Master of Technology in Software Engineering

The overall credit structure

<table>
<thead>
<tr>
<th>Undergraduate Core (UC)</th>
<th>Undergraduate Elective(UE)</th>
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<tr>
<td><strong>Category</strong></td>
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**Program Core**

- SEL505  S/W Engineering Concepts & Methodologies  3-0-0  3
- SEL507  Object Oriented Software Engg & UML  3-0-0  3
- SEL511  Software Project Management / Software Quality Management  3-0-2  4
- CSL535  Data Structure using C++ & Testing  3-0-2  4
- SEL508  Software Verification, Validation & Testing  3-0-2  4
- CSL534  Programming Course – 1  3-0-2  4
- SEL528  Advanced Database Management Systems  3-0-2  4
- SEL617  Software Metrics  3-0-0  3
- CSP605  Lab Course – 1  0-0-2  1

Total Credits  24-0-12  30

**Project**

- SED502  Minor Project  0-0-4  2
- SED603  Project & Dissertation  0-0-6  3
- SED604  Major Project and Thesis  0-0-24  12

Total Credits  0-0-34  17

**Seminar**

- SEC604  Seminar  0-0-2  1

Total Credits  0-0-2  1

**Program Elective**

- SEL525  Software Design, Construction & Testing  3-0-0  3
- SEL641  Programming Course – 2  3-0-2  4
- SEL529  Software Systems for Data ware Housing & Data Mining  2-0-2  3
- CSL530  Probability and Mathematical Statistics  3-0-0  3

Programme Code: SE

Object Oriented Analysis & Design  3-0-0  3
System Performance & Evaluation  3-0-0  3
System Software  3-0-0  3
Personal S/W Process & Team S/W Process  3-0-0  3
Embedded & Real time Systems  3-0-0  3
Cooperative Computing  3-0-0  3
Component based S/W Development and Computing  3-0-0  3
Software Process Maturity  3-0-0  3
United S/W Configuration Management  3-0-0  3
E-Business  3-0-0  3
Network Security  3-0-0  3
Web Services  3-0-0  3
Distributed Operating System  3-0-0  3
Human Interface Design  3-0-0  3
Customer Relationship Management  3-0-0  3
# Master of Technology in Software Engineering

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<th>Sem.</th>
<th>Sub 1</th>
<th>Sub 2</th>
<th>Sub 3</th>
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<td>Total Credits of M.Tech.(SE) Programme</td>
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Outline Syllabus of M.Tech (Software Engineering)

SEL505 Software Engineering Concepts and Methodologies
3 Credit (3 -0- 0)
Pre-requisites (if any): Basics of Computers, Data Structures, and Programming languages
Software development process models from the points of view of technical development and project management, Software Development Methods: Formal, semi-formal and informal methods; Requirements elicitation, requirements specification; Data, function, and event-based modeling; Some of the popular methodologies such as Yourdon’s SAD, SSADM etc; CASE tools-classification, features, strengths and weaknesses; ICASE; CASE standards. Software Project Management, Software Quality Management, Configuration Management, Brief introduction to various standards related to Software Engineering.

SEL506 Software Quality Management
3 Credit (3 -0- 0)
Pre-requisites (if any): Introduction to software Engineering concepts, Programming languages
Basic Concepts of software quality, software quality control and software quality assurance, evolution of SQA, major SQA activities, major SQA issues, zero defect software, Software Quality Assurance, Software Quality Assurance .Error Reporting: Trend Analysis: Error quantity, error frequency, program unit complexity, compilation frequency. Corrective action as to Cause: Identifying the requirement for corrective action, determining the action to be taken, implementing the corrective action, and documenting the corrective action, periodic review of actions taken. Records Collection, Maintenance, and Retention, quality evaluation reports. Quality standards with emphasis on ISO 9000, SEI CMM, TQM Models.

SEL507 Object Oriented Software Engineering & UML
3 Credit (3 -0- 0)
Pre-requisites (if any): Object oriented Programming

SEL508 Software Verification, Validation & Testing
4 Credit (3 -0- 2)
Pre-requisites (if any): Software Testing
Introduction: Terminology, evolving nature of area. V&V Limitations: Theoretical foundations: impracticality of testing all data, impracticality of testing all paths, no absolute proof of correctness. Role of V&V in Software Evolution: Types of Products: requirements, specifications, designs, implementations, changes; V&V objectives: correctness, consistency, necessity, sufficiency, performance. Software V & V Approaches and their Applicability: Software technical reviews; Software testing: levels of testing - module, integration, system, regression; Testing techniques and their applicability-functional testing and analysis, structural testing and analysis, error-oriented testing and analysis, hybrid approaches, integration strategies, transaction flow analysis, stress analysis, failure analysis, concurrency analysis, performance analysis; Proof of correctness; simulation and prototyping; Requirement tracing. Software V&V Planning: Identification of V&V Goals; Selection of V&V techniques: requirements, specifications, design, implementations, changes; Organizational responsibilities: development organization, independent test organization; software quality assurance; independent V&V contractor; V&V standards; Integrating V&V approaches; Problem tracking; Tracking test activities; Assessment.

