

# RAJEEV GANDHI MEMORIAL COLLEGE OF ENGINEERING AND TECHNOLOGY

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AUTONOMOUS

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Affiliated to JNTU-Anantapur, Approved by AICTE-New Delhi, Accredited by NBA-New Delhi

NANDYAL-518 501, KURNOOL Dist., A.P.

## SOFTWARE ENGINEERING



ACADEMIC REGULATIONS, COURSE STRUCTURE AND SYLLABI  
**APPLICABLE FOR STUDENTS ADMITTED INTO**  
M.TECH(REGULAR) FROM 2010-11

# RAJEEV GANDHI MEMORIAL COLLEGE OF ENGINEERING AND TECHNOLOGY

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## REGULATIONS

For pursuing Two year Master (post graduate) Degree of study in Engineering (M.Tech), offered by Rajeev Gandhi Memorial College of Engineering and Technology, Nandyal-518501 under Autonomous status and herein referred to as RGM CET (Autonomous)

All the rules specified herein approved by the Academic Council will be in force and applicable to students admitted from the Academic Year 2010-11 onwards. Any reference to "Institute" or "College" in these rules and regulations stands for Rajeev Gandhi Memorial College of Engineering and Technology (Autonomous).

All the rules and regulations, specified here after shall be read as a whole for the purpose of interpretation as and when a doubt arises , the interpretation of the Chairman, Academic Council is final. As per the requirements of statutory bodies, the Principal, Rajeev Gandhi Memorial College of Engineering and Technology shall be the Chairman, Academic Council.

### **I. ACADEMIC REGULATIONS 2010 FOR M.TECH (REGULAR)**

(Effective for the students admitted into first year from the Academic Year 2010-2011)

THE M.TECH DEGREE OF JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY, ANANTAPUR, SHALL BE CONFERRED ON CANDIDATES WHO ARE ADMITTED TO THE M.TECH PROGRAM AT RGM CET, NANDYAL AND THEY SHALL FULFIL ALL THE REQUIREMENTS FOR THE AWARD OF THE DEGREE.

#### **1.0 Eligibility for Admissions:**

Admission to the above program shall be made subject to the eligibility, qualifications and specialization prescribed by Andhra Pradesh State Council of Higher Education (APSCHE) from time to time.

Admissions shall be made on the basis of merit rank obtained in GATE examination or PG CET conducted by any University of Andhra Pradesh designated by Govt. of A.P., or on the basis of any other order of merit prescribed by APSCHE, subject to the reservations prescribed by the Government of A.P. from time to time.

#### **2.0 Award of M.Tech Degree:**

2.1) The student shall be declared eligible for the award of the M.Tech degree, if he pursues a course of study and completes it successfully for not less than prescribed course work duration and not more than double the prescribed course work duration.

2.2) The student, who fails to fulfil all the academic requirements for the award of the degree within double the course work duration from the year of his admission, shall forfeit his seat in M.Tech course.

2.2) The minimum clear instruction days for each semester shall be 95.

### 3.0 Courses of Study:

The following specializations are offered at present for the M.Tech course of study.

1. Computer Science (CSE)
2. Digital Systems and Computer Electronics (ECE)
3. Embedded Systems (ECE)
4. Machine Design (ME)
5. Power Electronics (EEE)
6. Software Engineering (IT)

and any other course as approved by the appropriate authorities from time to time.

### 4.0 Course pattern:

4.1) The entire course of study is of four semesters. During the first and second semesters the student has to undergo course work and during the third and fourth semesters the student has to carry out project work.

4.2) The student eligible to appear for the End Examination in a subject, but absent at it or has failed in the End Examination may appear for that subject at the supplementary examination.

**Table 1: Credits**

	SEMESTER			
	Periods/ Week	Credits	Internal Marks	External Marks
Theory	04	04	40	60
Practical	03	02	40	60
Seminar		02	100	
Comprehensive Viva-voce		04		100
Project		12		

**Table: 2 Course pattern**

Semester	No.of Subjects	Number of Labs	Total Credits	
First	06	02	6X4=24 2X2=04	28
Second	06	02 Comprehensive Viva	6X4=24 2X2=04 1X4=04	32
Third	Seminar (3 <sup>rd</sup> semester) Project Work			02
Fourth				12
Total credits				74

## **5.0 Attendance:**

5.1) The candidate shall be deemed to have eligibility to write end semester examinations if he has secured a minimum of 75% of attendance in aggregate of all the subjects.

5.2) Condonation of shortage of attendance up to 10% i.e. 65% and above and below 75% may be given by the College academic committee consisting of Principal, Head of the Department and a senior faculty member.

5.3) Condonation of shortage of attendance shall be granted only on genuine and valid reasons on representation by the candidate with supporting evidence.

**5.4) Shortage of attendance below 65% shall in no case be condoned.**

5.5) The candidate shall not be promoted to the next semester unless he fulfils the attendance requirements of the previous semester.

## **6.0 Evaluation:**

The performance of the candidate in each semester shall be evaluated subject wise, with a maximum of 100 marks for Theory and 100 marks for practicals, on the basis of Internal Evaluation and End Semester Examination.

6.1) For the theory subjects 60 marks shall be for the External End Examination, While 40 marks shall be for Internal Evaluation, based on the better of the marks secured in the two Mid Term-Examinations held, one in the middle of the Semester (I-IV units) and another immediately After the completion of instruction (V-VIII) units with four questions to be answered out of six, evaluated for 40 marks. Each question carries 10 marks. Each midterm examination shall be conducted for duration of 120 minutes. The End Examination will have 08 questions and 5 questions are to be answered and each question carries 12 marks.

6.2) For practical subjects, 60 marks shall be for the End Semester Examinations and 40 marks shall be for Internal evaluation based on the day-to-day performance. End practical examinations for M.Tech courses will be conducted with two Examiners, one of them being Laboratory Class Teacher and second Examiner shall be external from other institution.

6.3) Student has to undergo a comprehensive viva pertaining to his specialization which carries 100 marks. He has to secure 50% marks to obtain required credits. Comprehensive viva will be held at the end of II semester with HOD, senior faculty member and external Examiner from outside the institute. For this, HOD of the Department shall submit a panel of 5 Examiners, who are eminent in that field. One from the panel will be selected by the principal of the institute as external Examiner for comprehensive viva.

6.4) For Seminar 100 marks shall be for Internal evaluation. The candidate has to secure a minimum of 50 marks to be declared successful. The assessment will be made by a board consisting of HOD and two Internal experts at the end of III semester.

6.5) The candidate shall be deemed to have secured the minimum academic requirement in a subject if he secures a minimum of 40% of marks in the End Examination and a minimum aggregate of 50% of the total marks in the End Examination and Internal evaluation taken together.

6.6) In case the candidate does not secure the minimum academic requirement in any subject(as specified in 6.5.) he has to reappear for the Semester Examination either supplementary or

regular in that subject, or repeat the course when next offered or do any other specified subject as may be required.

### **7.0 Re-registration for improvement of Internal marks:**

Following are the conditions to avail the benefit of improvement of internal marks.

7.1) The candidate should have completed the course work and obtained examinations results for I & II semesters.

7.2) He should have passed all the subjects for which the internal marks secured are more than 50%.

7.3) Out of the subjects the candidate has failed in the examination due to lack of Internal marks secured being less than 50%, the candidate shall be given one chance for Theory subject and subject to a maximum of three Theory subjects.

7.4) The candidate has to re-register for the chosen subjects and fulfil the academic requirements as and when they are offered.

7.5) For each subject, the candidate has to pay a fee equivalent to one third of the semester tuition fee and the amount is to be remitted in the form of D.D. in favour of the Principal, RGM CET payable at RGM CET Nandyal branch along with the requisition through the HOD of the respective Department.

7.6) In case of availing the Improvement of Internal marks, the Internal marks as well as the End Examinations marks secured in the previous attempt(s) for the reregistered subjects stand cancelled.

### **8.0 Evaluation of Project / Dissertation work :**

Every candidate shall be required to submit thesis or dissertation after taking up a topic approved by the Department.

8.1) Registration of Project work: The candidate is permitted to register for the project work after satisfying the attendance requirement of all the courses (theory and practical courses of I & II Sem).

8.2) An Internal Department Committee (I.D.C) consisting of HOD, Supervisor and One Internal senior expert shall monitor the progress of the project work.

