B.E. SEMESTER VIII

Scheme of Instructions					Scheme of Evaluation					
Subjects		Lect/ Week	Pract/ Week	Tuto/ Week	Paper Hours	Paper Marks	T/W	Pract	Oral	Total
1	System Security	4	2	-	3	100	25	-	25	150
2	Distributed Computing	4	2	-	3	100	25	-	25	150
3	Multimedia Systems*	4	2	-	3	100	25	-	25	150
4	Elective-II	4	2	-	3	100	25	-	25	150
5	Project-B	-	-	6	-	-	50	-	50	100
		16	8	6	-	400	150	-	150	700

Elective-I	
1	Image Processing
2	Pattern Recognition*
3	Mobile Computing*
4	Embedded Systems*
5	Computer Simulation and Modeling*
6	Advanced Computer Networks*

Elective-II	
1	Robotics*
2	Computer Vision*
3	Parallel Processing
4	Data Warehousing and Mining*
5	Neural Networks and Fuzzy Systems*
6	Software Testing*

* Common with IT

B.E. COMPUTER ENGINEERING
FOURTH YEAR SEMISTER VIII

SUBJECT: SYSTEM SECURITY

Lectures: 4 Hrs per week **Practical: 2 Hrs per week**	**Theory: 100 Marks** **Term work: 25 Marks** **Oral: 25 Marks**

Objectives of the course: Learn about the threats in computer security. Understand what puts you at a risk and how to control it. Controlling a risk is not eliminating the risk but to bring it to a tolerable level.

Pre-requisites: Computer Networks, Operating system.

DETAILED SYLLABUS

1. **Introduction:** Security, Attacks, Computer criminals, Method of defense
2. **Cryptography:** Basic Cryptography: Classical Cryptosystems, Public key Cryptography, Cryptographic checksum, Key Management: Key exchange, Key generation, Cryptographic key infrastructure, Storing and revoking keys, Hash algorithm, Digital signature, Cipher Techniques: Problems, Stream and block ciphers: AES, DES, RC4.
3. **Program Security:** Secure programs, Non-malicious program errors, Viruses and other malicious code, Targeted malicious code, Controls against program threats
4. **Operating System Security:** Protected objects and methods of protection, Memory address protection, Control of access to general objects, File protection mechanism, Authentication: Authentication basics, Password, Challenge-response, Biometrics.
5. **Database Security:** Security requirements, Reliability and integrity, Sensitive data, Interface, Multilevel database, Proposals for multilevel security
6. **Security in Networks:** Threats in networks, Network security control, Firewalls, Intrusion detection systems, Secure e-mail, Networks and cryptography, Example protocols: PEM, SSL, IPsec
7. **Administrating Security:** Security planning, Risk analysis, Organizational security policies, Physical security.
8. **Legal, Privacy, and Ethical Issues in Computer Security: P**rotecting programs and data, Information and law, Rights of employees and employers, Software failures, Computer crime, Privacy, Ethical issues in computer society, Case studies of ethics

Books

Text Books:

1. Stallings**, "***Cryptography And Network Security: Principles and practice*"
2. C. P. Pfleeger, and S. L. Pfleeger, "*Security in Computing*", Pearson Education.
3. Matt Bishop, "*Computer Security: Art and Science*", Pearson Education.

References :

1. Kaufman, Perlman, Speciner, "*Network Security*"
2. Eric Maiwald, "*Network Security : A Beginner's Guide*", TMH
3. Bruce Schneier, "*Applied Cryptography*", John Wiley.
4. Macro Pistoia, "*Java network security* ", Pearson Education
5. Whitman, Mattord, "*Principles of information security",* Thomson

TERM WORK
1. Term work should consist of at least 10 practical experiments and two assignments covering the topics of the syllabus.
ORAL EXAMINATION
An oral examination is to be conducted based on the above syllabus.

B.E. COMPUTER ENGINEERING
FOURTH YEAR SEMISTER VIII

SUBJECT: DISTRIBUTED COMPUTING

Lectures: 4 Hrs per week **Practical: 2 Hrs per week**	**Theory: 100 Marks** **Term work: 25 Marks** **Oral: 25 marks**

Objective: This course aims to build concepts regarding the fundamental principles of distributed systems. The design issues and distributed operating system concepts are covered.

