



**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR**  
**Academic Regulations For The Award Of Full Time M.Tech. P.G. Degree**  
**(WITH EFFECT FROM THE ACADEMIC YEAR 2009-10)**

The Jawaharlal Nehru Technological University Anantapur shall confer M.Tech. Post Graduate degree to candidates who are admitted to the Master of Technology Programs and fulfill all the requirements for the award of the degree.

**1.0 ELIGIBILITY FOR ADMISSIONS:**

Admission to the above programme shall be made subject to the eligibility, qualifications and specialization prescribed by the University for each programme, from time to time.

Admissions shall be made either on the basis of merit rank obtained by the qualified candidates at an Entrance Test conducted by the University or on the basis of GATE / PGECET score, subject to reservations prescribed by the University or Government policies from time to time.

**2.0 COURSE WORK:**

- 2.1 A Candidate after securing admission must pursue the M.Tech. course of study for Four semesters duration.
- 2.2 Each semester shall be of 20 weeks duration including all examinations.
- 2.3 A candidate admitted to a programme should complete it within a period equal to twice the prescribed duration of the programme from the date of admission.

**3.0 ATTENDANCE:**

- 3.1 A candidate shall be deemed to have eligibility to write end semester examinations if he has put in at least 75% of attendance on cumulative basis of all subjects/courses in the semester.
- 3.2 Condonation of shortage of attendance up to 10% i.e., from 65% and above and less than 75% may be given by the college on the recommendation of the Principal.
- 3.3 Condonation of shortage of attendance shall be granted only on genuine and valid reasons on representation by the candidate with supporting evidence.
- 3.4 If the candidate does not satisfy the attendance requirement he is detained for want of attendance and shall reregister for that semester. He / she shall not be promoted to the next semester.

#### 4.0. 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.

- 4.1 For the theory subjects 60% of the marks will be for the External End Examination. While 40% of the marks will 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 Three questions to be answered out of four in 2hours, evaluated\* for 40 marks.

\*Note: All the Questions shall be of equal weightage of 10 marks and the marks obtained for 3questions shall be extrapolated to 40 marks, any fraction rounded off to the next higher mark

- 4.2 For practical subjects, 60 marks shall be for the End Semester Examinations and 40 marks will be for internal evaluation based on the day to day performance.
- 4.3 For Seminar there will be an internal evaluation of 50 marks. A candidate has to secure a minimum of 50% to be declared successful. The assessment will be made by a board consisting of HOD and two internal experts at the end of IV semester instruction.
- 4.4 A 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 Semester Examination and Internal Evaluation taken together.
- 4.5 In case the candidate does not secure the minimum academic requirement in any of the subjects (as specified in 4.4.) 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.

#### 5.0 RE-REGISTRATION FOR IMPROVEMENT OF INTERNAL EVALUATION MARKS:

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

- 5.1 The candidate should have completed the course work and obtained examinations results for I & II semesters.
- 5.2 He should have passed all the subjects for which the Internal evaluation marks secured are more than 50%.
- 5.3 Out of the subjects the candidate has failed in the examination due to Internal evaluation marks secured being less than 50%, the candidate shall be given one chance for each Theory subject and for a maximum of three Theory subjects for Improvement of Internal evaluation marks.
- 5.4 The candidate has to re-register for the chosen subjects and fulfill the academic requirements.

- 5.5 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 Registrar, JNTUA payable at Anantapur along with the requisition through the Principal of the respective college.
- 5.6 In the event of availing the Improvement of Internal evaluation marks, the internal evaluation marks as well as the End Examinations marks secured in the previous attempt(s) for the reregistered subjects stand cancelled.

## 6.0 EVALUATION OF PROJECT WORK:

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

- 6.1 Registration of Project work: A 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)
- 6.2 An Internal Departmental Committee (I.D.C) consisting of HOD, Supervisor and one internal senior expert shall monitor the progress of the project work.
- 6.3 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 and one calendar year from the date of registration for the project work. Extension of time within the total permissible limit for completing the programme is to be obtained from the Head of the Institution.
- 6.4 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.
- 6.5 A 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.
- 6.6 Three copies of the Thesis / Dissertation certified in the prescribed form by the supervisor & HOD shall be presented to the H.OD. One copy is to be forwarded to the University and one copy to be sent to the examiner.
- 6.7 The college shall submit a panel of three experts for a maximum of 5 students at a time. However, the thesis / dissertation will be adjudicated by one examiner nominated by the University.
- 6.8 If the report of the examiner is favorable viva-voce examination shall be conducted by a board consisting of the Supervisor, Head of the Department and the examiner who adjudicated the thesis / dissertation. The board shall jointly report candidates work as:
  1. Very Good Grade A
  2. Good Grade B
  3. Satisfactory Grade C
  4. Not satisfactory Grade D

If the report of the viva-voce is not satisfactory (Grade D) 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.

**7.0 AWARD OF DEGREE AND CLASS:**

A candidate shall be eligible for the award of respective degree if he satisfies the minimum academic requirements in every subject and secures 'satisfactory' or higher grade report on his thesis/dissertation and viva-voce. Based on overall percentage of marks obtained, the following class is awarded.

First class with Distinction:	70% or more
First class	below 70% but not less than 60%
Second class	below 60% but not less than 50%

**8.0 WITH – HOLDING OF RESULTS:**

If the candidate has not paid dues to the university or if any case of in-discipline is pending against him, the result of the candidate shall be withheld and he will not be allowed/ promoted into the next higher semester. The issue of degree is liable to be withheld in such cases.

**9.0 TRANSITORY REGULATIONS:**

Candidates who have discontinued or have been detained for want of attendance or who have failed after having undergone the course in earlier regulations and wish to continue the course are eligible for admission into the unfinished semester from the date of commencement of class work with the same or equivalent subjects as and when subjects are offered, subject to 4.5 and 2.3 sections. Whereas they continue to be in the academic regulations they were first admitted.