8.3) The work on the project shall be initiated in the penultimate semester and continued in the final semester. The duration of the project is for two semesters. The candidate can submit Project thesis with the approval of I.D.C. after 36 weeks from the date of registration at the earliest. Extension of time within the total permissible limit for completing the programme is to be obtained from the Head of the Institution.

8.4) The student must submit status report at least in three different phases during the project work period. These reports must be approved by the I.D.C before submission of the Project Report.

8.5) The candidate shall be allowed to submit the thesis / dissertation only after passing in all the prescribed subjects (both theory and practical) and then take viva voce examination of the project. The viva voce examination may be conducted once in two months for all the candidates submitted during that period.

8.6) Three copies of the Thesis / Dissertation certified in the prescribed form by the supervisor & HOD shall be submitted to the institute.

8.7) The Department shall submit a panel of three experts for a maximum of 5 students at a time. However, the thesis / dissertation will be adjudicated by the board consists of HOD, concerned supervisor and one external Examiner from other institute nominated by the principal from a panel of Examiners submitted by the Department to the Controller of Examinations.

8.8) If the report of the board is favourable in viva voce examination, the board shall jointly report candidates work as:

1. Satisfactory
2. Not satisfactory

If the report of the viva voce is not satisfactory the candidate will retake the viva voce examination after three months. If he fails to get a satisfactory report at the second viva voce examination he will not be eligible for the award of the degree unless the candidate is permitted to revise and resubmit the thesis.

#### **9.0 Award of Degree and Class:**

After the student has satisfied the requirements prescribed for the completion of the program and is eligible for the award of M. Tech. Degree he shall be placed in one of the following classes:

**Table 3: Award of division**

Class Awarded	% of marks to be secured	From the aggregate marks secured form the 74 Credits.
First Class with Distinction	70% and above	
First Class	Below 70% but not less than 60%	
Second Class	Below 60% but not less than 50%	

(The marks in Internal evaluation and End Examination shall be shown separately in the marks memorandum)

#### **10.0 Supplementary Examinations:**

Apart from the regular End Examinations the institute may also schedule and conduct supplementary examinations for all subjects for the benefit of students with backlogs. Such of the students writing supplementary examinations as supplementary candidates may have to write more than one examination per day.

#### **11.0 Transcripts:**

After successful completion of prerequisite credits for the award of degree a Transcript containing performance of all academic years will be issued as a final record. Duplicate transcripts will also be issued if required after the payment of requisite fee and also as per norms in vogue.

#### **12.0 Minimum Instruction Days:**

The minimum instruction days for each semester shall be 95 clear instruction days excluding the days allotted for tests/examinations and preparation holidays declared if any.

### **13.0 Amendment of Regulations:**

The college may, from time to time, revise, amend or change the regulations, scheme of examinations and syllabi. However the academic regulations of any student will be same throughout the course of study in which the student has been admitted.

### **14.0 Transfers**

There shall be no branch transfers after the completion of admission process.

### **15.0 With holding of results:**

If the candidate has not paid any dues to the institute or if any case of in-discipline is pending against him, the result of the candidate will be with held and he will not be allowed for the next semester. The issue of the degree is liable to be withheld in such cases.

### **16.0 Transitory Regulations:**

Candidates who have discontinued or have been detained for want of attendance are eligible for admission to the same or equivalent subjects as and when subjects are offered, subject to 6.5 and 2.0

### **17.0 Rules of Discipline:**

17.1) Any attempt by any student to influence the teachers, Examiners, faculty and staff of controller of Examination for undue favours in the exams, and bribing them either for marks or attendance will be treated as malpractice cases and the student can be debarred from the college.

17.2) When The student absents himself, he is treated as to have appeared and obtained zero marks in that subject(s) and grading is done accordingly.

17.3) When the performance of the student in any subject(s) is cancelled as a punishment for indiscipline, he is awarded zero marks in that subject(s).

17.4) When the student's answer book is confiscated for any kind of attempted or suspected malpractice the decision of the Examiner is final.

### **18.0 General:**

18.1) The Academic Regulation should be read as a whole for the purpose of any interpretation.

18.2) In the case of any doubt or ambiguity in the interpretation of the above rules, the decision of the College Academic Council is final.

18.3) The Institute may change or amend the academic regulations or syllabi at any time and the changes or amendments made shall be applicable to all the students with effect from the dates notified by the Institute.

18.4) Where the words "he", "him", "his", occur in the regulations, they include "she", "her", "hers".

## COURSE STRUCTURE

### SEMESTER – I

Code	Subject	Scheme of instruction periods/week		Credits	Scheme of Examination		
		Theory	Practical		Internal	External	Total
D2501101	<u>Design and Analysis of Algorithms</u>	4		4	40	60	100
D2502101	<u>Advances in Software Engineering</u>	4		4	40	60	100
D2503101	<u>Object Oriented Design and Patterns</u>	4		4	40	60	100
D2504101	<u>Software Quality Assurance and Testing</u>	4		4	40	60	100
<b>ELECTIVE-I</b>							
D2505101	<u>Human Computer Interaction</u>	4		4	40	60	100
D2506101	<u>Data Mining &amp; Information Retrieval</u>						
D2507101	<u>Cloud Computing</u>						
<b>ELECTIVE-II</b>							
D2508101	<u>Embedded Systems</u>	4		4	40	60	100
D2509101	<u>Mobile Computing</u>						
D2510101	<u>Software Requirements And Estimation</u>						
<b>LABORATORY</b>							
D2591101	<u>Data Structures &amp; Algorithms</u>		3	2	40	60	100
D2592101	<u>Quality Assurance &amp; Testing</u>		3	2	40	60	100
<b>Total</b>		<b>24</b>	<b>6</b>	<b>28</b>	<b>320</b>	<b>480</b>	<b>800</b>

### SEMESTER – II

Code	Subject	Scheme of instruction periods/week		Credits	Scheme of Examination		
		Theory	Practical		Internal	External	Total
D2511102	<u>Middleware Technologies &amp; Service Oriented Architecture</u>	4		4	40	60	100
D2512102	<u>Software Architecture &amp; Advanced Design Patterns</u>	4		4	40	60	100
D2513102	<u>Software Project Management</u>	4		4	40	60	100
D2514102	<u>Software Maintenance &amp; Reengineering</u>	4		4	40	60	100
<b>ELECTIVE-III</b>							
D2515102	<u>Secure Software Engineering</u>	4		4	40	60	100
D2516102	<u>Soft Computing</u>						
D2517102	<u>Model-driven Software Development</u>						
<b>ELECTIVE-IV</b>							
D2518102	<u>Machine Learning</u>	4		4	40	60	100
D2519102	<u>Image Processing</u>						
D2520102	<u>High Performance Computing</u>						
<b>LABORATORY</b>							
D2593102	<u>Middleware Technologies</u>		3	2	40	60	100
D2594102	<u>Software Project Management and Reengineering</u>		3	2	40	60	100
D2595102	Comprehensive Viva			4		100	100
<b>Total</b>		<b>24</b>	<b>6</b>	<b>32</b>	<b>320</b>	<b>580</b>	<b>900</b>

### III-SEMESTER & IV-SEMESTER

Code	Subject	Credits	Internal	External	Total
D2596103	Seminar (End of III Semester)	2	100	-	100
D2597104	Project work	12	-	-	-
<b>Total</b>		<b>14</b>	<b>100</b>	<b>-</b>	<b>100</b>



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**(D2501101) DESIGN AND ANALYSIS OF ALGORITHMS**

**UNIT I :** Algorithm Analysis

Efficiency of algorithms, Apriori Analysis, Asymptotic Notations, Time complexity of an algorithm using O notation, Polynomial Vs Exponential Algorithms, Average, Best, and Worst Case Complexities, Analyzing Recursive Programs. Introduction to Computability, correctness, and complexity.

**UNIT II:** Trees and Graphs

Introduction, Definition and Basic terminologies of trees and binary trees, Representation of trees and Binary trees, Binary tree Traversals, Threaded binary trees, Graphs-basic concepts, representation and traversals. Hash Tables: Introduction, Hash Tables, Hash Functions and its applications.

**UNIT III:** Binary Search Trees, AVL Trees and B Trees, Red – Black Trees, Splay Trees and Hash Tables

Introduction, Binary Search Trees: Definition, Operations and applications. AVL Trees: Definition, Operations and applications. B Trees: Definition, Operations and applications. Red – Black Trees, Splay Trees and its applications.