Pre-requisites: Operating Systems and Computer Networks

DETAILED SYLLABUS

1. **Introduction to Distributed System:** Goals, Hardware concepts, Software concepts, and Client-Server model. Examples of distributed systems.
2. **Communication:** Layered protocols, Remote procedures call, Remote object invocation, Message-oriented communication, Stream-oriented communication.
3. **Processes:** Threads, Clients, Servers, Code Migration, Software agent.
4. **Naming:** Naming entities, Locating mobile entities, Removing un-referenced entities.
5. **Synchronization:** Clock synchronization, Logical clocks, Global state, Election algorithms, Mutual exclusion, Distributed transactions.
6. **Consistency and Replication:** Introduction, Data centric consistency models, Client centric consistency models, Distribution protocols, Consistency protocols.
7. **Fault Tolerance:** Introduction, Process resilience, Reliable client server communication, Reliable group communication. Distributed commit, Recovery.
8. **Security:** Introduction, Secure channels, Access control, Security management.
9. **Distributed File System:** Sun network file system, CODA files system.
10. **Case Study:** CORBA, Distributed COM, Globe, Comparison of CORBA, DCOM, and Globe.

BOOKS

Text Books:

1. A. Taunenbaum, **"***Distributed Systems: Principles and Paradigms***"**
2. G. Coulouris, J. Dollimore, and T. Kindberg, "*Distributed Systems: Concepts and Design*", Pearson Education

References:

1. M. Singhal, N. Shivaratri, "*Advanced Concepts in Operating Systems*", TMH

TERM WORK

2. Term work should consist of at least 10 practical experiments and two assignments covering the topics of the syllabus.

ORAL EXAMINATION

An oral examination is to be conducted based on the above syllabus.

B.E. COMPUTER ENGINEERING
FOURTH YEAR SEMISTER VIII

SUBJECT: MULTIMEDIA SYSTEMS

Lectures: 4 Hrs per week **Practical: 2 Hrs per week**	**Theory: 100 Marks** **Term work: 25 Marks** **Oral: 25 marks**

Objectives of the course: This course teaches students to collect, and intelligently integrate multiple media on computers. Students learn the issues involved in capturing, compressing, processing, manipulating, searching, indexing, storing, and retrieving various kinds of continuous media in the text section.

Pre-requisites: Operating Systems, Computer Networks

DETAILED SYLLABUS

1. Multimedia Systems Introduction: Multimedia application, Multimedia system architecture, Evolving technologies for multimedia systems, defining objects for multimedia systems, Multimedia data interface standards
2. Compression and Decompression: Types of compression, Binary image compression schemes, Color, Gray scale, Still video image compression, Video image compression, Audio compression, Fractal compression, Data and File Format Standards: Rich text format, TIFF, RIFF, MIDI, JPEG, AVI, MPEG
3. Multimedia Input/Output Technologies: Key technologies issues, Pen input, Video and Image display system, Printout technology, Image scanners, Digital Voice and Audio, Full motion video
4. Storage and Retrieval Technologies: Magnetic media technology, Optical media, Hierarchical storage management, Cache management for storage system, Image and video databases: Indexing and Retrieval
5. Architectural and Telecommunications Considerations: Specialized computational processors, Memory systems, Multimedia board solutions, LAN/WAN connectivity, Multimedia transport across ATM networks, Multimedia across wireless, Distributed object models
6. Multimedia Networking: Multimedia networking applications, Streaming stored audio and video, RTP, Scheduling and policing mechanisms, Integrated services, RSVP
7. Multimedia Application Design: Multimedia application classes, Types of multimedia systems, Virtual reality design, Components of multimedia systems, Organizing multimedia databases, application workflow design issues, Distributed application design issues, Applications like Interactive, Television, Video Conferencing, Video-on-demand, Educational applications and authoring, Industrial applications, Multimedia archives and digital libraries
8. Multimedia Authoring and User Interface: Multimedia authoring systems, Hyper media application design considerations, User interface design, information access, Object display/playback issues
9. Hyper Media Messaging: Mobile messaging, Hyper media message components, Hypermedia linking and embedding, Creating hypermedia messages, integrated multimedia message standards, Integrated document management, The world-wide web, Open hypermedia systems, Content based navigation.
10. Distributed Multimedia Systems: Components of distributed multimedia systems, Distributed client server operations, Multimedia object servers, Multi-server network

topologies, Distributed multimedia database, Managing distributed objects

11. Multimedia System Design: Methodology and considerations, Multimedia systems design examples.

Books

Text Books:

1. Prabhat K. Andheigh, Kiran Thakrar, "*Multimedia Systems Design*", PHI John F,
2. Koegel Buford, "*Multimedia Systems*", Pearson Education.