**10.0 GENERAL:**

- i. **The academic regulations should be read as a whole for purpose of any interpretation.**
- ii. **Disciplinary action for Malpractice / improper conduct in examinations is appended.**
- iii. **There shall be no places transfer within the constituent colleges and affiliated colleges of Jawaharlal Nehru Technological University Anantapur.**
- iv. **Where the words "he", "him", "his", occur in the regulations, they include "she", "her", "hers".**
- v. **In the case of any doubt or ambiguity in the interpretation of the above rules, the decision of the Vice-Chancellor is final.**
- vi. **The University may change or amend the academic regulations or syllabi at any time and the changes or amendments shall be made applicable to all the students on rolls with effect from the dates notified by the University.**

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**RULES FOR DISCIPLINARY ACTION FOR MALPRACTICE / IMPROPER CONDUCT  
IN EXAMINATIONS**

	<b>Nature of Malpractices/Improper conduct</b>	<b>Punishment</b>
	<i>If the candidate</i>	
1.	(a) Possesses or keeps accessible in examination hall, any paper, note book, programmable calculators, Cell phones, pager, palm computers or any other form of material concerned with or related to the subject of the examination (theory or practical) in which he is appearing but has not made use of (material shall include any marks on the body of the candidate which can be used as an aid in the subject of the examination)	Expulsion from the examination hall and cancellation of the performance in that subject only.
(b)		
	Gives assistance or guidance or receives it from any other candidate orally or by any other body language methods or communicates through cell phones with any candidate or persons in or outside the exam hall in respect of any matter.	Expulsion from the examination hall and cancellation of the performance in that subject only of all the candidates involved. In case of an outsider, he will be handed over to the police and a case is registered against him.
2.	Has copied in the examination hall from any paper, book, programmable calculators, palm computers or any other form of material relevant to the subject of the examination (theory or practical) in which the candidate is appearing.	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted to appear for the remaining examinations of the subjects of that Semester/year. The Hall Ticket of the candidate is to be cancelled and sent to the University.
3.	Comes in a drunken condition to the examination hall.	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year.

4.	Smuggles in the Answer book or additional sheet or takes out or arranges to send out the question paper during the examination or answer book or additional sheet, during or after the examination.	Expulsion from the examination hall and cancellation of performance in that subject and all the other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The candidate is also debarred for two consecutive semesters from class work and all University examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat.
5.	Leaves the exam hall taking away answer script or intentionally tears of the script or any part thereof inside or outside the examination hall.	Expulsion from the examination hall and cancellation of performance in that subject and all the other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The candidate is also debarred for two consecutive semesters from class work and all University examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat.
6.	Possess any lethal weapon or firearm in the examination hall.	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The candidate is also debarred and forfeits the seat.

7.	Impersonates any other candidate in connection with the examination.	The candidate who has impersonated shall be expelled from examination hall. The candidate is also debarred and forfeits the seat. The performance of the original candidate who has been impersonated, shall be cancelled in all the subjects of the examination (including practicals and project work) already appeared and shall not be allowed to appear for examinations of the remaining subjects of that semester/year. The candidate is also debarred for two consecutive semesters from class work and all University examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat. If the impostor is an outsider, he will be handed over to the police and a case is registered against him.
8.	Refuses to obey the orders of the Chief Superintendent/Assistant – Superintendent / any officer on duty or misbehaves or creates disturbance of any kind in and around the examination hall or organizes a walk out or instigates others to walk out, or threatens the officer-in charge or any person on duty in or outside the examination hall of any injury to his person or to any of his relations whether by words, either spoken or written or by signs or by visible representation, assaults the officer-in-charge, or any person on duty in or outside the examination hall or any of his relations, or indulges in any other act of misconduct or mischief which result in damage to or destruction of property in the examination hall or any part of the College campus or engages in any other act which in the opinion of the officer on duty amounts to use of unfair means or misconduct or has the tendency to disrupt the orderly conduct of the examination.	In case of students of the college, they shall be expelled from examination halls and cancellation of their performance in that subject and all other subjects the candidate(s) has (have) already appeared and shall not be permitted to appear for the remaining examinations of the subjects of that semester/year. The candidates also are debarred and forfeit their seats. In case of outsiders, they will be handed over to the police and a police case is registered against them.

9.	If student of the college, who is not a candidate for the particular examination or any person not connected with the college indulges in any malpractice or improper conduct mentioned in clause 6 to 8.	Student of the colleges expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The candidate is also debarred and forfeits the seat. Person(s) who do not belong to the College will be handed over to police and, a police case will be registered against them.
10.	Uses objectionable, abusive or offensive language in the answer paper or in letters to the examiners or writes to the examiner requesting him to award pass marks.	Cancellation of the performance in that subject.
11.	Copying detected on the basis of internal evidence, such as, during valuation or during special scrutiny.	Cancellation of the performance in that subject and all other subjects the candidate has appeared including practical examinations and project work of that semester/year examinations.
12.	If any malpractice is detected which is not covered in the above clauses 1 to 11 shall be reported to the University for further action to award suitable punishment.	

Malpractices identified by squad or special invigilators

1. Punishments to the candidates as per the above guidelines.
2. Punishment for institutions : (if the squad reports that the college is also involved in encouraging malpractices)
  - (i) A show cause notice shall be issued to the college.
  - (ii) Impose a suitable fine on the college.
  - (iii) Shifting the examination centre from the college to another college for a specific period of not less than one year.



**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR**

**Course structure and syllabi for**

**M.Tech. Software Engineering**

**for affiliated Engineering Colleges 2009-10**

**I YEAR      I SEMESTER**

S. No	Course code	Subject	Theory	Lab.	Credits
1.	9D58101	Advanced Data Structures and Algorithms	4		4
2.	9D25102	Advanced Software Engineering	4		4
3.	9D25103	Software Requirements and Estimation	4		4
4.	9D25104	Software Metrics	4		4
5.	9D25105	Middleware Technologies	4		4
6.	9D25106a 9D25106b 9D25106c	Elective-I a. Object Oriented Modeling b. Software Project Management c. Software Process Management	4		4
7.	9D25107	Software Lab- 1 (Covering the experiments: Data structures & Algorithms and Middleware Technologies)		3	2
		contact periods/week	24	3	26
			Total 27		

**I YEAR          II SEMESTER**

S. No	Course code	Subject	Theory	Lab.	Credits
1.	9D58201	Software Quality Assurance and Testing	4		4
2.	9D25202	Software Architecture and Design Patterns	4		4
3.	9D25203	Service Oriented Architecture	4		4
4.	9D25204	Software Reliability	4		4
5.	9D25205	Software Reengineering	4		4
6.		<b>Elective-II</b>	4		4
	9D25206a	a. Secure Software Engineering			
	9D25206b	b. Soft Computing			
	9D25206c	c. Model Driven Software Development			
7.	9D25207	Software Lab- 2 (Covering the experiments: Software Testing and Design Patterns)		3	2
		contact periods/week	24	3	
			Total 27		26

**II YEAR          (III & IV Semesters)**

S. No	Course code	Subject		credits
1	9D25401	Seminar		2
2	9D25402	Project work		16

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**M.Tech I Semester (Software Engineering)**

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**(9D58101) ADVANCED DATA STRUCTURES AND ALGORITHMS**

**UNIT I : Overview of Data Structures** - Review of Arrays, Stacks, Queues, linked lists , Linked stacks and Linked queues, Applications

**UNIT II: 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.

**UNIT III: 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.

**UNIT IV: Binary Search Trees, AVL Trees and B Trees** - Introduction, Binary Search Trees: Definition, Operations and applications. AVL Trees: Definition, Operations and applications. B Trees: Definition, Operations and applications.