**UNIT IV:** Divide – and – Conquer & Greedy Method

Divide-and-conquer method: General Method, Binary Search, Finding Maximum and Minimum, Quick Sort, Merge sort, Strassen's Matrix Multiplication, Greedy Method: General Method, Minimum Cost Spanning Trees, Single Source Shortest Path.

**UNIT V:** Dynamic Programming

General Method, All Pairs Shortest Path, Single Source Shortest Path, 0 / 1 Knapsack problem, Reliability Design, Traveling Sales Person's Problem.

**UNIT VI:** Back Tracking and Branch – and – Bound

General Method, 8 – Queen's Problem, Graph Coloring. Branch – and – Bound: The Method, LC Search, Control Abstraction, Bounding, 0 / 1 Knapsack Problem.

**UNIT VII:** Parallel Algorithms

Introduction to parallelism- computer system categories, parallel architectures, principles of parallel analysis; PRAM model; simple parallel operations; parallel searching; parallel sorting; parallel numerical algorithms; parallel graph algorithms.

**UNIT VIII:** Nondeterministic and Probabilistic algorithms

What is NP?, typical NP problems; is P = NP?; testing possible solutions – job scheduling, graph coloring.

Numerical probabilistic algorithms:-Buffon's Needle, Monte Carlo integration, probabilistic counting; Monte Carlo algorithms- majority element, primetesting, Las Vegas algorithm, Sherwood algorithm, comparison of probabilistic algorithms.

**TEXT BOOKS:**

1. Data Structures and Algorithms by G.A.V. Pai, 2009, TMH.
2. Analysis of Algorithms- An active learning approach by Jeffrey J. Connell,2002, Narosa.
3. Fundamentals of Computer Algorithms by Ellis Horowitz, Sartaj Sahni and Sanguthevar Rajasekaran, 2nd edition, University Press.

**REFERENCE BOOKS:**

1. Classic Data Structures by D. Samanta, 2005, PHI.
2. Design and Analysis of Computer Algorithms by Aho, Hopcraft, Ullman 1998, PEA.
3. Introduction to the Design and Analysis of Algorithms by Goodman, Hedetniemi, TMG.
4. Design and Analysis of Algorithms by E. Horowitz, S. Sahani, 3rd Edition, Galgotia.
5. Data Structures and Algorithms in C++ by Drozdek 2nd Edition, Thomson.

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**(D2502101) ADVANCES IN SOFTWARE ENGINEERING**

**UNIT I:** Introduction

Software Processes: Software Process Models, Process Iteration, Process Activities, The Rational Unified Process, Computer-Aided Software Engineering

Project Management: Management Activities, Project Planning, Project Scheduling, Risk Management

**UNIT II:** Requirements

Software Requirements: Functional and Non-Functional Requirements, User Requirements, System Requirements, Interface Specification, The Software Requirements Document

Requirements Engineering Processes: Feasibility Studies, Requirements Elicitation And Analysis, Requirements Validation, Requirements Management

**UNIT III:** Design

Architectural Design: Architectural Design Decisions, System Organization, Modular Decomposition Styles, Control Styles, Reference Architectures

Object-Oriented Design: Objects And Object Classes, An Object-Oriented Design Process, Design Evolution

**UNIT IV:** Development

Rapid Software Development: Agile Methods, Extreme Programming, Rapid Application Development, Software Prototyping

Software Reuse: The Reuse Landscape, Design Patterns, Generator-Based Reuse, Application Frameworks, Application System Reuse

An Overview of Component-Based Software Engineering and its use.

**UNIT V:** Verification And Validation

Verification And Validation: Planning Verification And Validation, Software Inspections, Automated Static Analysis, Verification And Formal Methods

Software Testing: System Testing, Component Testing, Test Case Design, Test Automation

An Overview of Critical Systems Specification and Critical Systems Validation

**UNIT VI:** Management

Managing People: Selecting Staff, Motivating People, Managing Groups, The People Capability Maturity Model

Software Cost Estimation: Software Productivity, Estimation Techniques, Algorithmic Cost Modeling, Project Duration and Staffing

**UNIT VII:** Quality Management

Process And Product Quality, Quality Assurance And Standards, Quality Planning, Quality Control, Software Measurement And Metrics Configuration Management: Configuration

Management Planning, Change Management, Version And Release Management, System Building, CASE Tools For Configuration Management

**UNIT VIII:** Emerging Technologies

Security Engineering: Security Concepts, Security Risk Management, Design For Security, System Survivability

Service-Oriented Software Engineering: Services As Reusable Components, Service Engineering, Software Development With Services

**Text Books:**

1. Software Engineering, by Ian Sommerville, Addison-Wesley, 8th Edition, 2006.

**References:**

2. Software Engineering, A Practitioner's Approach, by Roger S. Pressman, 7th Edition, 2009
3. The Future of Software Engineering, edited by Anthony Finkelstein, ACM Press, 2000

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**(D2503101) Object-Oriented Design and Patterns**

**UNIT I:** Introduction to OOD.

The principles of object oriented Design - Encapsulation and connascence, Encapsulation structure, Levels of encapsulation, Design criteria governing interacting levels of encapsulation. Connascence - varieties of connascence, contra nascence, connascence and encapsulation, boundaries, connascence and maintainability, connascence abuse in object –oriented system.

**UNIT II:** Class Diagrams

The Generalization construct, Single inheritance, Multiple Inheritances, Subclass Partitioning. The Association Construct - The basic UM notation for Association, Associations depicted as classes, Higher-order Associations, Navigability of Associations, the Whole/ Part Associations, Composition, Aggregation.

**UNIT III:** Object Interaction Diagrams

The Collaboration Diagram, Depicting a message, Polymorphism in the collaboration Diagram, Iterated messages, Use of self in messages.

The sequence Diagram - Asynchronous messages and concurrent execution, The call back mechanism, Asynchronous message with Priority, Depicting a broadcast.

**UNIT IV:** State Diagram

Basic State Diagram, Nested States, Concurrent States and Synchronization, Transient States from Message Result Arguments, Continuously Variable Attribute.

**UNIT V:** Inception

Artifacts that may start in inception, Understanding Requirements, Types of Requirements. Use Case Model - Use cases and Functional Requirements, Goals and scope of a Use cases, Finding Priority Actors ,Goals , and Use cases.

**UNIT VI:** Elaboration Iteration 1

Design model : Use case Realization with GRASP Patterns - Use case Realization for the Next Gen Iteration, Use- Case Realization, Use-Case Realization for the NextGen Iteration, Object Design enter Item.

Determine Visibility - Visibility between Objects, Illustrating visibility in the UML.

Implementation Model: Mapping Designs to code, Creating Methods from Interaction Diagrams, Exception and Error Handling, Order of Implementation.

**UNIT VII:** Elaboration Iteration 2 and its Requirements

From Iteration 1 to 2, Iteration 2 Requirements.

Design Use-Case Realization with GoF Design Patterns – Adapter, Singleton.

Elaboration Iteration 3 - Relating Use-Cases, The Include Relationship, The Extend Relationship, The Generalization Relationship

**UNIT VIII:** Designing a Software Component

What is a Component, Similarities & Differences between Components, Internal Design of a Component, Lightweight and Heavy Weight Component, Advantages and Disadvantages of using Component.

**TEXT BOOKS:**

1. Fundamentals of Object-Oriented Design in UML, Meilir Page-Jones, 6th Impression 2009, Pearson Education.
2. Applying UML and Patterns: An introduction to Object – Oriented Analysis and Design and Unified Process, Craig Larman, 2nd edition, Pearson Education.

**REFERENCE:**

1. The Unified Modeling Language User Guide, Grady Booch, James Rumbaugh, Ivar Jacobson , Pearson Education.
2. UML 2 Toolkit, Hans-Erik Eriksson, Magnus Penker, Brian Lyons, David Fado, WILEY-Dreamtech India Pvt. Ltd.
3. Modeling Software Systems Using UML2, Pascal Roques, WILEY-Dreamtech India Pvt. Ltd.
4. Object Oriented Analysis & Design, Atul Kahate, The McGraw-Hill Companies.
5. Practical Object-Oriented Design with UML, Mark Priestley, TATA McGrawHill

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**(D2504101) SOFTWARE QUALITY ASSURANCE AND TESTING**

**UNIT: I**

Software Quality Assurance Framework and Standards SQA Framework: What is Quality? Software Quality Assurance, Components of Software Quality Assurance – Software Quality Assurance Plan: Steps to develop and implement a Software Quality Assurance Plan – Quality Standards: ISO 9000 and Companion ISO Standards, CMM, CMMI, PCMM, Malcom Balridge, 3 Sigma, 6 Sigma

**UNIT: II**

Software Quality Assurance Metrics and Measurement Software Quality Metrics: Product Quality metrics, In-Process Quality Metrics, Metrics for Software Maintenance, Examples of Metric Programs.