SEL509 Software Project Management
4 Credit (3 -0- 2)
Pre-requisites (if any): Basics of Computers, Data Structures, and Programming languages
Introduction to software project management, creation of project plan, software estimation, project scheduling, project cost management, project team and project manager, cost management, human resource management, project communication management, project management process group, risk management, project monitoring and control, quality control. alternative approaches and emerging issues.
SEL525 Software Design, Construction & Testing
3 Credit (3 -0- 0)
Pre-requisites (if any): Testing

SEL526 System Performance & Evaluation
3 Credit (3 -0- 0)
Pre-requisites: None

SEL528 Advanced Database Management Systems
4 Credit (3 -0- 2)
Pre-requisites (if any): Database
Introduction, Data Modeling, Data Models, Relational Model, Database Design, Query Languages - SQL, DDL, DML, DCL, File Organization, Indexing and Hashing, Data Security.

SEL529 Software Systems For Data Mining and warehousing
3 Credit (2 -0- 2)
Pre-requisites (if any): Database
Introduction: Fundamentals of data mining, Data Warehouse and OLAP Technology for Data Mining Data Warehouse, Multidimensional Data Model, Data Warehouse Architecture, Data Warehouse Implementation, Data Preprocessing: Needs Data Mining Primitives, Languages, and System Architectures, Data Mining Primitives, Data Mining Query Languages, Designing Graphical User Interfaces Based on a Data Mining Query Language

SEL629 United Software Configuration Management
(Credit 3: L-T-P 3-0-0)
Prerequisites


Text Books
Architectures of Data Mining Systems, Concepts Description: Characterization and Comparison, Data Generalization and Summarization-Based Characterization, Analytical Characterization: Analysis of Attribute Relevance, Mining Class Comparisons: Discriminating between Different Classes, Mining Descriptive Statistical Measures in Large Databases. Mining Association Rules in Large Databases, Classification and Prediction, Cluster Analysis Introduction, Mining Complex Types of Data.

SEL530 System Software
3 Credit (3 -0- 0)
Pre-requisites: Fundamental of Computer
Introduction -System Software and Machine Architecture; The Simplified Instructional Computer; traditional CISC Machines; RISC Machines. Assemblers Basic Assembler Functions; Machine Dependent Assembler Features; Machine-Independent Assembler Features; Assembler Design Options; AIX Assembler. Loaders and Linkers Basic Loader Functions; Machine Dependent Loader Features; Machine-Independent Loader Features; Loader Design Options. Macro Processors Basic Macro Processor Functions; Machine Independent Macro Processor Features; Macro Processor Design Options. Compilers Basic Compiler Functions; Machine Dependent Compiler Features; Machine independent Compiler Features; Compiler Design Options. Operating Systems Basic OS functions; Machine Dependent OS Features; Machine independent OS Features; Operating System Design Options. Other System Software Text editors; Interactive Debugging Systems.

SEL531 Object Oriented Analysis & Design
3 Credit (3 -0- 0)
Pre-requisites (if any): OOP

SEL532 Personal S/W Process & Team S/W Process
3 Credit (3 -0- 0)
Pre-requisites (if any): None

CSL534 Programming Course – 1
4 Credits (3-0-2)
Pre-requisites (if any) : Object Oriented Programming C++, Core Java
Java Basics Review, Distributed Computing, Java Beans and swing, Java Enterprise Application,JNI - Servlets - Java Server Pages - JDBC - Related Java Techniques, Java Media Framework, Case study - Deploying n-tier application, E-commerce applications.

CSL535 Data Structure using C++
4 Credits (3-0-2)

SEL617 Software Metrics
3 Credit (3 -0- 0)
Pre-requisites (if any): Software Engg..
Basics of measurement, Software-metrics data collection and analysis, Measuring internal product attributes, Measuring external product attributes, Metrics for object-oriented systems LK suite, CK suite
and MOOD metrics. Metrics for component-based systems: The intent of component-based metrics, distinguishing characteristics of component-based metrics, various component-based metrics. Resource measurement: Measuring productivity, teams, tools, and methods.

