

SOFTWARE ENGINEERING (M.S.)

Academic Year

2011-2012

School

Graduate School [School Web site](#)

School Dean

Henry Flores, Ph.D. hflores@stmarytx.edu

Department

Engineering

Program Director

Jaffer Ibaroudene, Ph.D. jibaroudene@stmarytx.edu

Admission Requirements

To be considered for admission into St. Mary's University Graduate School, you will need to submit the following (along with application):

- (2) Letters of Recommendation
- (2) Official Transcripts reflecting your degree earned.
- Official GRE/GMAT/MAT
- Official TOEFL (80 Computer based) (international students only)
- Financial Guarantee (international students only)

Program Specific Admission Requirements

Admission is granted only to those with high promise for success in graduate study. Applicants demonstrate this potential through previous academic records and testing. To be considered for admission to the M.S.S.E. program, an applicant must fulfill the following:

1. Have a bachelor's degree in Software Engineering, Computer Science, Computer Engineering or a closely related discipline.
2. Have
 1. a minimum grade point average (GPA) of 3.00 (A=4.00) in their B.S. degree; and
 2. a minimum quantitative GRE score of 600;
 3. Applicants who fail to meet any of the above standards may be admitted on a conditional basis. The graduate programs director evaluates these cases on an individual basis.
3. International students must submit minimum TOEFL scores of 213 on the computer-based test, 550 on the paper-based test, or 79 on the Internet-based test. Alternatively, students may submit a

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minimum ISELS score or 6.5

4. Submit a completed application form, a written statement of purpose indicating the applicant's interests and objectives, two letters of recommendation concerning the applicant's potential for succeeding in the graduate program and official transcripts of all college level work.

Prerequisites

Applicants whose Bachelor of Science degree is not in Software Engineering, Computer Science, or Computer Engineering are required to demonstrate proficiency or take the following prerequisite courses:

EG1302/4 or CS1410 (or equivalent C/C++ course) - 3 semester hour

EG2342 Data Structure & Algorithms course (or CS1311 & CS1315) - 3 semester hours

MT3323 (or equivalent Discrete Math course) - 3 semester hours

Calculus I and II - 8 semester hours

Degree Requirements

Software Engineering (30 hrs)

Software Engineering Non-Thesis

Course #	Course Title	Hours
<u>Engineering Courses Required:</u>		
EG 6306	Software Project & Planning Management	3
EG6328	Software Engineering	3
EG6334	Software Quality Assurance	3
EG7304	Specification, Design, & Implementation of Software Systems	3
EG7305	Object-Oriented Analysis & Design Methodologies	3
EG7308	Software Verification & Validation	3
EG7309	Formal Methods in Software Engineering	3
EG7310	Software Maintenance, Evolution, & Reengineering	3
EG7311	User Interface Design	3
EG7312	Software Design & Architecture	3
EG7313	Web Engineering	3
EG7314	Software Security	3
EG7155	Internship	1
EG7255	Internship	2

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Course #	Course Title	Hours
EG7355	Internship	3
Total:		36

Software Engineering (30 hrs)

Software Engineering - Thesis

Course #	Course Title	Hours
<u>Engineering Courses Required (27hrs):</u>		
EG 6306	Software Project & Planning Management	3
EG6328	Software Engineering	3
EG6334	Software Quality Assurance	3
EG7304	Specification, Design, & Implementation of Software Systems	3
EG7305	Object-Oriented Analysis & Design Methodologies	3
EG7308	Software Verification & Validation	3
EG7309	Formal Methods in Software Engineering	3
EG7310	Software Maintenance, Evolution, & Reengineering	3
EG7311	User Interface Design	3
EG7312	Software Design & Architecture	3
EG7313	Web Engineering	3
EG7314	Software Security	3
EG7155	Internship	1
EG7255	Internship	2
EG7355	Internship	3
<u>Thesis (3hrs):</u>		
EG6339	Thesis Direction	3
Total hours		30

Department Courses and Descriptions

EG 6306 Software Project Planning and Management (3)

Planning and control of software project. Cost factors and cost estimation. Project scheduling, staffing, setting milestones. Role of project manager and organization of project team. Project management tools. Factors influencing productivity and success. Productivity metrics. Software project economics. Metrics for software quality, schedule, budget, and progress. Analysis of options and risks. Planning for change. Management of expectations. Release and configuration management. Software process standards and

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process implementation. Software contracts and intellectual property. Approaches to maintenance and long-term software development. Case studies of real industrial projects. CASE tools for project planning, cost estimation, and project management

EG 6328 **Software Engineering** (3)

This course surveys the entire software engineering field. It presents the management and technical aspects of the software development process. Software architectures, paradigms, and life-cycles are briefly discussed and compared. It covers topics in software management, problem specification and analysis, system design techniques, documentation, system testing and performance evaluation, and system maintenance. The technical aspects include software requirement analysis, design methodologies, system implementation, and testing techniques. Software verification and validation, quality assurance, and configuration management are also introduced.

