MILWAUKEE SCHOOL OF ENGINEERING

SOFTWARE ENGINEERING

What is Software Engineering?

Software Engineering is the application of engineering concepts, techniques, and methods to the development of software systems. A software engineering program develops engineering professionals with a mastery of software development theory, practice, and process.

Software engineering is based on computer science, in the same way that other engineering disciplines are based on natural or life sciences. However, it adds an emphasis on issues of process, design, measurement, analysis, and verification, providing a strong foundation in engineering principles and practice as applied to software development.

Software engineering students gain knowledge and skill in all aspects of the software development life cycle, including requirements elicitation and analysis, software architecture, design, construction, and verification/validation. They learn to work within and to continuously improve a defined software development process, with the aim of producing high-quality software predictably and efficiently. To provide a basis for this software engineering practice and process, students are grounded in the fundamentals of computer science, including data structures, algorithms, formal methods, and operating systems.

What distinguishes MSOE's software engineering program?

MSOE prides itself on uniting theory with industry practice, in both classroom and laboratory activities. The curriculum incorporates key elements of contemporary software engineering practice, including languages like Java and C++, computer-aided software engineering (CASE) tools, design techniques like design patterns and the Unified Modeling Language (UML), databases, and testing techniques. The program also stresses software engineering process, including project planning, estimation and tracking of effort and quality, continuous process improvement, and risk management. All MSOE students have their own notebook computers; classrooms, dormitories, and common areas provide network access.

Software is a critical component of many different types of products and systems, in fields such as consumer electronics, transportation, health care, communications, finance, manufacturing, entertainment, government, and education. To work effectively and collaboratively in one of these application areas, a software engineer must become familiar with its body of knowledge, practices, and vocabulary. Each software engineering student demonstrates an ability to do this by completing a sequence of elective courses in a chosen "application domain" field. Since many software engineers develop computer systems that are embedded into other products, from cellular telephones to medical devices to vehicle controls, the software engineering program incorporates a sequence of computer engineering courses in hardware and software design of microprocessor-based systems.

Because software engineers seldom work in isolation, communication skills and teamwork are critically important. Course work and projects provide many opportunities to develop proficiency in writing, oral presentation, collaboration, and project management. In the freshman year, students are introduced to a development process that includes requirements gathering, design, implementation, and testing. The software development laboratory provides experience in various team roles, working on large-scale projects using software engineering tools and techniques. In the senior design sequence, software engineering students complete a major project in teams that are often interdisciplinary. Software lab and senior design projects are typically done for external clients, and are often sponsored by industry partners.

For more information

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Web pages

MSOE home page: http://www.msoe.edu/

MSOE EECS department home page: http://www.msoe.edu/eecs/

MSOE Software Engineering home page: http://www.msoe.edu/eecs/se/

Periodic updates on the SE program:
    http://www.msoe.edu/academics/academic_departments/eecs/bsse/blog/

Curriculum note

When reading the curriculum track listing, you will see numbers like "3-2-4" as in the following example:

    SE-2811   Software Component Design   3-2-4

This means that this course has three (3) hours of lecture per week, two (2) hours of lab per week, and carries a total of four (4) hours of academic credit.

Thus, any course that has a "middle" number that is not zero has a lab. Some courses that have no officially allocated lab time (e.g., Senior Design Project, SE-400 and SE-401) actually have a significant laboratory component; it's just that there is no specifically scheduled lab period.

Bachelor of Science
Software Engineering
Model Full-Time Track - V2.5

FRESHMAN YEAR		1	2	3
CE-1900	Digital Logic I: Combinational Systems	2-2-3		
EN-131	Composition	3-0-3		
MA-136	Calculus for Engineers I	4-0-4		
OR-100	Freshman Orientation[1]	1-0-0		
SE-1011	Software Development I	3-2-4		
CH-200	Chemistry I		3-2-4	
EN-132	Technical Composition		3-0-3	
HU-100	Contemporary Issues in the Humanities		3-0-3	
MA-137	Calculus for Engineers II		4-0-4	
SE-1021	Software Development II		3-2-4	
CS-2852	Data Structures			3-2-4
EN-241	Speech			2-2-3
MA-231	Calculus for Engineers III			4-0-4
MA-262	Probability and Statistics			3-0-3
PH-2010	Physics I - Mechanics			3-3-4
	TOTALS	**13-4-14**	**16-4-18**	**15-7-18**

