217</b>	<b>Semester:</b> - IInd	<b>L T P</b>	3 0 0
<b>Max. Marks</b>	<b>External:</b> - 50	<b>Internal:</b> - 50	<b>Elective</b>	Y
<b>Pre-requisites</b>	Discrete mathematics, basic idea of Matlab		<b>Contact Hours</b>	45
			<b>Time</b>	3 Hours
<b>Objectives</b>	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			
<b>Note for Examiner</b>	The Semester question paper of a subject will be of 50 marks having 7 questions of equal marks. First question, covering the whole syllabus and having questions of conceptual nature, will be compulsory. Rest of the paper will be divided into two parts having three questions each and the candidate is required to attempt at least two questions from each part.			
<b>SECTION-A</b>				
<b>Introduction</b> What is modeling and simulation. application areas, definition and types of system, model and simulation, introduction to discrete-event and continuous simulation.				2
<b>Simulation Methods</b> 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
<b>Queuing Models</b> Single server queuing system, introduction to arrival and departure time, flowcharts for arrival and departure routine. Event graphs of queuing model. Determining the events and variables.				8
<b>SECTION-B</b>				
<b>Distribution Functions</b> 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
<b>Programming in MATLAB</b> Introduction, Branching statements, loops, functions, additional data types, plots, arrays, inputs/outputs etc.				7
<b>Programming in GPSS and C/C++</b> Basic Introduction to Special Simulation Languages:-GPSS and Implementation of Queuing Models using C/C++.				6
<b>Introduction to Simulators</b>  Introduction regarding features and usage of any Network simulator.				2
<b>Suggested Books</b>				
	<div>1. Averill M. Law and W. David Kelton: “Simulation Modeling and Analysis”, Tata McGraw-Hill Publication.</div> <div>2. Geoffery Gordon: “System Simulation”, Prentice-Hall of India.</div> <div>3. D.S. Hira: “System Simulation”, S. Chand Publication.</div> <div>4. Stephen J. Chapman: “MATLAB Programming for Engineers”,</div>			

	<p>Thomson learning inc.</p> <p>5. Jerry Banks, John S. Carson, Barry L. Nelson and David M. Nicol: “Discrete-Event System Simulation”, Prentice-Hall of India.</p> <p>6. RudraPratap: “Getting Started with MATLAB 7”, Oxford University Press.</p>	
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<b>Title</b>	<b>OPEN SOURCE SOFTWARE</b>		<b>Credits</b>	03
<b>Code</b>	<b>CSE 8218</b>	<b>Semester:</b> - IInd	<b>L T P</b>	3 0 0
<b>Max. Marks</b>	<b>External:</b> - 50	<b>Internal:</b> - 50	<b>Elective</b>	Y
<b>Pre-requisites</b>	Discrete mathematics, basic idea of Matlab		<b>Contact Hours</b>	45
			<b>Time</b>	3 Hours
<b>Objectives</b>	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.			
<b>Note for Examiner</b>	The Semester question paper of a subject will be of 50 marks having 7 questions of equal marks. First question, covering the whole syllabus and having questions of conceptual nature, will be compulsory. Rest of the paper will be divided into two parts having three questions each and the candidate is required to attempt at least two questions from each part.			
<b>SECTION-A</b>				
<b>Introduction</b> Open Source origins, Differences among Open Source, freeware, proprietary and other software. Principle & Techniques of Open Source Development, Issues in Open Source Software Development.				5
<b>Legal issues</b> Copyright and IPR, Open Source Licenses, Open Standards				4
<b>Open Source Operating Systems</b> 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				12
<b>SECTION-B</b>				
<b>Internet - The technology</b> Open standards. W3C Protocols. Role of XML in Open Source Software Development.				4
<b>Open Source Web Development Tools</b> 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.				10
Case Studies related to successful implementation of open source software.				3
<b>Suggested Books</b>		<div><div>1. Elizabeth Narnore, Jason Gerner, Yann Le Scouarnec, Jeremy Stolz, Michael K. Glass: Beginning PHP5, Apache, MySQL Web Development, Wiley Publishing Inc.</div><div>2. Graham Glass, King Ablas: Unix for Programmers and Users, Pearson Education</div><div>3. <a href="http://www.opensource.org">www.opensource.org</a></div><div>4. <a href="http://www.w3.org">www.w3.org</a></div></div>		