**UNIT V: Red – Black Trees, Splay Trees and Hash Tables** - Red – Black Trees, Splay Trees and its applications. Hash Tables: Introduction, Hash Tables, Hash Functions and its applications.

**UNIT VI: Divide – and – Conquer & Greedy 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 VII: Dynamic Programming** - General Method, All Pairs Shortest Path, Single Source Shortest Path, 0 / 1 Knapsack problem, Reliability Design, Traveling Sales Person’s Problem.

**UNIT VIII: 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.

**TEXT BOOKS:**

1. Data Structures and Algorithms by G.A.V. Pai, 2009, TMH.
2. Fundamentals of Computer Algorithms by Ellis Horowitz, Sartaj Sahni and Sanguthevar Rajasekaran, 2<sup>nd</sup> edition, University Press.

**REFERENCES:**

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, TMGH.
4. Design and Analysis of Algorithms by E. Horowitz, S. Sahani, 3<sup>rd</sup> Edition, Galgotia.
5. Data Structures and Algorithms in C++ by Drozdek 2<sup>nd</sup> Edition, Thomson.

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR**

**M.Tech I Semester (Software Engineering)**

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**(9D25102) ADVANCED SOFTWARE ENGINEERING**

**UNIT-I - Software and Software Engineering** - The Nature of Software, Software characteristics, The Unique Nature of WebApps, Software Engineering, The Software Process, Software Engineering Practice, Software Myths.

**Software Paradigms** - Prespective Process Models, Specialized Process Models.

**UNIT- II - Unified Process Model** - The Unified Process, Personal and Team Process Models, Process Technology, Product and Process.

**Agile Development** - What is Agility? Agility and the Cost of Change, What is an Agile Process? Extreme Programming (XP), Other Agile Process Models, A Tool set for the Agile Process.

**UNIT-III - Critical Systems** - A simple safety-critical system, System dependability, Availability and reliability, Safety, Security.

**Critical systems specification** - Risk-driven specification, Safety specification, Security specification Software reliability specification.

**Formal Specification** - Formal specification in the software process, Sub-system interface specification, Behavioural specification.

**UNIT- IV - Software Reuse** - The reuse landscape, Design patterns, Generator-based reuse, Application frameworks, Application system reuse.

**Component-based Software Engineering** - Components and component models, The CBSE process, Component composition.

**UNIT-V - Software Testing** - System testing, Component testing, Test case design, Test automation.

**Software Evolution** - Program evolution dynamics, Software maintenance, Evolution Processes, Legacy system evolution.

**UNIT-VI - Aspect oriented software engineering:** The separation of concerns, Aspects, Join points and pointcuts, Software engineering with aspect, Using AOSD to streamline complex systems development without sacrificing flexibility or scalability.

**Service oriented software engineering:** Service-based concepts, modeling and documentation, Service discovery and composition, Service-oriented architecture, Services as reusable components, Software development with services.

**UNIT-VII - Quality Management** - Process and product quality, Quality assurance and standards, Quality Planning, Quality control, Software Measurement and metrics.

**Process Improvement** - Process and product quality, process classification, Process measurement, Process analysis and modeling, Process change, The CMMI process improvement framework.

**UNIT-VIII - Model Driven Software Development (MDSO)** - Goals of MDSO, The MDSO approach, An overview of MDA concepts, Common MDSO concepts and terminology, Model driven architecture, Domain specific modeling, What is meta modeling, MOF and UML, Software architecture in the context of MDSO.

#### **TEXTBOOKS:**

1. Software Engineering, by Ian Sommerville, Addison-Wesley, 8<sup>th</sup> Edition, 2006.
2. Software Engineering, A Practitioner's Approach, by Roger S. Pressman, 7<sup>th</sup> Edition, 2009.
3. Model-Driven Software Development: Technology, Engineering, Management , by Thomas Stahl , Markus Voelter , Krzysztof Czarnecki , Wiley; 1st edition , 2006

#### **REFERENCES:**

1. 1. Using UML: Software Engineering with Objects and Components, by Perdita Stevens, Rob Pooley, Addison-Wesley, 2<sup>nd</sup> edition, 2006.
2. The Mythical Man-Month : Essays on Software Engineering, by Frederick P., Jr. Brooks, Frederick P. Brooks Jr, Addison-Wesley, 1995.
3. The Future of Software Engineering, edited by Anthony Finkelstein, ACM Press, 2000.
4. Aspect-Oriented Software Development, by, Addison-Wesley, 1/e, 2004. Robert E. Filman, Tzilla Elrad, Siobh  n Clarke, Mehmet Aksit
5. Service-Oriented Software System Engineering : Challenges and Practices, by Zoran Stojanovic, Ajantha Dahanayake, IGI Global, 2005.
6. Software Reuse, by I. Jacobson, M. Griss, and P. Jonsson, ACM Press, 1997

M.Tech I Semester (Software Engineering)

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**(9D25103) SOFTWARE REQUIREMENTS AND ESTIMATION**

**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 Modeling**- Use Case Modeling, Analysis Models, Dataflow diagram, state transition diagram, class diagrams, Object analysis, Problem Frames

**UNIT IV: Software Requirements Management**- Requirements management Principles and practices, Requirements attributes, Change Management Process, Requirements Traceability Matrix, Links in requirements chain.

**UNIT-V: Requirements Management Tools:** Benefits of using a requirements management tool, commercial requirements management tool, Rational Requisite pro, Caliber – RM, implementing requirements management automation.

**UNIT VI: Software Estimation** - Components of Software Estimations, Estimation methods, Problems associated with estimation, Key project factors that influence estimation. **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: Software Estimation Tools:** Desirable features in software estimation tools, IFPUG, USC's COCOMO II, SLIM (Software Life Cycle Management) Tools

**TEXT BOOKS:**

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

**REFERENCES:**

1. Software Requirements by Karl E. Weigers, Microsoft Press.
2. Managing Software Requirements, Dean Leffingwell & Don Widrig, Pearson Education, 2003.
3. Mastering the requirements process, second edition, Suzanne Robertson & James Robertson, Pearson Education, 2006.
4. Estimating Software Costs, Second edition, Capers Jones, Tata McGraw-Hill, 2007.
5. Practical Software Estimation, M.A. Parthasarathy, Pearson Education, 2007.
6. Measuring the software process, William A. Florac & Anita D. Carleton, Pearson Education, 1999.