**UNIT: III**

Software Quality Metrics Methodology: Establish quality requirements, Identify Software quality metrics, implement the software quality metrics, analyze software metrics results, and validate the software quality metrics – Software quality indicators – Fundamentals in Measurement theory.

**UNIT: IV**

Software Testing Strategy and Environment: Establishing testing policy, structured approach to testing, test factors, Economics of System Development Life Cycle (SDLC) Testing.

**UNIT: V**

Software Testing Methodology Defects hard to find, verification and validation, functional and structural testing, workbench concept, eight considerations in developing testing methodologies, testing tactics checklist.

**UNIT: VI**

Software Testing Techniques - Black-Box, Boundary value, Bottom-up, Branch coverage, Cause-Effect graphing, CRUD, Database, Exception, Gray-Box, Histograms, Inspections, JADs, Pareto Analysis, Prototyping, Random Testing, Risk-based Testing, Regression Testing, Structured Walkthroughs, Thread Testing, Performance Testing, White-Box Testing.

**UNIT: VII**

Software Testing Tools: Taxonomy of Testing tools, Methodology to evaluate automated testing tools, Load Runner, Win runner and Rational Testing Tools, Silk test, Java Testing Tools, JMetra, JUNIT and Cactus.

**UNIT: VIII**

Testing Process: Eleven Step Testing Process: Assess Project Management Development Estimate and Status, Develop Test Plan, Requirements Phase Testing, Design Phase Testing, Program Phase Testing, Execute Test and Record Results, Acceptance Test, Report test results,

testing software installation, Test software changes, Evaluate Test Effectiveness. Testing Specialized Systems and Applications Testing Client/Server – Web applications, Testing off the Shelf Components, Testing Security, Testing a Data Warehouse.

**TEXT BOOKS:**

1. Effective Methods for Software Testing, 2nd Edition, William E.Perry , Second Edition, Wiley India, 2006.
2. Software Quality, Mordechai Ben-Menachem/Garry S. Marliss, Thomson Learning publication, 1997.

**REFERENCE BOOKS:**

1. Software Testing Tools, K.V.K.K. Prasad, Dream tech press, 2008.
2. Software Testing Techniques, by Borjes Beizer, Second Edition, Dreamtech Press
3. Handbook of Software Quality Assurance, by G. Gordon Schulmeyer, James I.McManus, Second Edition, International Thomson Computer Press
4. Metrics and Models for Software Quality Engineering, by Stephen H. Kan, by Pearson Education Publication.
5. Software Testing, Srinivasan Desikan & Gopaldaswamy Ramesh, Pearson Education,2006.
6. Software testing techniques, Scott Loveland & Geoffrey Miller, Shroff Publishers, 2005.



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**(D2505101) HUMAN COMPUTER INTERACTION**

(Elective – I)

**UNIT I:** Introduction

Importance of user Interface, definition, importance of good design. Benefits of good design. A brief history of Screen design,

**UNIT II:** The graphical user interface.

Popularity of graphics, the concept of direct manipulation, graphical system, Characteristics, Web user – Interface popularity, characteristics- Principles of user interface.

**UNIT III:** Design process

Human interaction with computers, importance of human characteristics human consideration, Human interaction speeds, understanding business junctions.

**UNIT IV:** Screen Designing

Design goals – Screen planning and purpose, organizing screen elements, ordering of screen data and content – screen navigation and flow – Visually pleasing composition – amount of information – focus and emphasis – presentation information simply and meaningfully – information retrieval on web – statistical graphics – Technological consideration in interface design.

**UNIT V:** Windows

New and Navigation schemes selection of window, selection of devices based and screen based controls.

**UNIT VI:** Components

Ttext and messages, Icons and increases – Multimedia, colors, uses problems, choosing colors.

**UNIT VII:** Software tools

Specification methods, interface – Building Tools.

**UNIT VIII:** Interaction Devices

Keyboard and function keys – pointing devices – speech recognition digitization and generation – image and video displays – drivers.

**TEXT BOOKS**

1. The essential guide to user interface design, Wilbert O Galitz, Wiley DreamTech.
2. Designing the user interface. 3rd Edition Ben Shneidermann , Pearson Education.

**REFERENCE BOOKS**

1. Human – Computer Interaction. Alan Dix, Janet Fincay, Gre Goryd, Abowd, Russell Bealg, Pearson Education
2. Interaction Design Prece, Rogers, Sharps. Wiley Dreamtech, 3. User Interface Design, Soren Lauesen , Pearson Education.

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**(D2506101) DATA MINING AND INFORMATION RETRIEVAL**

(Elective – I)

**UNIT- I**

Introduction to data mining, knowledge discovery from database, kind of data, data mining functionalities, classification of data mining systems

Data warehouse, Multidimensional data models: data cubes, stars, snowflakes and fact constellations, defining schemas, concept hierarchies, OLAP, Three-tier data warehouse architecture, Types of OLAP servers, data warehouse implementation.

**UNIT- II**

Data preprocessing and its need, data cleaning, data integration, data transformation, data reduction, discretization and concept hierarchy generation

Data Mining Primitives, Languages and its system architectures: Task relevant data, Kind of knowledge to be mined, data mining query languages and its syntaxes, designing GUI, architectures of DM systems.

**UNIT- III**

Class description, data generalization and summarization-based characterization, Attribute relevance analysis, association rule mining and its road map, finding frequent item sets using APRIORI algorithm and FP growth algorithm, mining multi- level association rules from relational databases, Correlational analysis

**UNIT- IV**

Introduction to classification and prediction, classification model, classification using decision trees, classification by Bayesian concepts Back propagation, K-nearest neighbor classifiers , case based reasoning, genetic algorithms, Linear and Non-linear regression, Bagging and Boosting, DM tools such as OLEDB/ DBMiner / WEKA / ORACLE DM

**UNIT-V**

Clustering, types of data, partitioning methods: k-means and PAM, hierarchical clustering methods: BIRCH, CURE, CHAMELEON Clustering, Density Based Clustering: DBSCAN, OPTICS, DENCLUE, Grid based clustering: STING, CLIQUE, Model based clustering methods, Outlier analysis

**UNIT-VI**

Information Retrieval Introduction: Definition, Objectives, Functional Overview, Relationship to DBMS, Information Retrieval System Capabilities: Search, Browse, Miscellaneous

**UNIT-VII**

Cataloging and Indexing: Objectives, Indexing Process, Automatic Indexing, Information Extraction, Data Structures: Introduction, Stemming Algorithms, Inverted file structures, N-

gram data structure, PAT data structure, Signature file structure, Hypertext data structure, Document and Term Clustering

### **UNIT- VIII**

User Search Techniques, Information Visualization, Text Search Algorithms: Introduction, Software text search algorithms, Hardware text searching systems, Information system Evaluation

### **TEXT BOOKS**

1. J. Han, M. Kamber, Data Mining Concepts and Techniques, Second Edition, ELSEVIER
2. Information storage and retrieval systems : Theory and Implementation by Kowalski, Gerald, Mark T Maybury Kluwer Academic Press, 2000

### **REFERENCE BOOKS**

1. Data Mining Techniques – Arun K Pujari, University Press.
2. Data Warehousing in the Real World – Sam Aanhory & Dennis Murr Pearson Edn Asia.
3. Data Warehousing Fundamentals – Paulraj Ponnaiah Wiley student Edition
4. The Data Warehouse Life cycle Tool kit – Ralph Kimball Wiley student edition.

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**(D2507101) CLOUD COMPUTING**

**UNIT I:**

Cloud Computing Basics; Overview, applications, Internet and cloud Organization and Cloud Computing: use cloud computing, benefits, Limitations, security concerns.