**Branch:** Computer Science and Engineering

<b>Title</b>	<b>MULTIMEDIA SYSTEM DESIGN</b>		<b>Credits</b>	03
<b>Code</b>	<b>CSE 8219</b>	<b>Semester:</b> - IInd	<b>L T P</b>	3 0 0
<b>Max. Marks</b>	<b>External:</b> - 50	<b>Internal:</b> - 50	<b>Elective</b>	Y
<b>Pre-requisites</b>	<b>Peripheral Device Interface, Computer Graphics</b>		<b>Contact Hours</b>	45
			<b>Time</b>	3 Hours
<b>Objectives</b>	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.			
<b>Note for Examiner</b>	The Semester question paper of a subject will be of 50 marks having 7 questions of equal marks. First question, covering the whole syllabus and having questions of conceptual nature, will be compulsory. Rest of the paper will be divided into two parts having three questions each and the candidate is required to attempt at least two questions from each part.			
<b>SECTION-A</b>				
<b>Introduction</b> Multimedia and its types, Introduction to Hypermedia, Hyper Text, Multimedia Systems and their Characteristics, Challenges, Desirable Features, Components and Applications, Trends in Multimedia				4
<b>Multimedia Technology</b> Multimedia Systems Technology , Multimedia Hardware devices, Multimedia software development tools, Multimedia Authoring Tools, Multimedia Standards for Document Architecture, SGML, ODA, Multimedia Standards for Document interchange, MHEG, Multimedia Software for different media.				6
<b>Storage Media</b> Magnetic and Optical Media, RAID and its levels, Compact Disc and its standards, DVD and its standards, Multimedia Servers				4
<b>Image, Graphics and Video</b> Graphic/Image File Formats, Graphic/Image Data, Colour in Image and Video, Colour Image and Video Representations, Basics of Video ,Types of Colour Video Signals, Analog Video, Digital Video, TV standards.				6
<b>SECTION-B</b>				
<b>Video and Audio Compression</b> Classifying Compression Algorithms, Lossless Compression Algorithms, Entropy Encoding, Run-length Encoding, Pattern Substitution, Basics of Information theory, Huffman Coding, Huffman Coding of Images, Adaptive Huffman Coding, Arithmetic Coding, Lempel-Ziv-Welch (LZW) Algorithm, Source Coding Techniques , Transform Coding, Frequency Domain Methods, Differential Encoding, Vector Quantisation, JPEG Compression, Video Compression, H. 261 Compression, Intra Frame Coding, Inter-frame (P-frame) Coding, MPEG Compression, MPEG Video, The MPEG Video Bitstream , Decoding MPEG Video in Software , Audio Compression, Simple Audio Compression Methods, Psychoacoustics ,MPEG Audio Compression.				12
<b>Multimedia Communication</b> Building Communication network, Application Subsystem, Transport Subsystem, QOS, Resource Management, Distributed Multimedia Systems.				6
<b>System Design issues</b> Design considerations, Design steps, Feasibility analysis and Performance Evaluations, Different ways to analyze performance, Multimedia System architecture and different components.				6
<b>Suggested Books</b>	1. Ralf Steinmetz and Klara Nahrstedt: Multimedia Computing			