EG 6334 **Software Quality Assurance** (3)

Quality: How to assure it and verify it? Avoidance of errors and other quality problems. Inspections and formal technical reviews. Testing, verification, and validation techniques. Process assurance versus product assurance. Quality work product attributes. Software quality measurements and metrics. Quality process standards and formal approaches to SQA. Product and process assurance. Problem analysis and reporting. Statistical approach to quality control. Software configuration management: baselines, version control, change control, configuration audits, and SCM standards. CASE tools for SQA.

EG 7155, 7255, 7355 **Internship** 1, 2, 3 semester hour(s)

An experimental approach to advanced engineering topics through work in a company or organization. Industry/University cooperation is required. Topics vary depending on the needs of the sponsoring company or organization and the academic needs of the student. Students may start an internship projects anytime after enrolling in any Engineering program. A minimum of three credit hours is required. Credit hours may be completed in increments of 1, 2, or 3 credit hours per semester. Prerequisite: Consent of the Graduate Program Director.

EG 7304 **Requirement Engineering** (3)

Domain engineering. Techniques for discovering and eliciting requirements. Languages and models for representing requirements. Analysis and validation techniques, including need, goal, and use case analysis. Requirements in the context of system engineering. Specifying and measuring external qualities: performance, reliability, availability, safety, security, etc. Specifying and analyzing requirements for various types of systems: embedded systems, consumer systems, web-based systems, business systems, systems for scientists and other engineers. Resolving feature interactions. Requirements documentation standards. Requirement traceability. Human factors. Requirements in the context of agile processes. Requirements management: Handling requirements changes. CASE tools for requirement engineering.

EG 7305 **Object-Oriented Analysis and Design Methodologies** (3)

Review of object oriented concepts: objects, classes, instances, inheritance, and entity relationship diagrams. Object-oriented analysis methodologies and their role in the software development process. Object-oriented modeling and prototyping using UML. Software reuse. Design patterns, frameworks, architectures. Component design. Measures of design attributes. Component and system interface design.

EG 7308 **Software Verification and Validation** (3)

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Testing techniques and principles: defects versus failures, equivalence classes, boundary testing. Types of defects. Black-box versus structural testing. Testing categories: Unit testing, integration testing, profiling, test driven development. State-based testing, configuration testing, compatibility testing. Website testing. Alpha, beta, and acceptance testing. Coverage criteria. Test instrumentation and tools. Developing a test plan. Managing the test process. Problem reporting, tracking, and analysis. Testing metrics. Software safety. Debugging and fault isolation techniques. Defect analysis.

EG 7309 Formal Methods in Software Engineering (3)

Review of mathematical foundation for formal methods. Formal languages and techniques for specification and design, including specifying syntax using grammars and finite state machines. Analysis and verification of specification and designs. Use of assertion and proofs. Automated program and design transformation.

EG 7310 Software Maintenance, Evolution, and Reengineering (3)

Introduction to software maintenance, defect management, corrective, adaptive and perfective maintenance. Evolution of legacy software systems. Program comprehension techniques, reverse engineering, restructuring, refactoring of software systems. Software re-engineering, data reverse engineering. Software reuse. Impact analysis, regression testing.

EG 7311 User Interface Design (3)

Psychological principles of human-computer interaction. Evaluation of user interfaces. Usability engineering. Task analysis, user-centered design, and prototyping. Conceptual models and metaphors. Software design rationale. Design of windows, menus, and commands. Voice and natural language I/O. Response time and feedback. Color, icons, and sound. Internationalization and localization. User interface architectures and APIs. Case studies and project.

EG 7312 Software Design and Architecture (3)

Modeling and design of flexible software at the architectural level. Basics of model-driven architecture. Architectural styles and patterns. Middleware and application frameworks. An in-depth look at software design. Survey of current middleware architectures. Design of distributed systems using middleware. Component based design. Measurement theory and appropriate use of metrics in design. Designing for qualities such as performance, safety, security, reusability, reliability, etc. Measuring internal qualities and complexity of software. Evaluation and evolution of designs.

EG 7313 Web Engineering (3)

Concepts, principles, techniques, and methods of Web engineering. Topics include requirement engineering for Web applications, modeling Web applications, Web application architectures, Web application design, technologies for Web applications, testing Web applications, operation and maintenance of Web applications, web project management, web application development process, usability of Web applications, performance of Web applications, and security of Web applications. Quality characteristic and attributes for websites.

EG 7314 Software Security (3)

Theory and practice of software security. Identification of potential threats and vulnerabilities early in the design cycle. Methodologies and tools for identifying and eliminating security vulnerabilities. Techniques to prove the absence of vulnerabilities and ways to avoid security holes in new software. Essential

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guidelines for building secure software: how to design software with security in mind from the ground up and to integrate analysis and risk management throughout the software life cycle.

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Department Faculty

[Software Engineering \(M.S.\) Faculty Website](#)

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