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**(9D25104) SOFTWARE METRICS**

**UNIT-I:** MEASUREMENT - Measurement in Everyday Life, Measurement in Software Engineering, Scope of Software Metrics.

**UNIT-II:** BASICS OF MEASUREMENT - Representational Theory of Measurement, Measurement and Models, Measurement Scales and Scale Types.

**UNIT-III:** FRAME WORK FOR SOFTWARE MEASUREMENT - Classifying Software Measures, Applying Frame Work, Software Measurement Validation.

**UNIT-IV:** SOFTWARE METHODS IN DATA COLLECTION - Good Data, Definition of Data, Collecting, Storing and Extracting Data.

**UNIT-V:** MEASURING INTERNAL PRODUCT ATTRIBUTES - Measuring Size and Structure.

**UNIT -VI:** MEASURING EXTERNAL PRODUCT ATTRIBUTES - Modeling Software Quality, Measuring Aspects of Quality.

**UNIT-VII:** MEASUREMENT AND MANAGEMENT - Planning a Measurement Program, Measurement in Practice.

**UNIT-VIII:** CUSTOMER SATISFACTION - Empirical Research in Software Engineering, Measuring and Analyzing Customer Satisfaction: Customer Satisfaction Surveys, Analyzing Satisfaction Data, Satisfaction with Company.

**TEXT BOOKS:**

1. Fenton, Pfleeger, "Software Metrics: A Rigorous and Practical Approach", Thomson.
2. Stephen H. Kan: "Metrics & Models in Software Quality Engineering", PEA.

**REFERENCES:**

1. Sheppard, "Software Engineering Metrics", 1992, MCG.
2. Pertis et al, "Software Metrics: An Analysis and Evaluation", 1981, MIT Press.

M.Tech I Semester (Software Engineering)

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**(9D25105) MIDDLEWARE TECHNOLOGIES**

**UNIT-I:**

**CLIENT/SERVER COMPUTING**

Building blocks-types of servers-types of Clients-types of middleware-aspects of client/server systems-sizing-scalability-tiered architecture-client/server models-requirements of client/server systems-Distributed objects-benefits-drawbacks-from distributed objects to components

**UNIT-II:**

**COMPONENT TECHNOLOGY**

Components- definitions-properties-benefits-components and interfaces- direct and indirect interfaces- versions-interfaces as contracts- callbacks- forms of design levels reuse- connection oriented programming – connectable objects.

**UNIT-III:**

**COMPONENT ARCHITECTURE**

Component architecture- component frameworks- composition- data driven, contextual, aspect oriented programming, subject oriented programming, XML components-component development- assembly.

**UNIT-IV:**

**THE MICROSOFT WAY**

Component object model- from COM, COM+, DCOM to .NET framework-evolution- web services technologies- XML, WSDL, UDDI, SOAP.

**UNIT-V :**

**COMMON LANGUAGE INFRASTRUCTURE**

Common language infrastructure- common language Runtime.NET framework class library- ADO.NET, ASP.NET- enterprise services.

**UNIT-VI:**

**THE SUN WAY**

Component variety- applets, servlets, java beans, enterprise beans- EJB architecture- types of beans- characteristics- Building and deploying distributed applications using EJB-java and web services-JXTA and jinni.

**UNIT-VII:**

**THE OMG WAY**

System object model- CORBA timeline- CORBA architecture- ORB- services- facilities-business objects-IIop- transport mechanisms- IDL- Drawbacks of CORBA.



**UNIT-VIII:****CORBA COMPONENT MODEL**

CORBA Component model- POA- CCM components- CCM containers- Meta Object Facility.  
Comparison of CORBA, .NET and EJB.

**TEXT BOOKS:**

1. Clemens szyperski, Dominik Gruntz and Stephan Murer, "Component Software Beyond object oriented Programming" Second edition, Pearson education, 2004.
2. Robert Orfali, Dan Harkey, Jeri Edwards, "Client/Server Survival Guide" third edition, John Wiley Inc, 2003.

**REFERENCES:**

1. David Chappell, "Understanding .NET", Pearson education Inc, 2002.
2. Bill Burke, Richard Monson-Haefel, "Enterprise JavaBeans", Fifth Edition, O'Reily, 2001.
3. Dan harkey, Robertt Orfali, " Client/Server programming with JAVA and CORBA", second edition, wiley& sons Inc, 1999.

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR****M.Tech I Semester (Software Engineering)**

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**ELECTIVE-1****(9D25106a) OBJECT ORIENTED MODELING****UNIT I**

**Introduction to UML:** The meaning of Object Orientation, object identity, Encapsulation, information hiding, polymorphism, generosity, importance of modeling, principles of modeling, object oriented modeling, conceptual model of the UML, Architecture.

**UNIT II**

**Basic Structural Modeling:** Classes, Relationships, common Mechanisms, and diagrams.

**Class & Object Diagrams:** Terms, concepts, modeling techniques for Class & Object Diagrams.

**UNIT III**

**Collaboration Diagrams:** Terms, Concepts, depicting a message, polymorphism in collaboration diagrams, iterated messages, use of self in messages.

**Sequence Diagrams:** Terms, concepts, depicting asynchronous messages with/without priority, callback mechanism, broadcast messages.

#### UNIT IV

**Basic Behavioral Modeling:** Use cases, Use case Diagrams, Activity Diagrams.

**Advanced Behavioral Modeling:** Events and signals, state machines, processes and Threads, time and space, state chart diagrams.

**Architectural Modeling:** Component, Deployment, Component diagrams and Deployment diagrams.

#### UNIT V

**The Unified process:** use case driven, architecture centric, iterative, and incremental

**The Four Ps:** people, project, product, and process

**Use case driven process:** why use case, capturing use cases, analysis, design, and implementation to realize the use cases, testing the use cases

**Architecture-centric process:** architecture in brief, why we need architecture, use cases and architecture, the steps to architecture, an architecture description.

#### UNIT VI

**Iterative incremental process:** iterative incremental in brief, why iterative incremental development? The iterative approach is risk driven, the generic iteration.

**The Generic Iteration workflow:** phases are the first division workflow, planning proceeds doing, risks affect project planning, use case prioritization, resource needed, assess the iteration and phases

#### UNIT VII

**Inception phase:** early in the inception phase, the archetypal inception iteration workflow, execute the core workflows, requirements to test.