**UNIT II:**

Cloud Computing with the Titans (Google, Microsoft, Amazon, Yahoo); The Business Case for going Cloud: Cloud computing Services, deleting data center, Thomson routers

**UNIT III:** (Cloud Computing Technology)

Hardware and Infrastructure: clients, security, network, services Accessing the Cloud (basics to APIs); Platforms, web apps,

**UNIT IV:**

Cloud Storage: Overview, Cloud storage providers

Emerging Standards: Applications, client, infrastructure, Service

**UNIT V:** (Cloud Computing at Work)

Software as a Service; Overview, Driving forces, company offerings, industries, Software plus Services

**UNIT VI:**

Developing Applications; Google, Microsoft, Cast Iron Cloud, Bungee Connect, Development, trouble Shooting, Application Management

**UNIT VII:**

Local Clouds and Thin Clients; Virtualization, server solutions, Thin Clients

**UNIT VIII:**

Migrating to the Cloud: Cloud services for individuals, cloud services, Enterprise cloud offerings Best Practices and Future of Cloud Computing

**TEXT BOOK**

1. Cloud Computing, A Practical Approach by Toby Velte , Anthony Velte

**REFERENCES:**

1. Cloud Computing and SOA Convergence in Your Enterprise: A Step-by-Step Guide by David S. Linthicum
2. Cloud Computing: Web-Based Applications That Change the Way You Work and Collaborate Online by Michael Miller (Aug 21, 2008)
3. Cloud Application Architectures: Building Applications and Infrastructure in the Cloud (Theory in Practice (O'Reilly)) by George Reese (Apr 10, 2009)

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**(D2508101) EMBEDDED SYSTEMS**

(Elective – II)

**UNIT-I:** Embedded Computing

Embedding Computers, Characteristics of Embedded Computing, Applications, Challenges in Embedded Computing System Design, Performance in Embedded Computing, The Embedded System Design Process, Formalisms for System Design, case study: Model Train Controller.

**UNIT – II:** Instruction Sets

Computer Architecture Taxonomy, Assembly Language, ARM Processor, TI C55x DSP Or SHARC family of DSPs

**UNIT – III:** CPUs

Programming Input and Output, Supervisor Mode, Exceptions, and Traps, Co-Processors; Memory System Mechanisms- Caches, Memory Management Units and Address Translation; CPU Performance- Pipelining, Caching CPU Power Consumption; Design Example: Data Compressor.

**UNIT – IV:** Bus-Based Computer System

The CPU Bus, Bus Protocols, DMA, System Bus Configurations, AMBA Bus; Memory Devices- Memory Device Organization Random-Access Memories, Read-Only Memories; I/O devices, Timers and Counters A/D and D/A Converters, Keyboards, LEDs Displays, Touch screens; Component Interfacing- Memory Interfacing, Designing with Microprocessors, System Architecture, Hardware Design, The PC as a Platform; Development and Debugging Development Environments, Debugging Techniques, Debugging Challenges, System-Level Performance Analysis, System-Level Performance Analysis, Parallelism; Design Example: Alarm Clock.

**UNIT – V:** Program Design and Analysis

Components for Embedded Programs; Models of Programs; Assembly, Linking, and Loading; Basic Compilation Techniques; Program Optimization; Program-Level Performance Analysis; Software Performance Optimization; Program-Level Energy and Power Analysis and Optimization; Analysis and Optimization of Program Size; Program Validation and Testing Design example: Software Modem.

**UNIT – VI:** Processes and Operating Systems

Multiple Tasks and Multiple Processes; Preemptive Real-Time Operating Systems; Priority-Based Scheduling; Interprocess Communication Mechanisms; Power Management and Optimization for Processes; Design Example: Telephone Answering Machine.

**UNIT – VII:** Multiprocessors And Networks

CPUs and Accelerators; Multiprocessor Performance Analysis; Consumer Electronics Architecture; Some Design Examples. Distributed Embedded Architectures; Networks for

Embedded Systems; Network-Based Design; Internet-Enabled Systems; Vehicles as Networks;  
Design Example: Elevator Controller.

UNIT – VIII: System Design Techniques

Design Methodologies; Requirements Analysis; Specifications; System Analysis and Architecture  
Design; Quality Assurance.

**TEXT BOOK**

1. Computers as Components - Principles of Embedded Computing System Design, by  
Wayne Wolf, Second Edition, Morgan Kaufmann Publishers, 2008.

**REFERENCE BOOKS**

2. Embedding system building blocks, Labrosse, via CMP publishers.
3. Embedded Systems, Raj Kamal, TMH.
4. Embedded System Design, Frank Vahid, Tony Givargis, John Wiley.
5. An Embedded Software Primer, David E. Simon, Pearson Education.

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**(D2509101) MOBILE COMPUTING**

(Elective – II)

**UNIT I:** Introduction to Network Technologies and Cellular Communications:

HIPERLAN: Protocol architecture, physical layer, Channel access control sub layer, MAC sub layer, Information bases and networking WLAN: Infrared vs. radio transmission, Infrastructure and ad hoc networks, IEEE 802.11. Bluetooth.: User scenarios, Physical layer, MAC layer, Networking, Security, Link management GSM: Mobile services, System architecture, Radio interface, Protocols, Localization and calling, Handover, Security, and New data services. Mobile Computing (MC): Introduction to MC, novel applications, limitations, and architecture.

**UNIT II:** (Wireless) Medium Access Control:

Motivation for a specialized MAC (Hidden and exposed terminals, Near and far terminals), SDMA, FDMA, TDMA, CDMA.

**UNIT III:** Mobile Network Layer:

Mobile IP (Goals, assumptions, entities and terminology, IP packet delivery, agent advertisement and discovery, registration, tunneling and encapsulation, optimizations), Dynamic Host Configuration Protocol (DHCP).

**UNIT IV:** Mobile Transport Layer:

Traditional TCP, Indirect TCP, Snooping TCP, Mobile TCP, Fast retransmit/fast recovery, Transmission /time out freezing, Selective retransmission, Transaction oriented TCP.

**UNIT V:** Database Issues:

Hoarding techniques, caching invalidation mechanisms, client server computing with adaptation, power aware and context aware computing, transactional models, query processing, recovery, and quality of service issues.

**UNIT VI:** Data Dissemination:

Communications asymmetry, classification of new data delivery mechanisms, push based mechanisms, pull based mechanisms, hybrid mechanisms, selective tuning (indexing) techniques.

**UNIT VII:** Mobile Ad hoc Networks (MANETs):

Overview, Properties of a MANET, spectrum of MANET applications, routing and various routing algorithms, security in MANETs.

**UNIT VIII:** Protocols and Tools:

Wireless Application Protocol WAP. (Introduction, protocol architecture, and treatment of protocols of all layers), Bluetooth (User scenarios, physical layer, MAC layer, networking, security, link management) and J2ME.

**TEXT BOOKS:**

1. Mobile Communications, Jochen Schiller, (Chapters 4, 7, 9, 10, 11), Pearson Education, Second edition, 2004.
2. Handbook of Wireless Networks and Mobile Computing, Stojmenovic and Cacute, Wiley, 2002, (Chapters 11, 15, 17, 26 and 27).

**REFERENCE BOOK:**

1. Mobile Computing Principles: Designing and Developing Mobile Applications with UML and XML", ISBN: 0521817331, Cambridge University Press, October 2004.



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**(D2510101) SOFTWARE REQUIREMENTS AND ESTIMATION**

(Elective – II)

**UNIT I:** Software Requirements:

What and Why Essential Software requirement, Good practices for requirements engineering, Improving requirements processes, Software requirements and risk management.

**UNIT II:** Software Requirements Engineering:

Requirements elicitation, requirements analysis documentation, review, elicitation techniques, analysis models, Software quality attributes, risk reduction through prototyping, setting requirements priorities, verifying requirements quality,

**UNIT III:** Software Requirements Management:

Requirements management Principles and practices, Requirements attributes, Change Management Process, Requirements Traceability Matrix, Links in requirements chain UNIT IV Software Requirements Modeling Use Case Modeling, Analysis Models, Dataflow diagram, state transition diagram, class diagrams, Object analysis, Problem Frames.

**UNIT V:** Software Estimation Components:

Software Estimations, Estimation methods, Problems associated with estimation, Key project factors that influence estimation.

**UNIT VI:** Size Estimation:

Two views of sizing, Function Point Analysis, Mark II FPA, Full Function Points, LOC Estimation, Conversion between size measures.

**UNIT VII:** Effort, Schedule and Cost Estimation:

What is Productivity? Estimation Factors, Approaches to Effort and Schedule Estimation, COCOMO II, Putnam Estimation Model, Algorithmic models, Cost Estimation.

