Detailed Study Plan

Year 1 - Semester 1

Course Code	Course Title	CRD	Pre requisite
SE 601	Requirements Engineering and Specifications	3	------
SE 602	Software Architecture and Design	3	------
SE 603	Research Methodology, Professional and Ethical issues	3	------

Year 1 - Semester 2

Course Code	Course Title	CRD	Pre requisite
SE604	Software Verification, Validation and Testing	3	-------
SE605	Software Engineering Management	3	------
SE6XX	Elective I	3	-------

Year 2 - Semester 3

Course Code	Course Title	CRD	Pre requisite
SE6XX	Elective II	3	-----
SE6XX	Elective III	3	------
SE6XX	Elective IV	3	------

Year 2 - Semester 4

Course Code	Course Title	CRD	Pre requisite
SE699	M.Sc. Thesis	6	SE603 and as specified in Graduate Studies Rules

Elective Courses

Course Code	Course Title	CRD	Prerequisite
SE 606	Systems Engineering	3	-----
SE 607	Configuration Management	3	-----
SE 608	Information Security	3	-----
SE 609	Software Engineering for Mobile Computing	3	-----
SE 610	Software Quality Assurance	3	-----
SE 611	Software Engineering Metrics	3	-----
SE 612	Formal Methods in Software Development	3	-----
SE 613	Engineering Economics	3	-----
SE 614	Human Computer Interaction	3	-----
SE 615	Object-Oriented Software Development	3	-----
SE 616	Parallelism and Concurrency in Software Development	3	-----
SE 617	Free and Open Source Software Development	3	-----
SE 618	Software Engineering for Web	3	-----
SE 619	Data Mining and Decision Support Systems	3	-----
SE620	Current Topics in Software Engineering*	3	-----
SE621	Special Topics I*	3	-----
SE622	Special Topics II*	3	-----
SE623	Intelligent Systems	3	-----
SE624	Distributed Systems	3	-----
SE625	Cloud Computing	3	-----
SE626	Information Retrieval	3	-----
SE627	Advanced Algorithms Analysis and Design	3	-----
SE628	Embedded Systems	3	-----

*****TOPICS TO BE APPROVED BY THE DEPARTMENT COUNCIL

Course Description

Course Code: SE601 **Course Title: Requirements Engineering and Specifications**
This course covers the theory, principles, and practical application of the approaches and tools for requirements engineering and specifications through contrasting the difference between requirements engineering and specifications. The main contents are fundamentals of requirement engineering, Requirement engineering process, initiation and scope definition, requirements elicitation, requirement analysis, requirement specification, requirement validation and practical consideration (including iterative nature of requirement process, change management, requirements attributes, requirements tracing and measuring requirements).

Course Code: SE602: **Course Title: Software Architecture and Design**
This course is concerned with all issues related to software architecture and design. Topics include Introduction to software architecture and design. Software architecture and requirements of a software system. Fundamental principles and guidelines for software architecture design. Methods, techniques and tools for describing software architecture and design process. Software design and evaluation processes. Approaches and tools for designing and evaluating software architectures. Best practices in software design. Emerging techniques in software architecture and design, especially Concurrency, cloud and mobile computing.

Course Code: SE603 **Course Title: Research Methodology, Professional and Ethical Issues**
The course provides in-depth understanding of research methodology and professional issues. Topics include research methodology, research types, scientific publishing, professional societies in the discipline and their role, legal IT issues and IT regulations, code of ethics and plagiarism, writing scientific proposal, writing research papers, writing master level thesis and presenting a project/paper to audience. Students will conduct research and report their research findings in a research paper.

Course Code: SE604 **Course Title: Software Verification, Validation and Testing**
This course focuses on issues related to software verification and validation throughout the software life cycle. Topics covered include reviews, inspections, walkthrough, and formal methods; testing techniques, strategies, and tools; and related software metrics.

Course Code: SE605 **Course Title: Software Engineering Management** This course covers the activities, methods, and processes needed to manage software engineering and software development projects using current best practices. Topics include software project framework activities and umbrella activities; planning, risk management, estimating technical resources, project schedules, and cost; fundamentals in tracking the project; approaches to building quality, maintainability, security, and other desirable characteristics into the system from the beginning; review and evaluation; engineering economic.