References :

1. Free Halshall, "*Multimedia Communications*", Pearson Education.
2. R. Steimnetz, K. Nahrstedt, "*Multimedia Computing, Communications and Applications*", Pearson Education
3. K.R. Rao, D. Milovanovic, "*Multimedia Communication Systems: Techniques, Standards, and Networks*"
4. Subrahmanian, "*Multimedia Database Systems*", M. Kaufman
5. J. D. Gibson, "*Multimedia Communications: Directions and Innovations*", Academic Press, Hardcourt India
6. J.F. Kurose, K.W. Ross, "*Computer Networking*", Pearson Education

TERM WORK

3. Term work should consist of at least 10 practical experiments and two assignments covering the topics of the syllabus.

ORAL EXAMINATION

An oral examination is to be conducted based on the above syllabus.

B.E. COMPUTER ENGINEERING
FOURTH YEAR SEMISTER VIII

SUBJECT: ROBOTICS
(ELECTIVE-II)

Lectures: 4 Hrs per week	**Theory: 100 Marks**
Practical: 2 Hrs per week	**Term Work: 25 Marks**
	Oral: 25 Marks

Objective: The goal of the course is to familiarize the students with the concepts and techniques in robot manipulator control, enough to evaluate, chose, and incorporate robots in engineering systems.

Pre-requisite: Exposure to linear algebra and matrix operations. Exposure to programming in a high level language

DETAILED SYLLABUS

1. **Robotic Manipulation**: Automation and Robots, Classification, Application, Specification, Notations.
2. **Direct Kinematics**: Dot and cross products, Co-ordinate frames, Rotations, Homogeneous, Co-ordinates, Link co-ordination arm equation, (Five-axis robot, Four axis robot, Six axis robot).
3. **Inverse Kinematics**: General properties of solutions tool configuration Five axis robots, Three-Four axis, Six axis robot (Inverse kinematics).
4. Workspace analysis and trajectory planning work envelop and examples, workspace fixtures, Pick and place operations, Continuous path motion, Interpolated motion, Straight-line motion.
5. **Robot Vision:** Image representation, Template matching, Polyhedral objects, Shane analysis, Segmentation (Thresholding, region labeling, Shrink operators, Swell operators, Euler numbers, Perspective transformation, Structured Illumination, Camera calibration).
6. **Task Planning:** Task level programming, Uncertainty, Configuration, Space, Gross motion, Planning, Grasp planning, Fine-motion Planning, Simulation of Planer motion, Source and goal scenes, Task planner simulation.
7. **Moments of Inertia.**
8. **Principles of NC and CNC Machines.**

BOOKS

Text Books:

1. Robert Shilling, "*Fundamentals of Robotics-Analysis and control",* PHI.
2. Fu, Gonzales and Lee, *"Robotics",* McGraw Hill
3. J.J, Craig, *"Introduction to Robotics"*, Pearson Education

References:

1. Staughard, *"Robotics and AI",* PHI.
2. Grover, Wiess, Nagel, Oderey, "Industrial Robotics", McGraw Hill
3. Walfram Stdder, *"Robotics and Mecatronics"*, TMH.
4. Niku, "*Introduction to Robotics*", Pearson Education
5. Klafter, Chmielewski, Negin, "*Robot Engineering*", PHI
6. Mittal, Nagrath, "*Robotics and Control*", TMH

TERM WORK
4. Term work should consist of at least 10 practical experiments and two assignments covering the topics of the syllabus.
ORAL EXAMINATION
An oral examination is to be conducted based on the above syllabus.

B.E. COMPUTER ENGINEERING
FOURTH YEAR SEMISTER VIII

SUBJECT: COMPUTER VISION
(ELECTIVE-II)

Lectures: 4 Hrs per week	**Theory: 100 Marks**
Practical: 2 Hrs per week	**Term Work: 25 Marks**
	Oral: 25 Marks

Objective: To introduce the student to computer vision algorithms, methods and concepts which will enable the student to implement computer vision systems with emphasis on applications and problem solving

Pre-requisite: Introduction to Image Processing.