**Elaboration Phase:** elaboration phase in brief, early in the elaboration phase, the architectural elaboration iteration workflow, execute the core workflows-Requirements to test.

#### UNIT VIII

**Construction phase:** early in the construction phase, the archetypal construction iteration workflow, execute the core workflow.

**Transition phase:** early in the transition phase, activities in transition phase

**Case Studies:** Automation of a Library, Software Simulator application (2-floor elevator simulator)

#### TEXT BOOKS :

1. The Unified Modeling Language User Guide By Grady Booch, James Rumbaugh, Ivar Jacobson 2<sup>nd</sup> Edition, Pearson Education.
2. UML 2 Toolkit By Hans-Erik Eriksson, Magnus Penker, Brian Lyons, David Fado WILEY-Dreamtech India Pvt. Ltd.
3. The Unified Software Development Process By Ivar Jacobson, Grady Booch, James Rumbaugh, Pearson Education

**REFERENCES:**

1. Fundamentals of Object Oriented Design in UML By Meilir Page-Jones, Pearson Education
2. Object Oriented Analysis & Design By Atul Kahate, The McGraw-Hill.
3. Practical Object-Oriented Design with UML By Mark Priestley, TATA McGrawHill
4. Object Oriented Analysis & Design By Brett D McLaughlin, Gary Pollice and David West, O'REILY .
5. Object-Oriented Analysis and Design using UML By Simon Bennet, Steve McRobb and Ray Farmer, 2<sup>nd</sup> Edition, TATA McGrawHill.
6. Object-Oriented Analysis and Design with the Unified Process By John W. Satzinger, Robert B Jackson and Stephen D Burd, THOMSON Course Technology.
7. UML and C++,R.C.Lee, and W.M.Tepfenhart,PHI.

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR****M.Tech I Semester (Software Engineering)****Th C  
4 4****ELECTIVE-1****(9D25106b) SOFTWARE PROJECT MANAGEMENT**

**UNIT-I: Conventional Software Management** - The Waterfall Model, Conventional software Management Performance. Evolution of Software Economics: Software Economics, Pragmatic Software Cost Estimation.

**UNIT-II: Improving Software Economics** - Reducing Software Product Size, Improving software Processes, Improving Team Effectiveness, Improving Automation, Achieving Required Quality, Peer Inspections.

**UNIT-III: Conventional And Modern Software Management** - Principles of Conventional Software Engineering, Principles of Modern Software Management, Transitioning to an Iterative Process. Life Cycle Phases: Engineering and Production Stages, Inception. Elaboration, Construction, Transition Phases.

**UNIT-IV: Artifacts Of The Process** - The Artifact Sets. Management Artifacts, Engineering Artifacts, Programmatic Artifacts. Model Based Software Architectures: A Management Perspective and Technical Perspective.

**UNIT-V: Flows Of The Process** - Software Process Workflows. Inter Trans Workflows. Checkpoints of the Process : Major Mile Stones, Minor Milestones, Periodic Status Assessments. Interactive Process Planning: Work Breakdown Structures, Planning Guidelines, Cost and Schedule Estimating. Interaction Planning Process. Pragmatic Planning.

**UNIT-VI: Project Organizations And Responsibilities** - Line-of-Business Organizations, Project Organizations, and Evolution of Organizations. Process Automation: Automation Building Blocks, The Project Environment.

**UNIT-VII: Project Control And Process Instrumentation** - Server Care Metrics, Management Indicators, Quality Indicators, Life Cycle Expectations Pragmatic Software Metrics, Metrics Automation. Tailoring the process: Process Discriminates, Example.

**UNIT-VIII: Future Software Project Management** - Modern Project Profiles Next Generation Software economics, Modern Process Transitions. Case Study: The Command Center Processing and Display System –Replacement (CCPDS-R)

**TEXT BOOKS:**

1. Walker Rayce, “Software Project Management”, 1998, PEA.
2. Henrey, “Software Project Management” Pearson.

**REFERENCES:**

1. Richard H. Thayer: “Software Engineering Project Management”, 1997, IEEE Computer Society.
2. Shere K. D. : “” Software Engineering and Management”, 1998, PHI.
3. S. A. Kelkar, “ Software Project Management: A Concise Study”, PHI.
4. Hughes Cotterell, “ Software Project Management”, 2e, TMH.
5. Kaeron Conway, “ Software Project Management from Concept to Development”, Dream Tech.

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**ELECTIVE-1**  
**(9D25106c) SOFTWARE PROCESS MANAGEMENT**

**UNIT-I: Software Process Maturity**

Framework: Software Process Improvement, Need for Process Optimization.  
Software Process Change: Perceptive, Principles, Misconceptions, Change Implementation.  
Software Process Assessment: Overview, Phases, Principles, Process and Conduct.

**UNIT-II: Repeatable Process**

Managing Software Organizations: Discipline, Management System, Establishment.  
Project Plan: Principles, Concepts, Size Measure, Estimation, Productivity Factors, Scheduling,  
Project Tracking, Development Plan, Planning Models, Final Considerations.

**UNIT-III: Configurations Management & Quality Assurance**

SCM: Introduction, Software Product Nomenclature, Functions, Baselines, Configurations,  
Responsibilities, Need for Automated Tools.  
SQA: Quality Management, The Role of SQA, Launching the SQA Program, The SQA Plan, SQA  
People, Independent Verification and Validation.

**UNIT-IV: Standards And Inspections**

Standards: Definitions, necessity, benefits, Major Standards, Standards Vs Guidelines.  
Software Inspections: Types of Reviews, Objectives, Principles, Conduct of Inspections, Training,  
Reports and Tracking, Other Considerations, Initiating an Inspection Program.

**UNIT-V: Software Testing And Scm Design**

Software Testing: Principles, Software Tests, Planning, Development, Execution, Reporting,  
Tools and Methods, Real-Time Testing.  
SCM Design Phase: Plan, Questions, Support Functions, Requirement Phase, Design Control,  
Implementation Phase, Operational data, Test Phases, Tools, Accounting, Audit.

**UNIT-VI: Software Process**

Software Process: Standards, Definitions, Levels of models & Uses, Architecture, Critical  
Software Process issues, Process Architecture, Process Models and Views, Establishing and Using  
a Process Definition, Basic process Guidelines.  
Software Engineering Process Group: Changing Software Process, Role, Standards, Process  
Database, Technology Insertion Focal Point, Education and Training Process Consultation,  
Process Consultation, Process Status and Assessment, Establishing the SEPG.

**UNIT-VII: Managed Process**

Data Gathering and Analysis: Principles, Process, Software Measure, Data Analysis.