Course Code: SE606 **Course Title: Systems Engineering**
This course focuses on defining customer needs and required functionality early in the development cycle, documenting requirements, then proceeding with design synthesis and system validation while considering the complete problem including operations, performance, test, manufacturing, cost, and schedule. This subject emphasizes the links of systems engineering to fundamentals of decision theory, statistics, and optimization. The main contents are concepts of systems engineering (including system context, people and systems, system hierarchal relationships and role of system engineers), system engineering life cycle management, system engineering and software engineering processes, stockholder requirements, requirements analysis, system design (including architecture design, implementation and trade studies), integration and verification, transition and validation, operation, maintenance and support.

Course Code SE607 **Course Title: Configuration**
This course covers the process of managing software configuration through tackling the disciplines and techniques of initiating, evaluating and controlling change to software products during and after the software engineering process. The main contents include management of configuration management process, configuration identification, configuration control, configuration status accounting and software release management and delivery.

Course Code: SE608 **Course Title: Information Security**

The course provides students with in-depth knowledge and techniques required to deal with security problems. The main topics include basic notions of confidentiality, integrity, availability, authentication models, protection models, security kernels, secure programming, audit, intrusion detection and response, operational security issues, physical security issues, personnel security, policy formation and enforcement, access controls, information flow, legal and social issues, identification and authentication in local and distributed systems, classification and trust modeling, risk assessment and management, recent trends in information security.

Course Code: SE609 **Course Title: Software Engineering for Mobile Computing**

In this course provides students with in-depth knowledge and skills to design, implement, and deploy methodologies and tools for mobile applications. Topics include analysis models in mobile software engineering (MSE); design and development models in MSE, including architectural models, information models, functional models, interaction models, navigation models, graphic user interface (GUI) hierarchical models; analysis of integrated development environments (IDEs) for various mobile platforms (Android, Windows Phone, etc.); testing strategies and techniques for mobile software systems; mobile software quality management; security issues of mobile software systems, and MSE-focused implementation methods.

Course Code: SE610 **Course Title: Software Quality Assurance**

This course is concerned with concepts and techniques for software quality assurance and Incorporation of quality assurance in different stages of software development. It also focuses on standards for quality assurance and measurements of software quality. Topics include: Software application Quality Requirements, Criticality of systems, Dependability, Software quality improvement, value and cost of quality, quality models and characteristics.

Course Code: SE611 **Course Title: Software Engineering Metrics**

This course covers how to identify and control essential parameters that affect software development. It also tackles how to use software metrics to measure the size of the software quantitatively by assessing issues like level of complexity involved, the strength of the module by measuring coupling, testing techniques and estimating cost of resources and project schedule. The course includes introduction to foundations of measurement theory, models of software engineering measurement, software products metrics, software process metrics and measuring management.

Course Code: SE612 **Course Title: Formal Methods in Software Development**

In this course all issues related to formal methods in software development are considered. Topics include Concepts of formal specifications, validation, and verification of software systems, formal Mathematical specification for software via algebraic specifications and abstract model specifications, the application of formal methods to analysis, design, implementation, and software verification. Also the study of Model-driven software architectures are included.

Course Code: SE613 **Course Title: Engineering Economics**

This course involves introduction to Engineering economics and analysis fundamentals. Topics include economic planning of a software Engineering project, cost analysis and estimation, economic analysis of projects, risk analysis, budget development and for-profit and not-for-profit decision making.

Course Code: SE614 **Course Title: Human Computer Interaction**

The course provides in-depth coverage of theory and practice of HCI. Topics include HCI concepts, human information processing, user interface design principles, information presentation, visual, auditory and tactile displays, speech communication, data entry, controls, tools and feedback, human factors in computer programming, workspace design, environmental & legal considerations, and current research in HCI.

Course Code: SE615 **Course Title: Object-Oriented Software Development**

This course aims to investigate, understand and apply the software design process, using an object-oriented paradigm. The course has two major components. It first introduces the Unified Modeling Language (UML), and a number of software development processes, including the Rational Unified process. The second half of the course is devoted to the understanding of a catalogue of design patterns, selected from Gamma et.al. Certain tools are to be learned throughout this course such as design-support tools (principally design patterns), programming-support tools (principally a visual editor, a code repository, unit testing and code coverage, and a logger), and teamwork-support tools (principally a mailing list, a project wiki, an issue tracker, a code integrator and release generator).

Course Code: SE616 **Course Title: Parallelism and Concurrency in Software Development**

The purpose of this course is to provide in-depth knowledge of parallelism and concurrency when designing and developing software solutions. Topic include parallel computations, computation graphs, Flynn's taxonomy, Parallel algorithms for data structures, Common parallel programming patterns including task parallelism, pipeline parallelism, data parallelism, divide-and-conquer parallelism, map-reduce, concurrent event processing including graphical user interfaces.