DETAILED SYLLABUS

9. **Recognition Methodology:** Conditioning, Labeling, Grouping, Extracting, Matching. Edge detection, Gradient based operators, Morphological operators, Spatial operators for edge detection. Thinning, Region growing, region shrinking, Labeling of connected components.
10. **Binary Machine Vision:** Thresholding, Segmentation, Connected component labeling, Hierarchal segmentation, Spatial clustering, Split & merge, Rule-based Segmentation, Motion-based segmentation.
11. **Area Extraction:** Concepts, Data-structures, Edge, Line-Linking, Hough transform, Line fitting, Curve fitting (Least-square fitting).
12. **Region Analysis:** Region properties, External points, Spatial moments, Mixed spatial gray-level moments, Boundary analysis: Signature properties, Shape numbers.
13. **Facet Model Recognition:** Labeling lines, Understanding line drawings, Classification of shapes by labeling of edges, Recognition of shapes, Consisting labeling problem, Back-tracking, Perspective Projective geometry, Inverse perspective Projection, Photogrammetry – from 2D to 3D, Image matching : Intensity matching of ID signals, Matching of 2D image, Hierarchical image matching.
14. **Object Models And Matching:** 2D representation, Global vs. Local features.
15. **General Frame Works For Matching:** Distance relational approach, Ordered-structural matching, View class matching, Models database organization.
16. **General Frame Works:** Distance –relational approach, Ordered –Structural matching, View class matching, Models database organization.
17. **Knowledge Based Vision:** Knowledge representation, Control-strategies, Information integration.

BOOKS

Text Books:

1. David A. Forsyth, Jean Ponce, *"Computer Vision: A Modern Approach"*
2. R. Jain, R. Kasturi, and B. G. Schunk, *"Machine Vision"*, McGraw-Hill.

References:

1. Milan Sonka,Vaclav Hlavac, Roger Boyle, "*Image Processing, Analysis, and Machine Vision*" Thomson Learning
2. Robert Haralick and Linda Shapiro, *"Computer and Robot Vision"*, Vol I, II, Addison-Wesley, 1993.

TERM WORK
5. Term work should consist of at least 10 practical experiments and two assignments covering the topics of the syllabus.
ORAL EXAMINATION
An oral examination is to be conducted based on the above syllabus.

B.E. COMPUTER ENGINEERING
FOURTH YEAR SEMISTER VIII

SUBJECT: PARALLEL PROCESSING
(ELECTIVE-II)

Lectures: 4 Hrs per week **Practical: 2 Hrs per week**	**Theory: 100 Marks** **Term Work: 25 Marks** **Oral: 25 Marks**

Objective: Upon completion of this course students will be able to understand and employ the fundamental concepts and mechanisms which form the basis of the design of parallel computation models and algorithms, recognize problems and limitations to parallel systems, as well as possible solutions

Pre-requisite: Computer architecture, Data structures

DETAILED SYLLABUS

1. **Introduction:** Parallel Processing Architectures: Parallelism in sequential machines, Abstract model of parallel computer, Multiprocessor architecture, Pipelining, Array processors.
2. **Programmability Issues:** An overview, Operating system support, Types of operating systems, Parallel programming models, Software tools
3. **Data Dependency Analysis:** Types of dependencies loop and array dependences, Loop dependence analysis, Solving diophantine equations, Program transformations
4. **Shared Memory Programming:** General model of shared memory programming, Process model under UNIX
5. **Algorithms for Parallel Machines:** Speedup, Complexity and cost, Histogram computation, Parallel reduction, Quadrature problem, Matrix multiplication, Parallel sorting algorithms, Solving linear systems, Probabilistic algorithms
6. **Message Passing Programming:** Introduction, Model, Interface, Circuit satisfiability, Introducing collective, Benchmarking parallel performance
7. **Parallel Programming languages:** Fortran90, nCUBE C, Occam, C-Linda
8. **Debugging Parallel Programs:** Debugging techniques, Debugging message passing parallel programs, Debugging shared memory parallel programs
9. **Memory and I/O Subsystems:** Hierarchical memory structure, Virtual memory system, Memory allocation and management, Cache allocation and management, Cache memories and management, Input output subsystems
10. **Other Parallelism Paradigms:** Data flow computing, Systolic architectures, Functional and logic paradigms, Distributed shared memory
11. **Performance of Parallel Processors:** Speedup and efficiency, Amdahl's law, Gustafson-Barsis's law, Karf-Flatt metric, Isoefficiency metric