**SEL619 Embedded & Real Time Systems**  
3 Credit (3-0-0)  
*Pre-requisites (if any): Microcontroller, Operating systems*  

**SEL621 Cooperative Computing**  
3 Credit (3-0-0)  
*Pre requisites: Computer Networks*  
Computer Oriented Programs; Cooperative Planning; Cooperative Programs; guidelines Information Networks; Institutional Cooperation; Models; Networks Program Development

**SEL623 Component Based Software Development & Computing**  
3 Credit (3-0-0)  
*Pre-requisites (if any): None*  

**SEL627 Software Process Maturity**  
(3 credits; 3-0-0)  
Software Processes : Process selection , definition and conformance, Standards Process maturity : Basic principles and misconceptions about the SW process. Introduction to the personal software process (PSP), Basics principles of software process improvement (SPI); six different contexts, Software inspections and defect causal analysis, Relationship between lifecycles, methods (methodologies), process Capability maturity Model, Difference between CMM and CMMI, quality assurance, Key Process Area, Six Sigma.

- Tom Gilb and Dorothy Graham, Software Inspection, Addison Wesley, 1993 (probably the best all around reference on inspections)

**SEL631 E- Business**  
3 Credit (3-0-0)  
*Pre-requisites (if any): None*  
The course is organized in three parts which move from macro to micro level issues related to e-commerce management. Part 1 provides a high level view of e-commerce business models, the ways that e-commerce technology changes value chains and creates new roles in the Marketspace. We also learn about analysis techniques and tools. Part 2 shifts the level of analysis to the firm level as we examine competing companies in certain industries. Part 3 moves into the organization and considers internal management issues related to e-commerce technology and the differences between conventional organizations and companies running on Internet time.

**SEL633 Network Security**  
3 Credit (3-0-0)  
*Pre-requisites (if any): None*  
Scanning: Scanning, Elaboration phase, active scanning, scanning tools nmap, hping2. Enumeration, DNS Zone transfer. Trojans and Backdoors: Effect on Business, Trojan?, Overt and Covert Channels, Working of Trojans, Different Types of Trojans, Different ways a Trojan can get into a system, Indications of a Trojan Attack. Some famous Trojans and ports used by them.


SEL635 Web Services
3 Credit (3-0-0) 
**Pre-requisites (if any):** (general understanding of data communications, communications system development in Java) Familiarity with XML - not a formal pre-requisite but highly desirable) 

SEL637 Distributed Operating System
3 Credit (3-0-0) 
**Pre-requisites (if any):** Operating System 
Introduction, goals and advantages of distributed system, Synchronization in distributed system, Process and processes in distributed systems, Distributed file system, distributed shared memory, Study of real time distributed operating system.

SEL639 Human Interface Design
3 Credit (3-0-0) 

SEL641 Programming Course – 2
4 Credit (3-0-2) 
CSP501 System Software Laboratory
1 Credit (0-0-2)

CSP 605 Lab Course – 1
1 Credit (0-0-2)

SED504 Minor Project
2 Credits (0-0-4)
Research and development projects based on problems of practical and theoretical interest. First part of a two semester long project activity. Problem definition, background research, development of overall project plan (detailed design, milestones, etc.) and meeting the research and development targets set up for the first part. Evaluation will be based on student seminars, written reports, and evaluation of the developed system and/or theories.

SED604 Major Project and Thesis
12 Credits (0-0-24)
Evaluation will be held periodically, and will be based on written reports, oral presentations and demonstration of results. The project will culminate in the production of a thesis by each individual student. Final evaluation will be according to the M.Tech., project evaluation guidelines.

SML617 Customer Relationship Management
3 Credit (3-0-0)
Cost of acquiring customers, turning customer acquisition into computer loyalty; internet and its effect on CRM; CRM and business intelligence, customer privacy Salesforce automation, key areas of salesforce automation, evolution of eCRM, multichannel CRM, CRM in business to business marketing, ERP, supply chain management
Integrated data, major types of data analysis, click stream analysis, personalization and collaborative filtering, defining CRM readiness
Pre-implemented checklist, CRM development team, avoiding failures in implementing CRM, future of CRM

SEC603 Seminar-I
1 Credit (0-0-2)

SEC604 Seminar-II
1 Credit (0-0-2)

CSL530 Probability and Mathematical Statistics
3 Credits (3-0-0)
Axioms of Probability, Bayes’ Formula, Expectations of Random Variables, Jointly Distributed Random Variables, Conditional Expectation, some applications – A list model, A random graph. Limit Theorem, Random Number Generator, Simulating continous random variables, Monte Carlo Integration.
Information Theory, Measure of Uncertainty, Shannon’s Measure, Entropy, Joint and Conditional Entropies, Mutual Information, Kullback-Leibler Directed Divergence, Coding Theory and Entropy.