SOPHOMORE YEAR		4	5	6
MA-235	Differential Equations for Engineers	4-0-4		
PH-2020	Physics II - Electromagnetism and Optics	3-3-4		
SE-2030	Software Engineering Tools and Practices	2-2-3		
SE-2831	Introduction to Software Verification	2-2-3		
	Elective (HU/SS)[2]	3-0-3		
CE-2800	Embedded Systems Software I		3-3-4	
EE-2050	Linear Circuits - Steady State I		3-2-4	
MA-232	Calculus for Engineers IV		3-0-3	
SE-280	Software Engineering Process		2-2-3	
	Elective (HU/SS)[2]		3-0-3	
CE-2810	Embedded Systems Software II			2-2-3
MA-230	Discrete Mathematics			4-0-4
OR-2000	Leadership and Teamwork			0-2-1
PH-2030	Physics III - Thermodynamics and Quantum Physics			3-3-4
SE-2811	Software Component Design			3-2-4
	TOTALS	**14-7-17**	**14-7-17**	**12-9-16**

JUNIOR YEAR		7	8	9
CS-3841	Design of Operating Systems	3-2-4		
CS-386	Introduction to Database Systems	2-2-3		
IE-423	Engineering Economy	3-0-3		
MA-383	Linear Algebra	3-0-3		
SE-3821	Software Requirements and Specification	3-2-4		
CS-3851	Algorithms		3-2-4	
OR-3000	Applied Servant-Leadership		0-2-1	
OR-402	Professional Guidance		1-0-1	
SE-3091	Software Development Laboratory I		2-2-3	
SE-380	Principles of Software Architecture		3-2-4	
	Elective (Application Domain)[2]		3-0-3	
HU-432	Ethics for Professional Managers and Engineers			3-0-3
SE-3092	Software Development Laboratory II			2-2-3
SE-3811	Formal Methods			2-2-3
SE-3830	Human-Computer Interface Design			2-2-3
	Elective (Application Domain)[2]			3-0-3
	TOTALS	**14-6-17**	**12-8-16**	**12-6-15**

SENIOR YEAR		10	11	12
CS-409	Ethical and Professional Issues in Computing	1-0-1		
SE-400	Senior Design Project I	2-2-3		
SE-4093	Software Development Laboratory III	2-2-3		
	Elective (Math/Science)[2]	3-0-3		
	Elective (Application Domain)[2]	3-0-3		
	Elective (HU/SS)[2]	3-0-3		
SE-401	Senior Design Project II		2-2-3	
SE-4831	Software Quality Assurance		2-2-3	
	Elective (Program)[2]		3-0-3	
	Elective (HU/SS)[2]		3-0-3	
	Elective (Free)[2]		3-0-3	
MS-442	Management in the Era of Rapid Technological Change			3-0-3
SE-402	Senior Design Project III			2-2-3
SS-461	Organizational Psychology			3-0-3
	Elective (Program)[2]			3-0-3
	Elective (HU/SS)[2]			3-0-3
	TOTALS	**14-4-16**	**13-4-15**	**14-2-15**

[1] Transfer students who have completed 36 quarter or 24 semester credits will be waived from OR-100, but will be required to complete OR-301 Transfer Student Orientation.

[2] There are 36 credits of elective subjects in the Software Engineering program which must be taken as follows:
- 15 credits of humanities and social sciences: 6 credits of humanities (HU), 6 credits of social sciences (SS), and 3 credits of humanities or social sciences
- 6 credits of approved program electives
- 3 credits of an approved math/science elective
- 9 credits of approved application domain electives (a list of application domain electives can be found at www.msoe.edu/academics/academic_departments/eecs/bsse/app_domain.shtml)
- 3 credits of an upper-division course from any area

Engineering technology courses may not be used to satisfy requirements of the software engineering curriculum.

Students in Air Force ROTC may make the following substitutions in the software engineering program: AF-300 for MS-442 and AF-401 for SS-455 (a social science elective).