BOOKS

Text Books:

1. Hawang Kai and Briggs F. A., "*Computer Architecture and Parallel Processing"*, McGraw Hill
2. Jorden H. F. and Alaghaband G., "*Fundamentals of Parallel Processing*"
3. M.J. Quinn, "*Parallel Programming*", TMH

References:

1. Shasikumar M., "*Introduction to Parallel Processing"*, PHI
2. Wilson G.V., "*Practical Parallel Programming*", PHI
3. D. E. Culler, J.P. Singh, A. Gupta, *"Parallel Computer Architecture*", Morgan Kaufman

TERM WORK

6. Term work should consist of at least 10 practical experiments and two assignments covering the topics of the syllabus.

ORAL EXAMINATION

An oral examination is to be conducted based on the above syllabus.

B.E. COMPUTER ENGINEERING
FOURTH YEAR SEMISTER VIII

SUBJECT: DATA WAREHOUSING AND MINING
(ELECTIVE-II)

Lectures: 4 Hrs per week	**Theory: 100 Marks**
Practical: 2 Hrs per week	**Term work: 25 Marks**
	Oral Exam: 25 Marks

Objectives of the course: The data warehousing part of module aims to give students a good overview of the ideas and techniques which are behind recent development in the data warehousing and online analytical processing (OLAP) fields, in terms of data models, query language, conceptual design methodologies, and storage techniques. Data mining part of the model aims to motivate, define and characterize data mining as process; to motivate, define and characterize data mining applications.

Pre-requisites: DBMS

DETAILED SYLLABUS

Data Warehousing:

1. **Overview And Concepts:** Need for data warehousing, Basic elements of data warehousing, Trends in data warehousing.
2. **Planning And Requirements:** Project planning and management, Collecting the requirements.
3. **Architecture And Infrastructure:** Architectural components, Infrastructure and metadata.
4. **Data Design And Data Representation:** Principles of dimensional modeling, Dimensional modeling advanced topics, data extraction, transformation and loading, data quality.
5. **Information Access And Delivery:** Matching information to classes of users, OLAP in data warehouse, Data warehousing and the web.
6. **Implementation And Maintenance:** Physical design process, data warehouse deployment, growth and maintenance.

Data Mining:

1. **Introduction:** Basics of data mining, related concepts, Data mining techniques.
2. **Data Mining Algorithms:** Classification, Clustering, Association rules.
3. **Knowledge Discovery :** KDD Process
4. **Web Mining:** Web Content Mining, Web Structure Mining, Web Usage mining.
5. **Advanced Topics:** Spatial mining, Temporal mining.
6. **Visualisation :** Data generalization and summarization-based characterization, Analytical characterization: analysis of attribute relevance, Mining class comparisons: Discriminating between different classes, Mining descriptive statistical measures in large databases
7. **Data Mining Primitives, Languages, and System Architectures:** Data mining primitives, Query language, Designing GUI based on a data mining query language, Architectures of data mining systems
8. **Application and Trends in Data Mining:** Applications, Systems products and research prototypes, Additional themes in data mining, Trends in data mining

BOOKS

Text Books:

1. Paulraj Ponnian, "*Data Warehousing Fundamentals*", John Wiley.
2. M.H. Dunham, "*Data Mining Introductory and Advanced Topics*", Pearson Education.
3. Han, Kamber, "*Data Mining Concepts and Techniques*", Morgan Kaufmann

References:

1. Ralph Kimball, "*The Data Warehouse Lifecycle toolkit*", John Wiley.
2. M Berry and G. Linoff, "*Mastering Data Mining*", John Wiley.
3. W.H. Inmon, "*Building the Data Warehouses*", Wiley Dreamtech.
4. R. Kimpall, "*The Data Warehouse Toolkit*", John Wiley.
5. E.G. Mallach, "*Decision Support and Data Warehouse systems*", TMH.

TERM WORK

7. Term work should consist of at least 10 practical experiments and two assignments covering the topics of the syllabus.

ORAL EXAMINATION

An oral examination is to be conducted based on the above syllabus.