**UNIT VIII:** Tools for Requirements:

Management and Estimation Requirements Management Tools: Benefits of using a requirements management tool, commercial requirements management tool, Rational Requisite pro, Caliber RM, implementing requirements management automation, Software Estimation Tools: Desirable features in software estimation tools, IFPUG, COCOMO II, SLIM (Software Life Cycle Management) Tools.

**TEXT BOOKS:**

1. Software Requirements and Estimation by Rajesh Naik and Swapna Kishore, published by Tata Mc Graw Hill WEB TECHNOLOGIES

**REFERENCES:**

1. Software Requirements by Karl E. Weigers.

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**(D2591101) DATA STRUCTURES & ALGORITHMS**

**Objective:**

To implement all the key algorithms described in the syllabus in C++ or Java.

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**(D2592101) QUALITY ASSURANCE & TESTING LAB**

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**(D2511102) MIDDLEWARE TECHNOLOGIES & SERVICE ORIENTED ARCHITECTURE**

**UNIT I:** Introduction to Middleware

What is Middleware? Why Middleware? Need for connectivity. Client Server concepts, Multi-tiered architecture, Distributed computing models.

**UNIT II:** Middleware categories.

Directory Services - LDAP, JNDI, Active Directory, Transaction processing – OLTP. Message oriented middleware (MoM). MQ Series. Distributed systems, COM/DCOM, CORBA. Business Process Execution Language (BPEL), Mobile Interoperability (Conceptual only).

**UNIT III:** Web Services.

Introduction. Where does WS fit into Middleware? Standards - XML/XSLT, SOAP, WSDL, REST. Frameworks & Utilities - Axis, etc.,

**UNIT IV:** Enterprise Architecture Integration (EAI)

What is Integration? Intro to EAI - definition of concepts involved - EDI, B2B Integration, Legacy integration, EAI Infrastructure, ESB, EAI Solution utilities - TIBCO, Vitria, etc

**UNIT V:** BPEL

Business process integration Vs Technical integration. Process Orchestration. Solutions available- SAP PI, Oracle Fusion.

**UNIT VI:** Service Oriented Architecture-1

Review of basic tiered architecture-EA and the basic points of benefit of SOA including better integration, business agility, asset re-use, increase ROI.

Web Services and SOA - XML over the Http protocol. Representational State Transfer(REST). Main java implementations of web services JAX-WS 2, Axis2, Spring-WS, and XFire/CXF 2.0.

**UNIT VII:** Service Oriented Architecture-2

Web Service Implementations in JAX-WS2, Axis2, Spring-WS, and XFire/CXF 2.0 The coded examples are very easy to follow and can get a developer up and running quickly.

Data and Services –review of JDO(Java Data Objects) as an alternative to JDBC along with sample code and examples. Service Data Objects(SDO). Apache Tuscany DSO. Service Component Architecture(SCA) with a Tuscany SCA java example. Benefits of MOM and ESB. OpenESB

**UNIT VIII:** Case Studies.

E-commerce server - common tools/products - BizTalk, WebSphere, OpenCommerce.

**TEXT BOOKS:**

1. Middleware and Enterprise Integration techniques, by Sudha Sadasivam G. and Radha Shankarmani, 2009, WIND.
2. Introduction To Multimedia Communications: Applications, Middleware, Networking.

3. Programming With Middleware Technologies, S Anitha and M Gomathi, Ane Books Pvt. Ltd (2011).
  4. Enabling Technologies For Computational Science: Frameworks, Middleware And Environments, Elias N. Houstis, E. N. Houstis, John R. Rice, Publisher: Springer Netherlands (2000).
  5. Service Oriented Architecture with Java” by Binildas CA, Malhar Barai, and Vincenzo.
- Note: Most of the material is available on the web as lecture notes and articles.

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**(D2512102) SOFTWARE ARCHITECTURE & DESIGN PATTERNS**

**UNIT I:** Envision Architecture:

Architecture business cycle. What is software architecture? Case study in utilizing architectures.

**UNIT II:** Creating an Architecture: Part-1

Understanding Quality Attributes: Functionality of architecture, architecture and quality of attributes, system quality attributes and their scenarios in practice, other system quality attributes, business and architecture qualities.

Achieving Qualities: Tactics; availability, modifiability, performance, security, testability and utility of tactics; Relationship of tactics to architectural patterns; Architectural patterns and styles;

**UNIT III:** Software Architectural styles

Architectural Styles, Pipes and Filters, Data Abstraction and Object Oriented Organization, Event Based Implicit Invocation, Layered systems, Repositories, Iterpretors.

**UNIT IV:** Creating an Architecture: Part-2

Designing the Architecture: Architecture in the life cycle; Designing the architecture; Forming the team structure; Creating the skeletal system.

Documenting Software Architecture: Uses of architectural documentations; Views; Choosing relevant views; Documenting a view; Documentation across views.

**UNIT V:** Creating an Architecture: Part-3

Reconstructing Software Architecture: Information extraction; Database construction; View fusion; Reconstruction; Example.

**UNIT VI:** Analyzing Architectures:

ATAM: Architectural Tradeoff Analysis Method. CBAM: Cost Benefit Analysis Method.

**UNIT VII:** Case Studies I

WWW a case study; J2EE/EJB, A case study of an industry standard computing Infrastructure.

**UNIT VIII:** Case Studies II

The Luther Architecture – A case study in mobile applications using J2ME.

Building systems from off-the-shelf components.

**TEXT BOOKS**

1. Software Architecture in Practice. Len Bass, Paul Clements, and Rick Kazman. 2e, Person. 2003. [Chapters 1-5,7,9-13, 17,18]

**REFERENCE BOOKS**

1. Pattern-Oriented Software Architecture, Vol-1. Frank Buschmann, Regine Meunier, et. Al., Wiley India Edn.2010.

2. Software Architecture: Organizational Principles and Patterns, David M. Dikel, David Kane, James R. Wilson, Pearson Education.
3. Software Engineering Software Architecture: A Case Based Approach Software Architecture: A Case Based Approach, Vasudeva Varma, Pearson Education.
4. Software architecture, Shaw, Mary Garlan, David, Prentice Hall of India, 2000 .

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**(D2513102) SOFTWARE PROJECT MANAGEMENT**

**UNIT: I**

Introduction to software project management. Project evaluation and programme management

**UNIT: II**

An overview of project planning. Selection of an appropriate project approach.

**UNIT: III**

Software effort estimation.

**UNIT: IV**

Activity planning.

**UNIT: V**

Risk management. Resource allocation.

**UNIT: VI**

Monitoring and control. Managing contracts.

**UNIT: VII**

Managing people in software environments. Working in teams

**UNIT: VIII**

Software quality.

**TEXT BOOK:**

1. Software Project Management, by Bob Hughes and Mike Cotterell. 5 ed. TMH.

**REFERENCES:**

1. Software Project Management in Practice, by Pankaj Jalota. Person edn. 2010.
2. Managing the Software Process by Watts S. Humphrey, published by Pearson Education
3. Software Project Management, by Walker Royce, published by Pearson Education
4. Software Project Management Readings and Cases by Chris Kemerer.



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**(D2514102) SOFTWARE MAINTENANCE AND REENGINEERING**

**UNIT I:** Software Maintenance

Introduction, Lehman's Laws of Evolution, Categories of Software Maintenance (Corrective, Adaptive, Preventive, Perfective)

**UNIT II:** Software Reengineering

Introduction, Role of Software Reengineering in improving Maintainability, Process of Reengineering (Program Comprehension, Reverse engineering, Program Restructuring/ Refactoring)

**UNIT III:** Software Reverse engineering

Introduction, Importance of Reverse Engineering for Maintenance and Reengineering, Objectives of Reverse Engineering, Levels of Reverse Engineering, Supporting Techniques, Benefits of Reverse Engineering, Maintenance Tools for Reverse Engineering

**UNIT IV:** Refactoring

What is Refactoring; Role of Refactoring in Reengineering as well as Perfective Maintenance, Origin of Refactoring as a practice; Principles of Refactoring: Problems with Refactoring, Refactoring and Design, Refactoring and Performance.