	<p>Communications and Applications By Pearson Educations.</p> <ol style="list-style-type: none"> <li>2. Prabhat K. Andleigh, KranThakkar: Multimedia System Design, PHI, Latest Edition</li> <li>3. Li, Drew: Multimedia Computing, Pearson Education, Latest Edition</li> <li>4. Fred Halsall: Multimedia Communications, Pearson Education, LatestEdition</li> </ol>	
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<b>Title</b>	<b>SOFT COMPUTING</b>		<b>Credits</b>	03
<b>Code</b>	<b>CSE 8220</b>	<b>Semester:</b> - IInd	<b>L T P</b>	3 0 0
<b>Max. Marks</b>	<b>External:</b> - 50	<b>Internal:</b> - 50	<b>Elective</b>	Y
<b>Pre-requisites</b>	Artificial intelligence, Neural networks.		<b>Contact Hours</b>	45
			<b>Time</b>	3 Hours
<b>Objectives</b>	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.			
<b>Note for Examiner</b>	The Semester question paper of a subject will be of 50 marks having 7 questions of equal marks. First question, covering the whole syllabus and having questions of conceptual nature, will be compulsory. Rest of the paper will be divided into two parts having three questions each and the candidate is required to attempt at least two questions from each part.			
<b>SECTION-A</b>				
<b>Intelligent Agents:</b> 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.				9
<b>Probabilistic Reasoning Fuzzy Logic:</b> 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				12
<b>SECTION-B</b>				
<b>Neural Networks:</b> Basic concepts, Single layer perception, Multilayer Perception, Supervised and Unsupervised learning - Back propagation networks - Kohonen's self organizing networks - Hopfield network, Introduction to Artificial Neural Systems - Perceptron - Representation - Linear separability - Learning <b>Training algorithm</b> :-Adaptive networks based Fuzzy interface systems - Classification and Regression Trees - Data clustering algorithms - Rule based structure identification - Neuro-Fuzzy controls - Simulated annealing				8
<b>Genetic Algorithms:</b> Evolutionary computation. Survival of the Fittest - Fitness Computations - Cross over – Mutation, Reproduction - Rank method - Rank space method.				8
<b>Suggested Books</b>	1. Stuart J.Russel, Norvig: AI: A Modern Approach, Pearson Education, Latest Edition.  2. Michael Negnevitsky: Artificial Intelligence: A Guide to Intelligent Systems, 2/E, Addison-Wesley, 2005  3. James Freeman A. and David Skapura M: Neural Networks - Algorithms, Applications & Programming Techniques Addison Wesley, 1992.  4. Yegnanarayana B: Artificial Neural Networks, Prentice Hall of India Private Ltd., New Delhi, 1999  5. Hagan, M.T., Demuth, Mark Beale: Neural Network Design By Cengage Learning  6. Goldberg, David E.: Genetic algorithms in search, optimization and machine learning, Latest Edition, Addison Wesley			

<b>Title</b>	<b>NATURAL LANGUAGE PROCESSING</b>		<b>Credits</b>	03
<b>Code</b>	<b>CSE 8311</b>	<b>Semester:</b> - IInd	<b>L T P</b>	3 0 0
<b>Max. Marks</b>	<b>External:</b> - 50	<b>Internal:</b> - 50	<b>Elective</b>	Y
<b>Pre-requisites</b>	first-order predicate logic, Grammars, languages for the parsing		<b>Contact Hours</b>	45
			<b>Time</b>	3 Hours
<b>Objectives</b>	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.			
<b>Note for Examiner</b>	The Semester question paper of a subject will be of 50 marks having 7 questions of equal marks. First question, covering the whole syllabus and having questions of conceptual nature, will be compulsory. Rest of the paper will be divided into two parts having three questions each and the candidate is required to attempt at least two questions from each part.			
<b>SECTION-A</b>				
<b>Introduction to NLP</b> Introduction and Survey of applications, Levels of linguistic processing: morphology, syntax, semantics				4
<b>Resources for NLP</b> Introduction to lexicons and knowledge bases.				2
<b>Computational morphology</b> lemmatization, Part-of-Speech Tagging, Finite-State Analysis.				5
<b>SECTION-B</b>				
<b>Syntactic Processing</b> Basic parsing: Top Down and Bottom Up parsing, Chart parsing, Deterministic parsing, Statistical parsing, Grammars with features, Unification Grammars, The Lexicon				8
<b>Semantic Interpretation</b> Lexical semantics, Semantics and logical form, Resolving ambiguities: Word Sense Disambiguation, Linking syntax and semantics, Linking syntax and semantics in restricted domains				8
<b>Context and World Knowledge</b> Discourse: linguistic context, Ellipsis; World knowledge, Discourse structure Conversation and co-operation, Implementing "co-operative responses", Information Retrieval and Information Extraction.				8
<b>Suggested Books</b>	<div>1. Allen, J.: Natural language understanding, 2<sup>nd</sup> Edition, Redwood City, CA: 1994. Benjamin/Cummings.</div> <div>2. Covington, M.A: Natural Language Processing for Prolog . Programmers, (1994), Prentice Hall</div> <div>3. Jurafsky, D. and Martin: Speech and Language Processing, (2000), Prentice Hall</div> <div>4. Gazdar, G. &amp;Mellish, C.: Natural Language Processing in Prolog: An Introduction to Computational Linguistics,(1989), Addison Wesley</div>			