Managing Software Quality: Paradigm, Quality Motivation, measurement Criteria, A Software Quality Program, Estimation, Goals, Plans, Tracking and Controlling Software Quality.

**UNIT-VIII: Optimizing Process**

Defect Prevention Principles, Process Changes, Considerations and Management's Role.

Automating The Software Process: Need, Importance, Dev. Environments, Organizational Plan, Tech. Transition, Special Considerations, Productivity, Justification Considerations.

**TEXT BOOKS:**

1. Watt S. Humphrey, "Managing the Software Process", 2003, PEA.

**REFERENCES:**

1. Watts S. Humphrey, "A Discipline for Software Engineering", 2002, PEA
2. Roger S. Pressman, "Software Engineering, A Practitioners Approach", 2003, 5e, TMH.
3. W. S. Humphrey, "Introduction to the Personal Software Process", 1997, PEA.
4. W. S. Humphrey, "Introduction to the Team Software Process", 2002, PEA.

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**(9D25201) 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, 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.

**REFERENCES:**

1. Testing and Quality Assurance for Component-based Software, by Gao, Tsao and Wu, Artech House Publishers
2. Software Testing Techniques, by Borjes Beizer, Second Edition, Dreamtech Press
3. Managing the Testing Process, by Rex Black, Wiley
4. Handbook of Software Quality Assurance, by G. Gordon Schulmeyer, James I.McManus, Second Edition, International Thomson Computer Press
5. Software Testing and continuous Quality Improvement, by William E.Lewis, Gunasekaran Veerapillai, Second Edition, Auerbach Publications
6. Metrics and Models for Software Quality Engineering, by Stephen H. Kan, by Pearson Education Publication
7. Software Testing Tools, K.V.K.K. Prasad, Dream tech press, 2008.
8. Practical Software Testing, Ilene Burnstein, Springer, 2003.



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**(9D25202) SOFTWARE ARCHITECTURE AND DESIGN PATTERNS**
**UNIT I Envisioning Architecture**

The Architecture Business Cycle, What is Software Architecture, Architectural patterns, reference models, reference architectures, architectural structures and views.

**UNIT II Creating an Architecture**

Quality Attributes, Achieving qualities, Architectural styles and patterns, designing the Architecture, Documenting software architectures, Reconstructing Software Architecture.

**UNIT III Analyzing Architectures**

Architecture Evaluation, Architecture design decision making, ATAM, CBAM.

**UNIT IV Moving from one system to many**

Software Product Lines, Building systems from off the shelf components, Software architecture in future.

**UNIT V Patterns**

Pattern Description, Organizing catalogs, role in solving design problems ,Selection and usage.

**UNIT VI Creational and Structural patterns**

Abstract factory, builder, factory method, prototype, singleton, adapter, bridge, composite, façade, flyweight, Proxy.

**UNIT VII Behavioral patterns**

Chain of responsibility, command, Interpreter, iterator, mediator, memento, observer, state, strategy, template method, visitor.

**UNIT VIII Case Studies**

A-7E – A case study in utilizing architectural structures, The World Wide Web - a case study in interoperability, Air Traffic Control – a case study in designing for high availability, Celsius Tech – a case study in product line development

**TEXT BOOKS:**

1. Software Architecture in Practice, second edition, Len Bass,Paul Clements&Rick Kazman, Pearson Education,2003.
2. Design Patterns, Erich Gamma, Pearson Education,1995.

**REFERENCE BOOKS:**

1. Beyond Software architecture, Luke Hohmann, Addison wesley, 2003.
2. Software architecture, David M. Dikel, David Kane and James R. Wilson, Prentice Hall PTR,2001
3. Pattern Oriented Software Architecture,F.Buschmann&others,John Wiley&Sons.
4. Head First Design patterns, Eric Freeman & Elisabeth Freeman, O'REILLY, 2007.
5. Design Patterns in Java, Steven John Metsker & William C. Wake, Pearson education, 2006
6. J2EE Patterns, Deepak Alur, John Crupi & Dan Malks, Pearson education, 2003.
7. Design Patterns in C#, Steven John metsker, Pearson education, 2004.
8. Software Design, David Budgen, second edition, Pearson education,2003

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**(9D25203) SERVICE ORIENTED ARCHITECTURE**

**UNIT I**

SOA and Web Services Fundamentals

Introducing SOA- Fundamental SOA, Common Characteristics of Contemporary SOA, Common tangible benefits of SOA, Common pitfalls of adopting SOA.The Evolution of SOA – An SOA timeline, The continuing evolution of SOA, The roots of SOA.Web Services and primitive SOA-The Web Services frame work,Services,Service descriptions,Messaging.

**UNIT II**

Web Services and Contemporary SOA(Part I-Activity management and Composition) Message exchange patterns,Service Activity Coordination,Atomic transactions,Business Activities,Orchestration,Choreography.

**UNIT III**

Web Services and Contemporary SOA (Part-II-Advanced Messaging , Metadata , and Security) Addressing, Reliable messaging, Correlation, Policies, Metadata exchange, Security, Notification and eventing.

**UNIT IV**

Principles of Service-Orientation

Service – Orientation and the enterprise,Anatomy of SOA,Common Principles of Service – Orientation,interrelation between Principles of Service-Orientation,Service Orientation and Object Orientation,Native Web Services support for Principles of Service-Orientation.

**UNIT V**

Service Layers

Service-Orientation and Contemporary SOA , Service Layer abstraction , Application Service Layer , Business Service Layer,Orchestration Service Layer,Agnostic Services,Service Layer Configuration Scenarios.

**UNIT VI**

Building SOA(Planning and Analysis)

SOA Delivery Strategies-SOA delivery lifecycle phases,The top-down strategy,The bottom-up strategy,The agile strategy.Service Oriented Analysis(Part I-Introduction)-Introduction to Service Oriented Analysis,Benefits of a Business Centric SOA,Deriving Business Services. Service Oriented Analysis(Part-II-Service Modelling)-Service Modelling,Service Modelling guidelines,Classifying Service model logic,Contrasting Service modelling approaches.

**UNIT VII**

Building SOA(Technology and Design)

Service Oriented Design(Part I-Introduction)-Introduction to Service-Oriented design,WSDL related XML Schema language basics,WSDL language basics,Service interface design tools. Service Oriented Design(Part II-SOA Composition Guidelines)-SOA Composing steps,Considerations for choosing service layers,Considerations for positioning core SOA standards,Considerations for choosing SOA extensions.