B.E. COMPUTER ENGINEERING
FOURTH YEAR SEMISTER VIII

SUBJECT: NEURAL NETWORKS & FUZZY SYSTEMS
(ELECTIVE-II)

Lectures: 4 Hrs per week **Practical: 2 Hrs per week**	**Theory: 100 Marks** **Term Work: 25 Marks** **Oral: 25 Marks**

Objective: This course covers basic concepts of artificial neural networks, fuzzy logic systems and their applications. Its focus will be on the introduction of basic theory, algorithm formulation and ways to apply these techniques to solve real world problems.

Pre-requisite: Knowledge of calculus, and basic probability and statistics are required. Background in the following subjects desirable: numerical analysis (including optimization). Programming skills in one of the following would be desirable: Matlab, MathCad, C, Java, C++

DETAILED SYLLABUS

1. **Introduction:** Biological neurons, McCulloch and Pitts models of neuron, Types of activation function, Network architectures, Knowledge representation. Learning process: Error-correction learning, Supervised learning, Unsupervised learning, Learning Rules.
2. **Single Layer Perceptron:** Perceptron convergence theorem, Method of steepest descent - least mean square algorithms.
3. **Multilayer Perceptron**: Derivation of the back-propagation algorithm, Learning Factors.
4. **Radial Basis and Recurrent Neural Networks:** RBF network structure, theorem and the reparability of patterns, RBF learning strategies, K-means and LMS algorithms, comparison of RBF and MLP networks, Hopfield networks: energy function, spurious states, error performance .
5. **Simulated Annealing**: The Boltzmann machine, Boltzmann learning rule, Bidirectional Associative Memory.
6. **Fuzzy logic:** Fuzzy sets, Properties, Operations on fuzzy sets, Fuzzy relations, Operations on fuzzy relations, The extension principle, Fuzzy measures, Membership functions, Fuzzification and defuzzification methods, Fuzzy controllers.

BOOKS

Text Books:

1. Simon Haykin, "*Neural Network a - Comprehensive Foundation"*, Pearson Education
2. Zurada J.M., "*Introduction to Artificial Neural Systems,* Jaico publishers
3. Thimothy J. Ross, *"Fuzzy Logic with Engineering Applications"*, McGraw Hill
4. Ahmad Ibrahim, "*Introduction to Applied Fuzzy Electronics*", PHI

References:

1. Yegnanarayana B., "*Artificial Neural Networks"*, PHI
2. Driankov D., Hellendoorn H. & Reinfrank M., "*An Introduction to Fuzzy Control*", Norosa Publishing House
3. Berkan R.C., and Trubatch S.L., "*Fuzzy Systems Design Principles*", IEEE Press

TERM WORK
8. Term work should consist of at least 10 practical experiments and two assignments covering the topics of the syllabus.
ORAL EXAMINATION
An oral examination is to be conducted based on the above syllabus.

B.E. COMPUTER ENGINEERING
FOURTH YEAR SEMISTER VII

SUBJECT: SOFTWARE ENGINEERING

Lectures: 4 Hrs per week	**Theory: 100 Marks**
Practical: 2 Hrs per week	**Term Work: 25 Marks**
	Oral: 25 Marks

Objectives: Apply various software Engineering principles and methodologies while dealing with the various phases of software development.

Pre-requisite: Programming concepts.