**Unit V:** Exposing Bad Coding Practices and Composing Method (Refactoring I)

Bad Practices in Code; Composite Method: Extract Method, Inline Method, Inline Temp, Replace Temp with Query, Introduce Explaining Variable, Split Temporary Variable, Remove Assignments to parameters, Replace Method with Method Object, Substitute Algorithm

**UNIT VI:** Moving Features between Objects & Organizing Data (Refactoring II)

Moving Features between Objects: Move Method, Move Field, Extract Class, Inline Class, Hide Delegate, Remove Middle Man, Introduce Foreign Method, Introduce Local Extension; Organizing Data: Self Encapsulate Method, Replace Data Value With Object, Change Value to Reference, Change Reference to Value, Encapsulate Field, Encapsulate Collection, Replace Sub Classes with Fields;

**UNIT VII:** Simplifying Conditional Expressions and Simplifying Methods (Refactoring III)

Simplifying Conditional Expressions: Decomposing Conditionals, Consolidate Conditional expression, Remove Control Flag, Replace Conditional with Polymorphism, Replace Nested Conditions with Guard Classes, Introduce Null Object, Introduce Assertion; Making Method Calls Simpler, Rename Method, Separate Query From modifier, Introduce parameter Object, Replace Constructor with factory method, Replace Error Code with Exception, Replace parameter with explicit Object, Hide Method.

**UNIT VIII:** Generalization & Refactoring: Reuse and Reality

Dealing With Generalization: Dealing Data Generalization related refactoring s like Extract Sub Class, Extract Super Class, Extract Interface, Collapse Hierarchy, Replace Inheritance with

Delegation, Pull up and Push Down Methods and Fields; Big Refactoring; Refactoring, Reuse and Reality.

**BOOKS:**

1. Software Maintenance: concepts and practice by Penny Grubb, Armstrong A. Takang
2. Refactoring: Improving the Design of Existing Code by Martin Fowler et al.

**REFERENCES:**

1. Software Engineering by Ian Sommerville, 8th Edition.

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**(D2515102) SECURE SOFTWARE ENGINEERING**

(ELECTIVE-III)

**UNIT I:** Why Is Security a Software Issue?

Introduction, The problem, Software assurance and software security, Threats to software security, Sources of software insecurity, The benefits of detecting software security defects early, Managing secure software development.

**UNIT II:** What Makes Software Secure?

Defining properties of secure software, How to influence the security properties of software, How to assert and specify desired security properties.

**UNIT III:** Requirements Engineering for Secure Software

The SQUARE process model: Identifying security requirements using the security quality requirements engineering (SQUARE) method, SQUARE sample outputs, Requirements elicitation, Requirements prioritization.

**UNIT IV:** Secure Software Architecture and Design

Introduction, Software security practices for architecture and design: Architectural risk analysis. Software security knowledge for architecture and design: Security principles, Security guidelines, and Attack patterns.

**UNIT V:** Considerations for Secure Coding and Testing

Introduction, Code analysis, Coding practices, Software security testing, Security testing considerations throughout the SDLC.

**UNIT VI:** Security and Complexity: System Assembly Challenges

Introduction, Security failures, Functional and attacker perspectives for security analysis, System complexity drivers and security, Deep technical problem complexity.

**UNIT VII:** Governance, and Managing for More Secure Software

Governance and security, Adopting an enterprise software security framework, How much security is enough?, Security and project management, maturity of practice.

**UNIT VIII:** Security metrics

Defining security metrics, Diagnosing problems and measuring technical security, Analysis techniques, Organize, aggregate, and analyze data to bring out key insights.

**TEXT BOOKS:**

1. Software Security Engineering: A Guide for Project Managers, by Julia H. Allen, Sean Barnum, Robert J. Ellison, Gary McGraw, Nancy R. Mead, Addison-Wesley , 1st edition, 2008.

2. Security Metrics: Replacing Fear, Uncertainty, and Doubt , by Andrew Jaquith, Addison-Wesley , 1st edition , 2007.

**REFERENCES:**

1. Integrating Security and Software Engineering: Advances and Future Vision, by Haralambos Mouratidis, Paolo Giorgini, IGI Global, 2006.
2. Software Security: Building Security In , by Gary McGraw , Addison-Wesley, 2006.
3. The Art of Software Security Assessment: Identifying and Preventing Software Vulnerabilities, by Mark Dowd, John McDonald, Justin Schuh, Addison-Wesley, 1<sup>st</sup> edition, 2006.
4. Building Secure Software: How to Avoid Security Problems the Right Way by John Viega, Gary McGraw, Addison-Wesley, 2001.
5. Writing Secure Code, by M. Howard, D. LeBlanc, Microsoft Press, 2nd Edition, 2003.
6. Exploiting Software: How to break code, by G. Hoglund, G. McGraw, Addison Wesley, 2004.

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**(D2516102) SOFTCOMPUTING**

(Elective – III)

**UNIT-I:** Introduction to Intelligent Systems and Soft Computing.

Introduction, Intelligent systems, Knowledge-based systems, Knowledge representation and processing, Soft computing.

**UNIT II:** Fundamentals of Fuzzy Logic Systems

Introduction, Background, Fuzzy sets, Fuzzy logic operations, Generalized fuzzy logic operations, Implication ( if-then), Some definitions, Fuzziness and fuzzy solutions, Fuzzy relations, Composition and inference, Considerations of fuzzy decision-making,

**UNIT III:** Fuzzy Logic Control

Introduction, Background, Basics of fuzzy control.

**UNIT IV:** Fuzzy Control Architectures

Fuzzy control architectures, Properties of fuzzy control, Robustness and stability, Summary.

**UNIT V:** Fundamentals of artificial neural networks.

Introduction, Learning and acquisition of knowledge, Features of artificial neural networks, fundamentals of connectionist modeling,

**UNIT VI:** Neuro-fuzzy Systems

Introduction & background, Architecture of neuro-fuzzy systems, Construction of neuro-fuzzy systems.

**UNIT VII:** Evolution Computing

Introduction, Overview of evolution computing, Genetic algorithms and Optimization, The schema theorem: the fundamental theorem of genetic algorithms, Genetic algorithm operators, Integration of genetic algorithms with neural networks, Integration of genetic algorithms with fuzzy logic, Known issues of Gas.

**UNIT VIII:** Applications:

PR, IP, IRS, Share Market Analysis, Soft Computing For Color Recipe Prediction.

**TEXT BOOKS:**

1. Soft computing and intelligent systems design, by Fakhreddine O. Karray and Clarence De Silva, Pearson Education, 2009.

**REFERENCE BOOK:**

1. Neuro-Fuzzy and Soft Computing, J.S.R Jan, C.-T. Sun and E. Mizutani, PHI, 2005.

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**(D2517102) MODEL-DRIVEN SOFTWARE DEVELOPMENT**

(Elective – III)

**UNIT I:**

Concepts complexity, the inherent complexity of software, the structure of complex systems, the role of decomposition, the role of abstraction and the role of hierarchy, on Designing complex systems, the meaning of design, categories of analysis and design Methods. The object model, the evolution of object model, trends in software engineering foundations of the model, OOP, OOD, OOA, elements of the object model, abstraction, encapsulation, modularity and hierarchy, applying the object model

**UNIT II:**

System Models, Continuous and discrete models, Static and Dynamic Models, Principles used in modeling, system studies, system analysis, design and Postulation, System simulation: Techniques of simulation, Monte Carlo Method, Comparison of analysis and modeling, Types of system modeling.

**UNIT III:**

Exponential growth models, exponential decay models , Logistic curves Generation of growth models, system models , system dynamic diagrams, Multi-segment models Representation of time , delay Arrival pattern and service times, Poisson arrival patterns , Exponentiations, Erlang and Hyper Exponential Distribution, Discrete system Simulation: Discrete events - Generation of arrival patterns .

**UNIT IV:**

Modeling detailed design behavior: Using activity diagrams to model class behavior Modeling event-driven behavior using state machines, design patterns, code refactoring, design and architectural modeling, Models, meta models, and meta-meta models : an introduction to defining domain specific modeling languages.

**UNIT V:**

Classification of Model Transformations, High-level Language Compiler Transformations, Transformational Software Development, MDSO Transformations, Tool Support for Model-Driven Development of Security-Critical Systems with UML: UML Machines and UML Machine Systems, Formal Semantics for a Fragment of UML, UML and XML-based Analysis for Critical Systems Development.

**UNIT VI:**

Caste-centric Modelling of Multi-agent Systems: The CAMLE Modeling Language and Automated Tools, Using Graph Transformation for Practical Model, Driven Software Engineering, A Generalized Notion of Platforms for Model-Driven Development.