<b>Title</b>	<b>CLOUD COMPUTING</b>		<b>Credits</b>	03
<b>Code</b>	<b>CSE 8312</b>	<b>Semester:</b> - IInd	<b>L T P</b>	3 0 0
<b>Max. Marks</b>	<b>External:</b> - 50	<b>Internal:</b> - 50	<b>Elective</b>	Y
<b>Pre-requisites</b>	Business and financial skills, Java and. NET framework skills, understanding of security protocols		<b>Contact Hours</b>	45
			<b>Time</b>	3 Hours
<b>Objectives</b>	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.			
<b>Note for Examiner</b>	The Semester question paper of a subject will be of 50 marks having 7 questions of equal marks. First question, covering the whole syllabus and having questions of conceptual nature, will be compulsory. Rest of the paper will be divided into two parts having three questions each and the candidate is required to attempt at least two questions from each part.			
<b>SECTION-A</b>				
<b>Cloud Computing Basics</b> Cloud Computing Overview; Characteristics; Applications; Internet and Cloud; Benefits; Limitations; Challenges; 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.				6
<b>Cloud Computing vs Other Computing Technologies</b> Overview of Grid, Peer-to-Peer, Pervasive and Utility Computing technologies; their characteristics and comparison with Cloud Computing. <b>Accessing the Cloud:-</b> Hardware and Infrastructure requirements; Access Mechanisms: Web Applications				6
<b>Understanding Abstraction and Virtualization</b> Virtualization Technologies, Load Balancing and Virtualization, Hypervisors, Machine Imaging.				5
<b>Scheduling in Cloud</b> Overview of Scheduling problem, Different types of scheduling, Scheduling for independent and dependent tasks, Static vs. Dynamic scheduling, Optimization techniques for scheduling.				6
<b>SECTION-B</b>				
<b>Cloud Storage and Cloud Standards</b> Overview; Storage as a Ser-vice; Cloud Storage Issues; Challenges; Standards.				5
<b>Cloud Security</b> Securing the Cloud, Securing Data, Establishing identity and presence				5
<b>Mobile Cloud Computing</b> Overview of Mobile Cloud Computing, Advantages, Challenges, Using Smartphones with the Cloud, Offloading techniques - their pros and cons, Mobile Cloud Security.				6
<b>Developing Applications</b> Major Players in Cloud Business; Overview of Service Oriented Architecture; Tools for developing Cloud services applications.				6
<b>Suggested Books</b>		<div>1. Anthony T. Velte, Toby J. Velte, and Robert Elsenpeter: Cloud Computing: A Practical Approach, McGraw Hill, 2010. 2. Rajkumar Buyys, James Broberg, AndrzejGoscinski (Editors): Cloud Computing: Principles and Paradigms, Wiley, 2011 3. Barrie Sosinsky: Cloud Computing Bible, Wiley, 2011. 4. Judith Hurwitz, Robin Bloor, Marcia Kaufman,Fern Halper: Cloud Computing for Dummies, Wiley, 2010. 5. BorkoFurht, Armando Escalante (Editors): Handbook of Cloud Computing, Springer, 2010.</div>		

**Branch:** Computer Science and Engineering

<b>Title</b>	<b>MACHINE VISION</b>		<b>Credits</b>	03
<b>Code</b>	<b>CSE 8313</b>	<b>Semester:</b> - IInd	<b>L T P</b>	3 0 0
<b>Max. Marks</b>	<b>External:</b> - 50	<b>Internal:</b> - 50	<b>Elective</b>	Y
<b>Pre-requisites</b>	Mathematics, Physical Science, digital imaging and digital image processing.		<b>Contact Hours</b>	45
			<b>Time</b>	3 Hours