**UNIT VIII**

Service Oriented Design(Part III- Service Design)

Service Design overview, Entity-centric business Service Design, Application Service Design, Task-centric business Service Design, Service Design guidelines. Service Oriented Design(Part IV-Business Process Design)-WS-BPEL language basics, WS- Coordination overview, Service Oriented Business process Design. Fundamental WS-\* Extensions-WS-Addressing language basics, WS-Reliable Messaging language basics, WS-Policy language basics, WS-Metadata Exchange language basics, WS-Security language basics. SOA Platforms-SOA platform basics, SOA support in J2EE and .NET, integration considerations.

**TEXT BOOKS:**

1. Service-Oriented Architecture-Concepts, Technology, and Design, Thomas Erl, Pearson Education.
2. Understanding SOA with Web Services, Eric Newcomer, Greg Lomow, Pearson Education.

**REFERENCES:**

1. The Definitive guide to SOA, Jeff Davies & others, Apress, Dreamtech.
2. Java SOA Cook book, E.Hewitt, SPD.
3. SOA in Practice, N.M.Josuttis, SPD.
4. Applied SOA, M.Rosen and others, Wiley India pvt. Ltd.
5. Java Web Services Architecture, J.Mc Govern, and others, Morgan Kaufmann Publishers, Elsevier.
6. SOA for Enterprise Applications, Shankar.K, Wiley India Edition.
7. SOA-Based Enterprise Integration, W.Roshen, TMH.
8. SOA Security, K.Rama Rao, C.Prasad, dreamtech press.

**M.Tech II Semester (Software Engineering)****Th C**  
**4 4****(9D25204) SOFTWARE RELIABILITY****UNIT I: Introduction**

The Need for Reliable Software, Software Reliability Engineering Concepts, Basic definitions, Software practitioners biggest problem, software reliability engineering approach, software reliability engineering process, defining the product

**UNIT II: The Operational Profile**

Reliability concepts, software reliability and hardware reliability, developing operational profiles, applying operational profiles, learning operations and run concepts.

**UNIT III: Software Reliability Concepts**

Defining failure for the product, common measure for all associated systems, setting system failure intensity objectives, determining develop software failure intensity objectives, software reliability strategies, failures, faults and errors, availability, system and component reliabilities and failure intensities, predicting basic failure intensity.

**UNIT IV: Software Reliability Modeling Survey**

Introduction, Historical Perspective and Implementation, Exponential Failure Time Class of Models, Weibull and Gamma Failure Time Class of Models, Infinite Failure Category Models, Bayesian Models, Model Relationship, Software Reliability Prediction in Early Phases of the Life Cycle.

**UNIT V: Software Metrics for Reliability Assessment**

Introduction, Static Program Complexity, Dynamic Program Complexity, Software Complexity and Software Quality, Software Reliability Modeling.

**UNIT VI: Software Testing and Reliability**

Introduction, Overview of Software Testing, Operational profiles, Time/Structure Based Software Reliability Estimation.

**UNIT VII: Best Practice of SRE**

Benefits and approaches of SRE, SRE during requirements phase, SRE during implementation phase, SRE during Maintenance phase.

**UNIT VIII: Neural Networks for Software Reliability**

Introduction, Neural Networks, Neural Networks for software reliability, software reliability growth modeling.

**TEXT BOOKS**

1. Handbook of Software Reliability Engineering Edited by Michael R. Lyu, published by IEEE Computer Society Press and McGraw-Hill Book Company.
2. Software Reliability Engineering John D. Musa, second edition Tata McGraw-Hill.

**REFERENCES**

1. Practical Reliability Engineering, Patric D. T. O connor 4<sup>th</sup> Edition, John Wesley & Sons, 2003.
2. Fault tolerance principles and Practice, Anderson and PA Lee, PHI, 1981.
3. Fault tolerant computing-Theory and Techniques, Pradhan D K (Ed.): Vol 1 and Vol 2, Prentice hall, 1986.
4. Reliability Engineering E. Balagurusamy, Tata McGrawHill, 1994.

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**(9D25205) SOFTWARE REENGINEERING****Unit I: Software, Software evolution and Maintenance:**

Software, Legacy software, Well designed software, Software evolution challenges, Lehman's laws, Software deterioration curve. Software maintenance: Software change, Types of change encountered during the support phase, Maintenance costs, Why is software maintenance expensive?, Factors affecting maintenance, Maintenance process, Change and maintenance prediction.

**UNIT II: Software quality factors, Quality and Maintainability metrics:** Internal and external attributes, McCall's quality factors, ISO 9126 quality factors, Need and importance of quality and maintainability metrics, Metric for software correctness (Defects/KLOC), Metric for software integrity, Software reliability (MTBF), Metrics for maintainability (Mean-time-to-change (MTTC), Spoilage metric, Software maturity index, McCabe and Halstead metrics). Design maintainability: Cohesion, Coupling, Understandability and Adaptability.

**UNIT III: Legacy software structure, Software reengineering process model:**

Software change strategies include: Software maintenance, Architectural transformation, Software reengineering. Legacy software structure and distribution: Ideal structure, Real structure, Layered distribution model, Legacy software distribution, Architectural problems. Business process reengineering: Business processes, A BPR Model. Software reengineering and its importance, Goals of reengineering, A software reengineering process model, Software reengineering activities.

**UNIT IV: Design Extraction:**

Reverse Engineering: Goals of reverse engineering, Why design extraction is needed?, Reverse engineering process, Reverse engineering to understand processing, Code duplication detection, Reverse engineering to understand data, Reverse engineering user interfaces, Design extraction with UML, Heuristics to extract the design, Tools for reverse engineering.

**UNIT V: Restructuring (In Traditional context):** Code restructuring: Characteristics of unstructured code, Characteristics of structured code, Spaghetti logic, Structured control logic, Restructuring problems, Flow graph restructuring, Warnier's logical simplification techniques, Some basic code restructuring methods: Interchange, Transposition, Combination, Resolution, Substitution. Data restructuring (Data reengineering): Data reengineering process, Data problems, Approaches: Data cleanup, Data extension, Data migration. Tools for restructuring.

**UNIT VI: Refactoring (Restructuring in object oriented context):** What is refactoring?, Principles in refactoring: Why should you refactor?, When should you refactor?, Problems with refactoring, Refactoring and design, Refactoring and performance. Refactoring opportunities, Top ten of code bad smells, Different refactorings and their use, Refactoring tools.

**UNIT VII: Forward Engineering:** What is forward engineering ? Goals of forward engineering, Forward engineering for client/server applications, Forward engineering for object oriented architectures, Forward engineering user interfaces, Tools for forward engineering.