**UNIT VII:**

Technical Infrastructure of Model-Driven Development: A Tool Infrastructure for Model-Driven Development Using Aspectual Patterns , Automatically Discovering Transitive Relationships in Class Diagrams, Generic and Domain-Specific Model Refactoring Using a Model Transformation Engine, Parallax – An Aspect-Enabled Framework for Plug-in-Based MDA Refinements towards Middleware.

**UNIT VIII:**

An Integrated Model-Driven Development Environment for Composing and Validating Distributed Real-Time and Embedded Systems, Component-Based High-Assurance Systems, A Model-Driven Technique for Development of Embedded Systems, Model-Driven Service Engineering, Design and Use of an MDA Toolkit.

**TEXT BOOK:**

1. System simulation – Geoffrey Gordon, Prentice Hall of India Pvt. Ltd.1999.
2. UML 2.0 and The Unified Process: Practical Object-Oriented Analysis and Design by Jim Arlow and Ila Neustadt, 2nd Edition, Addison-Wesley
3. Model-Driven Software Development – Sami Beydeda, Matthias Book, Volker Gruhn, (Eds.) 2005, Springer.

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**(D2518102) MACHINE LEARNING**

(Elective – IV)

**UNIT – I** Introduction:

Machine perception, pattern recognition example, pattern recognition systems, the design cycle, learning and adaptation.

**UNIT – II** Bayesian Decision Theory:

Introduction, continuous features – two categories classifications, minimum error-rate classification- zero-one loss function, classifiers, discriminant functions, and decision surfaces.

**UNIT – III** Normal density:

Univariate and multivariate density, discriminant functions for the normal density different cases, Bayes decision theory – discrete features, compound Bayesian decision theory and context.

**UNIT – IV** Maximum likelihood and Bayesian parameter estimation:

Introduction, maximum likelihood estimation, Bayesian estimation, Bayesian parameter estimation–Gaussian case.

**UNIT – V** Un-supervised learning and clustering:

Introduction, mixture densities and identifiability, maximum likelihood estimates, application to normal mixtures, K-means clustering. Data description and clustering – similarity measures, criteria function for clustering.

**UNIT – VI** Component analysis:

Principal component analysis, non-linear component analysis; Low dimensional representations and multi-dimensional scaling.

**UNIT – VII** Discrete Hidden Markov Models:

Introduction, Discrete-time markov process, extensions to hidden Markov models, three basic problems for HMMs.

**UNIT – VIII** Continuous hidden Markov models:

Observation densities, training and testing with continuous HMMs, types of HMMs.

**TEXT BOOKS:**

1. Pattern classifications, Richard O. Duda, Peter E. Hart, David G. Stroke. Wiley student edition, Second Edition.
2. Fundamentals of speech Recognition, Lawrence Rabiner, Biing – Hwang Juang Pearson education.

**REFERENCE BOOKS:**

1. Pattern Recognition and Image Analysis – Earl Gose, Richard John baugh, Steve Jost PHI 2004.



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**(D2519102) IMAGE PROCESSING**

(Elective – IV)

**UNIT I:** The digitized image and its properties

Applications of image processing, image function, image representation, sampling, quantization, color images, metrics and topological properties of digital images, histograms, image quality, noise image.

**UNIT II:** Image preprocessing

Pixel brightness transformation, position dependent brightness correction, gray scale transformation; geometric transformation, local preprocessing- image smoothing, edge detectors, zero-crossing, scale in image processing, canny edge detection, parametric edge models, edges in multi spectral images, local preprocessing and adaptive neighborhood preprocessing; image restoration;

**UNIT III:** Image Segmentation

Threshold detection methods, optimal thresholding, multispectral thresholding, thresholding in hierarchical data structures; edge based image segmentation- edge image thresholding, edge relaxation, border tracing, border detection,

**UNIT IV:** Mathematical Morphology

Basic morphological concepts, four morphological principles, binary dilation, erosion, Hit or miss transformation, opening and closing; thinning and skeleton algorithms; Morphological segmentation -particles segmentation and watersheds, particles segmentation.

**UNIT V:** Image textures

Statistical texture description, methods based on spatial frequencies, co-occurrence matrices, edge frequency, and texture recognition method applications

**UNIT VI:** Image representation and description

Representation, boundary descriptors, regional descriptors

**UNIT VII:** Application to pattern recognition:

Basic concepts of pattern recognition, fundamental problems in pattern recognition system, design concepts and methodologies, example of automatic pattern recognition systems, a simple automatic pattern recognition model

**UNIT VIII:** Implementation

Implementation of some of the above algorithms using MATLAB and Image Processor tool of MATLAB.

## **TEXT BOOKS**

1. Image Processing Analysis and Machine Vision: Millan sonka, Vaclav Hiavac, roger Boyle, vikas publishing House, Brooks/Cole.
2. Digital Image Processing: Pearson Education- Rafel C. Gonzalez Richard E. Woods. second edition
3. Pattern Recognition principles: Julus T. Tou and Rafel C. Gonzalez, Addison –Wesley publishing company.
4. Pattern Recognition and Image Analysis: Earl Gose, Richard Johnsonbaugh, prentice Hall of India private limited, 1999.

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**(D2520102) HIGH PERFORMANCE COMPUTING**

(Elective – IV)

**UNIT I:**

Introduction:

Fundamental concepts of high performance computing, Basic parallel algorithmic techniques: balanced binary tree computations, pointer jumping, divide and conquer, partitioning, pipelining  
Graph algorithms: graph partitioning, Load balancing, graph coloring.

Data structures and performance: complexity, memory hierarchies, and cache aware data structure.

**UNIT II:**

HPC related Concepts and Architectures:

Concurrency and Correctness (data races, atomic operations, deadlock, live lock), shared memory, semaphores/mutex, distributed memory, hybrid environments.

Partitioning, Communications, Synchronization, Data Dependencies, Granularity.

Limits and Cost of Parallel Programming, Speedup, weak speedup, efficiency, Amdahl's law, Review of recent Multicore processors.

**UNIT III:**

Compiler and Software support for parallel computer architectures:

Concurrent and distributed programming based on C/C++/Java. Parallel processing based on OpenMP for shared memory systems. Parallel processing based on MPI for distributed memory systems. Grid and Cloud computing.

**UNIT IV:**

Programming languages and programming-language extensions for HPC: Compiler options and optimizations for modern single-core and multi-core processors , Execution profiling, timing techniques, and benchmarking for modern single-core and multi-core processors Hardware architecture ,Parallelization strategies, task parallelism, data parallelism, and work sharing techniques, Message passing with MPI, advanced parallel algorithms.

**UNIT V:**

Parallel programs on hybrid architectures:

Advanced Programming in the UNIX Environment, UNIX Security Fundamentals, Mac OS X for UNIX Users. The simplicity of Macintosh. Features Open source UNIX POSIX compliant, Open Brand UNIX 03

**UNIT VII:**

MPI Intro, Designing Parallel Algorithms, MPI Synchrony and Types, MPI Process Groups, Parallel Sorting, Distributed Apps, Distributed HPC I, Distributed HPC II.

**UNIT VII:**

GIS computation on cloud/cluster/multi-cores, Parallel Priority Queue on GPUs / Multicores, Parallel/Distributed Quad or R-Trees for GIS computation, Parallel Parsing of GML (Geographic Markup Language) files, Distributed Vertex cover algorithms, Distributed graph coloring algorithms

**UNIT 8:**

Scientific Visualization in High Performance Computing, Numerical Linear Algebra, Random Number Generators, Monte Carlo Methods.

**TEXT BOOKS:**

1. Parallel Programming: Techniques and Applications using Networked Workstations and Parallel Computers" (2nd ed.) by B. Wilkinson and M. Allen, Prentice Hall.
2. Parallel Programming in C with MPI and OpenMP, Quinn, Michael J., 2004, 1st Edition, McGraw-Hill.
3. Introduction to Parallel Computing, (Second Edition) Ananth Grama, Anshul Gupta, George Karypis, and Vipin Kumar. Addison-Wesley, 2003.

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**(D2593102) MIDDLEWARE TECHNOLOGIES**

**OBJECTIVES:**

Implementation of some of the key concepts of middleware using Java, C## and or DOTNet .

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**(D2594102) SOFTWARE PROJECT MANAGEMENT AND REENGINEERING**

**OBJECTIVES:**

For implementing the concepts in project management and reengineering using case tools and other related components.