<b>Objectives</b>	To introduce the different low level and high level computer vision techniques. Students are also made aware about the different pattern recognition approaches.		
<b>Note for Examiner</b>	The Semester question paper of a subject will be of 50 marks having 7 questions of equal marks. First question, covering the whole syllabus and having questions of conceptual nature, will be compulsory. Rest of the paper will be divided into two parts having three questions each and the candidate is required to attempt at least two questions from each part.		
<b>SECTION-A</b>			
<b>Introduction</b> Camera Models, & Views, basics of image processing, introductions to image segmentation and representation.			6
<b>Early Vision</b> Vision goals, Linear Filters , Edge Detection, Texture, The Geometry of Multiple Views, Stereopsis, Affine Structure from Motion, Projective Structure from Motion.			8
<b>SECTION-B</b>			
<b>High-level Vision: Geometric Methods</b> Model-Based Vision, Smooth Surfaces and their Outlines, Aspect Graphs, Range Data			7
<b>High-level Vision: Probabilistic and Inferential Methods</b> Finding Templates using Classifiers, Recognition by Relations between Templates, Geometric Templates from Spatial Relations			8
<b>Applications</b> Digital Libraries, Image Rendering, Medical applications, Human activity recognition, Face Recognition			8
<b>Suggested Books</b>	<div><div></div><div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></d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**Branch:** Computer Science and Engineering

<b>Title</b>	<b>Information Retrieval</b>		<b>Credits</b>	03
<b>Code</b>	<b>CSE 8314</b>	<b>Semester:</b> - IIInd	<b>L T P</b>	3 0 0
<b>Max. Marks</b>	<b>External:</b> - 50	<b>Internal:</b> - 50	<b>Elective</b>	Y
<b>Pre-requisites</b>	efficient text indexing, link-based algorithms, and Web metadata		<b>Contact Hours</b>	45
			<b>Time</b>	3 Hours

<b>Objectives</b>	This subject will provide the knowledge of various concepts involved in efficient information retrieval that leads to the development of efficient Web crawling techniques.		
<b>Note for Examiner</b>	The Semester question paper of a subject will be of 50 marks having 7 questions of equal marks. First question, covering the whole syllabus and having questions of conceptual nature, will be compulsory. Rest of the paper will be divided into two parts having three questions each and the candidate is required to attempt at least two questions from each part.		
<b>SECTION-A</b>			
<b>Introduction</b>	Introduction to Information Retrieval. Inverted indices and boolean queries. Query optimization. The nature of unstructured and semi-structured text.		5
<b>The term vocabulary and postings lists</b>	Text encoding: tokenization, stemming, lemmatization, stop words, phrases. Optimizing indices with skip lists. Proximity and phrase queries. Positional indices.		5
<b>Dictionaries and tolerant retrieval</b>	Dictionary data structures. Wild-card queries, permuterm indices, n-gram indices. Spelling correction and synonyms: edit distance, soundex, language detection.		6
<b>Index construction</b>	Postings size estimation, sort-based indexing, dynamic indexing, positional indexes, n-gram indexes, distributed indexing, real-world issues.		5
<b>SECTION-B</b>			
<b>Scoring</b>	Term weighting and the vector space model. Parametric or fielded search. Document zones. The vector space retrieval model. weighting. The cosine measure. Scoring documents.		6
<b>Computing scores in a complete search system</b>	Components of an IR system. Efficient vector space scoring. Nearest neighbor techniques, reduced dimensionality approximations, random projection.		6
<b>Classification</b>	Naive Bayes models. Spam filtering, K Nearest Neighbors, Decision Trees, Support vector machine classifiers.		6
<b>Web Crawling</b>	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.		6
<b>Suggested Books</b>	<div><div>1. C. Manning, P. Raghavan, and H. Schütze: <i>Introduction to Information Retrieval</i>, CambridgeUniversity Press,2008</div><div>2. R. Baeza-Yates, B. Ribeiro-Neto: <i>Modern Information Retrieval</i>, Addison-Wesley, 1999</div></div>		