DETAILED SYLLABUS

1. **Product:** Evolving role of software, Software Characteristics, Software Applications, Software myths.
2. **Process:** Software Process, Process Models, Linear sequential model, Prototyping model, RAD model, Evolutionary software models, Component-based development, Formal methods model, Fourth generation techniques, Process technology, Product and process.
3. **Project Management:** Management spectrum, People, Product, Process, Project, W^5HH principle.
4. **Software Process and Project Metrics:** Measures-Metrics-Indicators, Metrics in the process and project domains, Software measurement, Metrics for software quality, Integrating metrics within the software engineering process, Statistical quality control, Metrics for small organizations, Establishing a software metrics program.
5. **Software Project Planning:** Objectives, Software scope, Resources, Software project estimation, Decomposition techniques, Empirical estimation models, Make/Buy decision, Automated estimation tools.
6. **Risk Analysis and Management:** Reactive versus proactive risk strategies, Software risks, Risk identification, Risk projection, Risk refinement, Risk mitigation-monitoring-management, Safety risks and hazards, RMMM plan.
7. **Project Scheduling and Tracking:** Basic concepts, Relationship between people and effort, Defining a task set for the software project, Selecting software Engineering tasks, Refinement of major tasks, Defining a task network, Scheduling, Earned value network, Error tracking, Project plan.
8. **Software Quality Assurance:** Quality concepts, Quality Movement, Software quality assurance, Software reviews, Formal technical reviews, Formal approaches to SQA, Statistical software quality assurance, Software reliability, Mistake-proofing for software, ISO 9000 quality standards, SQA plan.
9. **Software Configuration Management:** Introduction, SCM process, Identification of objects in the software configuration, Version control, Change control, Configuration audit, Status reporting, SCM standards.
10. **System Engineering:** Computer-based systems, System engineering hierarchy, Business process engineering, product engineering, Requirements engineering, System modeling.
11. **Analysis Concepts and Principles:** Requirement Analysis, Requirement elicitation for software, Analysis principles, Software prototyping, Specification.
12. **Analysis Modeling:** Introduction, Elements of analysis model, Data modeling, Functional modeling and information flow, Behavioral modeling, Mechanics of structured analysis, Data dictionary, Other classical analysis methods.

13. **Design Concepts and Principles:** Software design and software engineering, Design process, Design principles, Design concepts, Effective modular design, Design heuristics for effective modularity, Design model, Design documentation.
14. **Architectural Design:** Software architecture, Data design, Architectural styles, Analyzing alternative architectural designs, Mapping requirements into a software architecture, Transform mapping, Transaction mapping, Refining architectural design.
15. **User Interface Design:** The golden rules, User interface design, Task analysis and modeling, Interface design activities, Implementation tools, Design evaluation.
16. **Component-Level Design:** Structured programming, Comparison of design notation.
17. **Software Testing Techniques:** Software testing fundamentals, Test case design, White-box testing, Basis path testing, Control structure testing, Black-box testing, Testing for specialized environments, architectures and applications.
18. **Software Testing Strategies:** Strategic approach to software testing, Strategic issues, Unit testing, Integration testing, Validation testing, System testing, Art of debugging.
19. **Technical Metrics for Software:** Software quality, framework for technical software metrics, Metrics for the analysis model, Metrics for the design model, Metrics for source code, Metrics for testing, Metrics for maintenance.

BOOKS

Text Books:

1. Roger Pressman, "*Software Engineering*", McGraw Hill, Fifth Edition.
2. James Peter, "*Software Engineering An Engineering Approach*", John Wiley
3. Ian Sommerville, "*Software Engineering*", Pearson Education.

References:

1. W.S. Jawadekar, "Software *Engineering*", TMH.
2. Pankaj Jalote, "*An Integrated Approach To Software Engineering* ", Narosa.
3. R. Mall, "*Fundamentals of Software Engineering"*, Prentice Hall of India
4. A. Behferooz & F. J. Hudson, "*Software Engineering Fundamentals"*, Oxford University Press
5. S. L. Pfleeger, "*Software Engineering Theory and Practice*", Pearson Education

TERM WORK

9. Term work should consist of at least 10 practical experiments and two assignments covering the topics of the syllabus.

ORAL EXAMINATION

An oral examination is to be conducted based on the above syllabus.

B.E. COMPUTER ENGINEERING
FOURTH YEAR SEMISTER VIII

SUBJECT: PROJECT-B

Tutorial: 6 Hrs per week	**Term Work: 50 Marks** **Oral: 50 Marks**

GUIDELINES

1. Project-B exam be conducted by two examiners appointed by university. Students have to give demonstration and seminar on the project-B for the term work marks. All the students of the class must attend all the seminars. Seminars should be conducted continuously for couple of days.
2. Project –B should contain:
   - Introduction and motivation, Problem statement, Requirement analysis, Project design, Implementation details, Technologies used, Test cases, Project time line, Task distribution, References, and Appendix consisting of users manual, technical reference manual.
   - CD containing: Project documentation, Implementation code, Required utilities, Software's and Manuals.
   - Every student must prepare well formatted, printed and hard bound report.
3. Internal guide has to interact at least once in fortnight and maintain the progress and attendance report during the term.
4. Make sure that external project guides are BE graduates.
5. Convener should make sure that external examiners are appointed from the list as per appropriate technical area.