**UNIT VIII: Reengineering Metrics, Repositories, and Economics:**

Metrics in Reengineering: Why metrics in Reengineering?, Metrics as a reengineering tool, Which metrics to collect ?(Goal Question Metric (GQM) paradigm), Reengineering repositories: Why repositories?, Taxonomy (Functionality + Integration options), Issues. Reengineering economics.

**TEXT BOOKS:**

1. Software Reengineering, Ed. Robert S. Arnold, IEEE Computer Society, 1993.
2. Software Evolution, Tom Mens, Serge Demeyer, Springer publication company, 2008

**REFERENCES:**

1. Software Engineering, Ian Sommerville, Addison-Wesley, 8<sup>th</sup> Edition.
2. Software Engineering, A Practitioner's Approach, Roger S. Pressman, 7<sup>th</sup> Edition.
3. Refactoring: Improving the Design of Existing Code, Martin Fowler, K.Beck, J.Brant, W.Opdyke, D.Roberts, Addison- Wesley, NY, 1999.
4. Software Reengineering, Georg Abfalter, VDM Verlag, Germany, 2008.
5. Successful Software Reengineering, Salvatore Valenti, IRM Press, 2002.
6. Logical construction of programs, J.D.Warnier, Van Nostrand-Reinhold,1974.
7. Tutorial on Software Restructuring, Robert E.Arnold, IEEE Computer Society, 1986.

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**ELECTIVE-II  
(9D25206a) SECURE SOFTWARE ENGINEERING**
**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, 1st 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, 2<sup>nd</sup> Edition, 2003.
6. Exploiting Software: How to break code, by G. Hoglund, G. McGraw, Addison Wesley, 2004.

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**ELECTIVE-II  
(9D25206b) SOFT COMPUTING**

**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 operations, Implication (if-then), Some definitions, Fuzziness and Fuzzy resolution, Fuzzy relations, Composition and Inference, considerations of fuzzy decision-making.

**UNIT-III Fuzzy Logic Control**

Introduction, Background, Basic of Fuzzy control, Defuzzification, Fuzzification, Fuzzy Control Surface, Extensions of Mamdani fuzzy control.

**UNIT-IV Fuzzy Control Architectures**

Fuzzy control architectures, Properties of fuzzy control, Robustness and Stability.



**UNIT-V Fundamentals of Artificial Neural Networks**

Introduction, Learning and acquisition of knowledge, Features of artificial Neural Networks, Fundamentals of Connectionist Modeling.

**Major Classes of Neural Networks**

Introduction, The Multilayer Perceptron.

**UNIT-VI Neuro-Fuzzy Systems**

Introduction, Background, Architectures of neuron-fuzzy systems, Construction of neuron-fuzzy systems.

**UNIT-VII Evolutionary Computing**

Introduction, Overview of evolutionary 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 in GAs, Population-based incremental learning, Evolutionary strategies, ES applications.

**UNIT-VIII Applications**

Pattern Recognition, Image Processing, Information Retrieval Systems, Share Market Analysis, Soft Computing for Colour Recipe Prediction.

**TEXT BOOKS:**

1. "Soft Computing and Intelligent Systems Design", by Fakhreddine.O. Karray and Clarence De Silva, Pearson Education.
2. "Neuro-Fuzzy and Soft Computing", J.S.R. Jang, C.T. Sun and E.Mizutani, PHI, 2004, Pearson Education 2004.

**REFERENCES:**

1. "Fuzzy Logic with Engineering Applications", by Timothy J. Ross, McGraw-Hill, 1997.
2. "Computational Intelligence Principles, Techniques and Applications", by A.Konar, Springer, 2005.
3. "Introduction to Pattern Recognition- Statistical, Structural, Neural and Fuzzy Logic Approaches", by M.Friedman and Abraham Kandal, World Scientific, 2005.

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**ELECTIVE-II**

**(9D25206c) MODEL DRIVEN SOFTWARE DEVELOPMENT**

**UNIT-1 MDSD Basic Terminology**

Goals of MDSD, MDSD Approach, Overview of MDA concepts, Architecture-Centric MDSD, Common MDSD concepts and terminology, Model-Driven Architecture, Generative Programming, Software factories, Model-Integrated computing, Language-Oriented Programming, Domain specific modeling.

**UNIT- 2 Metamodeling**

What is Metamodeling?, Metalevels vs. Level of Abstraction, MOF and UML, Extending UML, UML profiles, Metamodeling & OCL, Examples, Tool-supported Model validation, Metamodeling & Behavior, Pitfalls in Metamodeling, MDSD classification.

**UNIT- 3 Model Transformation with QVT**

History, M2M language requirements, Overall Architecture, An Example Transformation, The OMG standardization Process and Tool Availability, Assesment.

**UNIT- 4 MDSD Tools:Roles, Architecture, Selection Criteria, and Pointers**

Role of Tools in the Development Process, Tool Architecture and selection criteria, pointers.  
**The MDA Standard:** Goals, Core concepts

**UNIT- 5 MDSD Process Building Blocks and Best Practices**

Introduction, Separation between Application and domain Architecture Development, Two track Iterative Development, Target Architecture Development Process, Product-line Engineering.

**UNIT- 6 Testing**

Test Types, Tests in Model-driven Application Development, Testing the Domain Architecture

**Versioning**

What is Versioned? Projects and Dependencies, The structure of Application Projects, The structure of Application Projects, Version management and Build Process for mixed files, Modeling in a team and versioning of partial models

**UNIT- 7 Case study: Embedded Component Infrastructures**

Overview, Product-Line Engineering, Modeling, Implementation of Components, Generator Adaptation, Code Generation.

**UNIT- 8 Quality : Quality in Model Driven Engineering**

**TEXT BOOKS:**

1. Model-Driven Software Development-Technology, Engineering, Management by Thomos Stahl, Markus Volter, jul 2006, John Wiley & Sons.
2. Model-Driven Software Development: Integrating Quality Assurance by Jorg Rech, Christian Bunse,2008,Information Science Publishing.(UNIT-8)

**REFERENCES:**

1. Model-Driven Software Development by Sami Beydeda Matthias Book , Volker Gruhn, Springer.
2. Model Driven Systems Development with Rational Products By Brian Nolan, Barclay Brown, Dr. Laurent Balmelli, Et Al Tim Bohn, 2008,IBM.
3. Model Driven Development with Executable UML by Dragan Milicev, 2009,Wilei India pvt Ltd.
4. Model Driven Software Development by Kevin Lano, Apr 2009, Ci Business Press.

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**(9D25402) PROJECT WORK**

The Project Work should be on a contemporary topic relevant to the core subjects of the course. It should be original work of the candidate.

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