**Branch:** Computer Science and Engineering

<b>Title</b>	<b>WIRELESS NETWORKS</b>		<b>Credits</b>	03
<b>Code</b>	<b>CSE 8314</b>	<b>Semester:</b> - IIInd	<b>L T P</b>	3 0 0
<b>Max. Marks</b>	<b>External:</b> - 50	<b>Internal:</b> - 50	<b>Elective</b>	Y
<b>Pre-requisites</b>	CCNA routing and switching		<b>Contact Hours</b>	45

		<b>Time</b>	3 Hours
<b>Objectives</b>	This challenging and comprehensive course provides a broad perspective on the wireless networks.		
<b>Note for Examiner</b>	The Semester question paper of a subject will be of 50 marks having 7 questions of equal marks. First question, covering the whole syllabus and having questions of conceptual nature, will be compulsory. Rest of the paper will be divided into two parts having three questions each and the candidate is required to attempt at least two questions from each part.		
<b>SECTION-A</b>			
<b>Overview of wireless networks</b> Introduction to wireless communication, architecture of wireless networks – 802.11, 2G, 3G, WLL, Wireless ATM, 802.16 and 802.20.			6
<b>Global System for Mobile Communication (GSM)</b> Evolution, mobile service, system architecture, radio interface, protocols, handover and security.			5
Introduction to GPRS, EDGE and CDMA2000 technologies and architectures.			4
<b>WiMAX Networks</b> Uses, architecture, MAC layer, physical layer, spectrum allocation issues, comparison with WiFi and limitations.			5
<b>SECTION-B</b>			
<b>Mobile Ad hoc Networks (MANETs)</b> Introduction to Ad hoc wireless networks and sensor networks, applications of Ad hoc networks, Power management.			4
<b>Media Access Control Protocols in Ad-hoc</b> Issues in designing MAC protocols, design goals and classifications of MAC protocols			4
<b>Transport layer issues in Ad-hoc networks</b> Design goals of transport layer protocols, classification of transport layer solutions and TCP over Ad hoc wireless networks.			4
<b>QoS and Security issues in MANETs</b> Network security requirements, issues and challenges in security and QoS provisioning, classifications of QoS solutions.			4
<b>Routing Protocols</b> Issues in designing protocols, classifications of routing protocols, operation of multicast routing protocols.			5
<b>Introduction to simulators:-NS2 and Qualnet.</b>			4
<b>Suggested Books</b>	<div><div>1. William Stallings: Wireless Communication and Networks, Prentice Hall.</div><div>2. C. Siva Ram Murthy and B. S Manoj: Adhoc Wireless Networks – Architecture and Protocols, Prentice Hall.</div><div>3. C. Demorais and D. P Aggarwal: Adhoc Networks – Theory and Applications, World Scientific Publications</div><div>4. Jochen Schiller: Mobile Communication, Pearson Education.</div></div>		



**Branch:** Computer Science and Engineering

<b>Title</b>	<b>PROJECT MANAGEMENT</b>			<b>Credits</b>	04
<b>Code</b>	<b>CSE 8316</b>	<b>Semester:</b> - IIInd	<b>L T P</b>		3 0 0
<b>Max. Marks</b>	<b>External:</b> - 50	<b>Internal:</b> - 50	<b>Elective</b>		Y
<b>Pre-requisites</b>	Software Engineering			<b>Contact Hours</b>	45
				<b>Time</b>	3 Hours
<b>Objectives</b>	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.				