Course Code: SE617 Course Title: Free and Open Source Software Development
This course covers the process of developing Open-source software development open-source software, or similar software whose source code is publicly available. Additionally, the course explains how free and open source software development is an alternative to traditional software engineering as an approach to the development of software systems and gaining significant importance specially in the production of complex software products. The main contents of the course are Introduction to Open Source software development, and its differences with proprietary software; technical infrastructure, developers' demographics and motivations; participation etiquette; best practices; Git distributed revision control system and GitHub; its societal and intellectual property licenses; its economic models; hands-on experience with free and open source software projects.

Course Code: SE618 Course Title: Software Engineering for Web
This course is concerned with how to develop internet applications and deal with issues such as concurrency, unpredictable load, security risks, web services, creating a reliable user experience, and multi-model interface. The students will develop a functional web-based application as a group effort something similar to "amazon.com".

Course Code: SE619 Course Title: Data Mining and Decision Support Systems
The course covers principles and techniques of data-mining and knowledge-based decision support systems. Topics will include clustering, regression, classification, estimation, forecasting, statistical analysis, warehousing principles, knowledge acquisition and representation, applications of data mining in social network analysis and big data as well as decision support systems.

Course Code: SE620 Course Title: Current Topics in Software Engineering
This course covers new issues and advanced areas in Software Engineering. The course description will be approved by the college council.

Course Code: SE621 Course Title: Special Topics I

This course covers new and advanced areas in Information Technology. The course description will be approved by the college council.

Course Code: SE622 Course Title: Special Topics II
This course covers new and advanced areas in Information Technology. The course description will be approved by the college council.

Course Code: SE623 Course Title: Intelligent Systems
The course provides students with in-depth coverage of theories and practices of intelligent systems. Topics include intelligent systems, expert systems, development and their tools, neural networks, fuzzy logic, genetic algorithms, genetic programming, neuroevolution, hybrid systems, swarm optimizations, intelligent tutoring systems, intelligent agents.

Course Code: SE624 Course Title: Mobile and Distributed Computing
This course provides students with a comprehensive knowledge of mobile and distributed computing. Topics include concepts of pervasive computing, mobile and distributed computing architecture, mobile hardware technology, characteristics, location-based services, context-aware computing, service discovery, client/server and distributed computing environment, remote procedure calls, message passing and synchronization, lightweight distributed objects, mobile and distributed application development and recent developments in mobile and distributed computing research.

Course Code: SE625 Course Title: Cloud Computing
The course provides in-depth coverage of cloud computing as the platform for the development and delivery of computing technologies. Topics include: cloud computing concepts, cloud computing architecture, Infrastructure as a

Service, Platform-as-a-Service, Software as a Service, cloud computing access and implementation, cloud computing with MapReduce, MapReduce framework, application development using MapReduce on Cloud, examining private cloud solution, creating a Hyper-V private cloud, building a virtual network, customizing storage allocation, monitoring and reporting on private cloud resource utilization and current research in cloud computing.

Course Code: SE626 **Course Title: Information Retrieval**

This course provides the student with basic and advanced techniques for text-based information systems: efficient text indexing; Boolean and vector space retrieval models; evaluation and interface issues; Web search including crawling, link-based algorithms, and Web metadata; text/Web clustering, classification; text mining; big data; data manipulation at a large scale; k-means; multidimensional scaling; introduction to machine learning.

Course Code: SE627 **Course Title: Advanced Algorithms Analysis and Design**

Review of algorithmic concepts, basic design techniques: divide and conquer, greedy, backtracking, dynamic programming, heuristics, parallel algorithms, analysis of algorithms, NP-hard and NP-complete problems, approximation algorithms for NP- complete problems, probabilistic analysis of algorithms and randomized algorithms.

Course Code: SE628 **Course Title: Embedded Systems**

This course focus on analysis, design and implementation of embedded systems. Topics include embedded architecture, memory architecture, I/O (analog & digital), embedded software design & development, microcontrollers, embedded system programming, embedded communication & networking, sensors, actuators, case studies.

Course Code: SE699 **Course Title: M.Sc. Thesis**

The student has to undertake and complete a research topic under the supervision of a faculty member in order to probe in depth a specific problem in Information Technology/Software Engineering.