<b>Note for Examiner</b>	The Semester question paper of a subject will be of 50 marks having 7 questions of equal marks. First question, covering the whole syllabus and having questions of conceptual nature, will be compulsory. Rest of the paper will be divided into two parts having three questions each and the candidate is required to attempt at least two questions from each part.		
<b>SECTION-A</b>			
<b>Introduction to project management:</b> 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	5		
<b>Programme management and project evaluation:</b> 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	8		
<b>Project approach and Software effort estimation:</b> 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	10		
<b>SECTION-B</b>			
<b>Activity Planning:</b> Objective of Planning, Project Schedule, Activities – Sequencing and Scheduling, Development of Project Network, Time Estimation, Forward and backward Pass, Critical Path and Activities.	5		
<b>Risk Management</b> Risk, Risk categories, identification, assessment, planning, management PERT and CPM Models, Monte Carlo Simulation	5		
<b>Resource Allocation, Monitoring and Control</b> Resources, Nature of Resources, Resource Requirement, Scheduling, Counting and Costing, Monitoring Framework, Cost Monitoring, Earned Value Analysis, Project targets, Change Control Management	6		
<b>Managing people and Organizing teams</b> Management Spectrum, Associating human resource with job, Motivation, Oldham- job Characteristics Model, Decision Making, Leadership, Stress, Health and Safety.	6		
<b>Suggested Books</b>	<div>1. Bob Hughes &amp; Mike Cotterell: Software Project Management, 4<sup>th</sup>, Tata McGraw Hill Publication .</div> <div>2. Prasanna Chandra: Projects – Panning, Analysis, Selection, Financing, Implementation and Review, 6<sup>th</sup>, Tata McGraw Hill Publication.</div> <div>3. JeffreyPinto: Project Management, Pearson Publications</div>		

**Branch:** Computer Science and Engineering

<b>Title</b>	<b>Business Process Reengineering</b>		<b>Credits</b>	04
<b>Code</b>	<b>CSE 8317</b>	<b>Semester:</b> - IInd	<b>L T P</b>	3 0 0
<b>Max. Marks</b>	<b>External:</b> - 50	<b>Internal:</b> - 50	<b>Elective</b>	Y
<b>Pre-requisites</b>	Market strategy, latest trends in market		<b>Contact Hours</b>	45
			<b>Time</b>	3 Hours
<b>Objectives</b>	Upon completion of this course, students should be able:			

	<ul style="list-style-type: none"> <li>To use information technology (IT) for redesigning business processes and organizations</li> <li>To understand the assumptions embedded in changing business with IT</li> <li>To evaluate problems in the planning and implementation of organizational change</li> <li>To assess the relationship of process reengineering to other initiatives to improve the performance of organizations</li> <li>To evaluate a variety of approaches to using IT to improve organizations</li> <li>To understand the behavioral and political issues surrounding the use of IT in organizational change.</li> </ul>
<b>Note for Examiner</b>	The Semester question paper of a subject will be of 50 marks having 7 questions of equal marks. First question, covering the whole syllabus and having questions of conceptual nature, will be compulsory. Rest of the paper will be divided into two parts having three questions each and the candidate is required to attempt at least two questions from each part.
<b>SECTION-A</b>	
<b>Introduction:</b> Definition of Business Process Reengineering	5
<b>Implementation of Business Process Reengineering</b> Development of Process Objectives, Identification of Processes to be reengineered, Measurement of existing Processes, Utilization of Information Technology, Design and Evaluation of Process Prototypes	10
<b>The Reengineering Structure</b> The Business Process Reengineering Leader, The Process Owner, The Reengineering Teams, Other Employees involved	10
<b>SECTION-B</b>	
<b>Change Management as an Enabler of Business Process Reengineering</b> Why Change Management?, Nature of Change, Process of Change, Roles of Change, Resistance to Change, Commitment to Change, Culture and Change, Resilience and Change	10
<b>Common Mistakes in Business Process Reengineering</b> Reengineering too many Processes, Inadequate Training of Process Owners and Team Members, Improper Monitoring, Wastage of Time, Delay in Showing Results, Discontinuance after Achievement	10
<b>Suggested Books</b>	<ol style="list-style-type: none"> <li>1. B.R. Dey : Business Process reengineering and change management, Wiley</li> <li>2. Jennifer Joksch : Business Process Reengineering and the important Role of Change Management</li> <li>3. VikramSethi, William King: Organizational Transformation Through Business Process Reengineering : Applying Lessons Learned, Pearson Education</li> </ol>

**Branch:** Computer Science and Engineering

<b>Title</b>	<b>TECHNOLOGY MANAGEMENT</b>		<b>Credits</b>	04
<b>Code</b>	<b>CSE 8318</b>	<b>Semester:</b> - IInd	<b>L T P</b>	3 0 0
<b>Max. Marks</b>	<b>External:</b> - 50	<b>Internal:</b> - 50	<b>Elective</b>	Y
<b>Pre-requisites</b>	Statistics, Mathematics		<b>Contact Hours</b>	45
			<b>Time</b>	3 Hours
<b>Objectives</b>	To make the students aware of latest techniques for managing the upcoming technologies in			

	the software field.
<b>Note for Examiner</b>	The Semester question paper of a subject will be of 50 marks having 7 questions of equal marks. First question, covering the whole syllabus and having questions of conceptual nature, will be compulsory. Rest of the paper will be divided into two parts having three questions each and the candidate is required to attempt at least two questions from each part.
<b>SECTION-A</b>	
<b>Introduction to Technology Management</b> Business Strategy for New Technologies: Adding value, Gaining competitive advantage, Timing and capability development.	8
<b>Technology Forecasting</b> Techniques of Forecasting, Technology Forecasting alliance and Relevance strategic Practicality and Technology transfer.	8
<b>Management of Research, Development and Innovation</b> 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	9
<b>SECTION-B</b>	
<b>Managing Scientist and Technologists</b>  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	20
<b>Suggested Books</b>	<ol style="list-style-type: none"> <li>1. John Humbleton Elsevier: Management of High Technology Research and Development.</li> <li>2. Charles W.L. HiIVGareth R. Jones: Strategic Management, Houghton Mifflin Co.</li> <li>3. S.A.Bergn: R&amp;D Management, Basil Blackwell Inc.,</li> <li>4. Spyros Maksidakis&amp; Steven C. Wheelwright: The Handbook of Forecasting - A Management Guide, John Wiley &amp; Sons.</li> <li>5. C. Marie Crawford: New Product Management, IR WIN, USA.</li> <li>6. David Hutchin: Just-in-Time, Gower Technical Press.</li> <li>7. Technology and Management, Cassell Educational Ltd., London</li> </ol>

**Branch:** Computer Science and Engineering

<b>Title</b>	<b>HUMAN RESOURCE DEVELOPMENT &amp; TRAINING</b>	<b>Credits</b>	<b>04</b>
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	<b>METHODS</b>			
<b>Code</b>	<b>CSE 8319</b>	<b>Semester: - IInd</b>	<b>L T P</b>	3 0 0
<b>Max. Marks</b>	<b>External: - 50</b>	<b>Internal: - 50</b>	<b>Elective</b>	Y
<b>Pre-requisites</b>	Business, Commerce and Management Studies		<b>Contact Hours</b>	45
			<b>Time</b>	3 Hours
<b>Objectives</b>	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.			
<b>Note for Examiner</b>	The Semester question paper of a subject will be of 50 marks having 7 questions of equal marks. First question, covering the whole syllabus and having questions of conceptual nature, will be compulsory. Rest of the paper will be divided into two parts having three questions each and the candidate is required to attempt at least two questions from each part.			
<b>SECTION-A</b>				
<b>Introduction to Human Resource Development:</b> 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				6
<b>Staff Development, Professional Development and Career Development :</b> Stages of HRD , Initial or Induction Training , Training for job-related/professional development , Training for horizontal and vertical mobility of employees				6
<b>Concept of Training :</b> Assumptions for prevailing and alternative concept of training, action through training or action through force				5
<b>Training Strategy:</b> Strategic issues; Basic phases; Modalities in training; formulating a coherent strategy.				5
<b>SECTION-B</b>				
<b>Training Methods:</b> 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				6
<b>Developing Group and the Climate :</b> The Social process; Indicators of group development; training climate				5
<b>Evaluation of Training:</b> Issues for evaluations; Role of the Training System with evaluators from other constituencies				6
<b>Systems Approach to HRD:</b> 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 .				6
<b>Suggested Books</b>				
		1. JW Gilley and SA Eggland: Principles of Human Resource Development 2. PP Arya and BB Tandon : Human Resource Development 3. RF Mayer and Peter Pipe : HRD Training and Development		