CS - Software Engineering Graduate Program

Master of Software Engineering (MSE) Program
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www.cs.uwlax.edu/index.php/graduate-program

The focus of the Master of Software Engineering (MSE) Program is to teach the advanced state-of-the-art technologies in software development with hands-on experience, and to apply the knowledge to some challenging real-world problems. The program will guide the students to acquire both technical skills and software project management skills that are required to lead and to carry out software development projects.

Program length

The Master of Software Engineering (MSE) Program is typically a two-year program. The program length is based on how long the required UWL coursework would take to complete for a full-time student who does not need to complete any prerequisite coursework. Program length may be extended due to the requirements of an individual student’s research project.

2021-22 Faculty/Staff

The following is the graduate faculty and staff as of the publication date of this catalog. This list will not be updated again until the next catalog is published in July.

Professor

Kenny Hunt
Kasilingam Periyasamy
Mao Zheng

Associate Professor

Samantha Foley
Thomas Gendreau

Assistant Professor

Elliott Forbes
John Maraist
David Mathias
Dipankar Mitra
W. Michael Petullo
Allison Sauppé

Jason Sauppe
Lei Wang

Administrative Support
Becky Yoshizumi

Graduate degree

• Master of Software Engineering - MSE (http://catalog.uwlax.edu/graduate/programrequirements/softwareengineering/mse/)

Courses

CS 402/502 Cr.3
Web Application Development
This course will give a detailed description of the core concepts and general principles of web application development. The course will cover various protocols, programming languages, scripting languages, data storage and security, layered software architectures, and graphical interface design as they relate to web development. Students will apply these techniques to the development of medium scale web application. This course is taught largely at an undergraduate level. Graduate students will have additional course requirements/expectations. Prerequisites: CS 340. Offered Spring.

CS 503 Cr.1-3
Special Topics in Computer Science for Teachers
A special topics course used to introduce K-12 teachers to computer science content and to curricula and pedagogy designed for K-12 students. Not applicable to the Computer Science Program or Master of Software Engineering degree. Prerequisite: current K-12 teacher certification (any discipline). Consent of instructor. Offered Occasionally.

CS 410/510 Cr.3
Free and Open Source Software Development
This course examines all aspects of the Free and Open Source Software movement. The course surveys the various definitions of open source licenses and examples of major free and open source development projects (e.g. the GNU Project, Apache Foundation, Linux). The course also examines the development tools that support developer communities as well as how web-based applications have created the possibility of international development teams. Students will select and contribute to the software development of an existing open source project. This course is taught largely at an undergraduate level. Graduate students will have additional course requirements/expectations. Prerequisite: CS 340. Offered Spring - Odd Numbered Years.

CS 418/518 Cr.3
Mobile Application Development
An introduction to the concepts and techniques of application development for mobile devices. The course will examine the design constraints of mobile devices, how mobile applications can leverage external data resources, integration of sensor data and the development environments of the chosen platform (e.g. iOS, Android and others). This course is taught largely at an undergraduate level. Graduate students will have additional course requirements/expectations. Repeatable for credit with different topic - maximum six. Offered Occasionally.
An intermediate course in operating systems extending topics introduced in CS 441. Operating systems concepts are studied in-depth. Typically students will study and modify an existing system. This course is taught largely at an undergraduate level. Graduate students will have additional course requirements/expectations. Prerequisite: CS 441. Offered Occasionally.
**Introduction to Data Science**

This course examines key components of the data science lifecycle, including data collection and cleaning, exploratory data analysis and visualization, and extracting insight via statistical models and machine learning algorithms for regression, classification, and clustering. Algorithmic efficiency and scalability will be emphasized, and techniques for working with big data will be introduced. Students will use a modern programming language (e.g., R, Python) with appropriate packages suitable for data analysis. This course is taught largely at an undergraduate level. Graduate students will have additional course requirements/expectations. Prerequisite: CS 340; STAT 245 or CS 351. Offered Alternate Years.

**Advanced Database Management Systems**

Advanced topics in database management systems. Topics include the relational data model, relational calculus, embedded SQL programming, database application programming, indexing, system software and storage structures for databases, concurrency control, crash recovery, database administration, parallel and distributed databases, object-oriented databases. This course is taught largely at an undergraduate level. Graduate students will have additional course requirements/expectations. Prerequisite: CS 364. This course cannot be taken for credit both at the undergraduate level and at the graduate level. Offered Spring - Odd Numbered Years.

**Parallel and Distributed Computing**

A study of architectures, control software, and applications for parallel and distributed systems. A survey of parallel and distributed architectures including data flow machines, vector processors, shared memory multiprocessors, and message based multiprocessors. Software topics include process communication and synchronization, global state maintenance, negotiation, scheduling, data parallelism, control parallelism, and languages for parallel and distributed computing. This course is taught largely at an undergraduate level. Graduate students will have additional course requirements/expectations. Prerequisite: CS 370. Offered Occasionally.

**Computer Networks**

This course is an introduction to data communications, including the electrical properties and software protocols. In addition to presentations of the concepts and techniques used for data communications, several currently used standards and communications networks will be examined. This course is taught largely at an undergraduate level. Graduate students will have additional course requirements/expectations. Prerequisite: CS 270, CS 340. Offered Spring - Even Numbered Years.

**Internet of Things**

This course explores the possibilities which are created when everyday things become connected to the internet and how this can create new ways for humans to interact with computation and for computation to enable human activities. This course involves building small, sensor equipped hardware devices and cloud based software systems using various technologies. This course is taught largely at an undergraduate level. Graduate students will have additional course requirements/expectations. Prerequisite: CS 340, CS 372. Offered Annually.

**Computer Graphics and Modeling**

An introduction to computer graphics in modern computing environments. Topics include geometric transformations, fundamental drawing algorithms, scalable vector graphics (SVG), OpenGL, WebGL, surface shaders, scene graphics, photorealistic rendering, surface mesh data structures, animation and modeling and GPGPU computing. This course is taught largely at an undergraduate level. Graduate students will have additional course requirements/expectations. Prerequisite: CS 340; MTH 207. Offered Fall - Odd Numbered Years.
CS 476/576 Cr.3
Data Visualization
An introduction to visualizing various forms of data (abstract and concrete) using computer graphics. The course will consider both scientific visualization where the data itself determines the spatial representation and information visualization where appropriate spatial representations are imposed on the data. This course is taught largely at an undergraduate level. Graduate students will have additional course requirements/expectations. Prerequisite: CS 575. Offered Spring - Even Numbered Years.

CS 741 Cr.3
Software Engineering Principles
This course introduces fundamentals of software engineering and various life cycle models for software development. It focuses on software processes addressing various life cycle activities such as requirements engineering, design, implementation, testing, and maintenance. Object-oriented design using the Unified Modeling Language (UML) will be introduced. Application of software engineering methods to different application domains will be briefly discussed. Prerequisite: CS 340. Offered Fall.

CS 743 Cr.3
Software Verification and Validation
This course explains the need for verification and validation, discusses the methods (formal, informal and diagrammatic) and techniques (prototyping and theoretical proof techniques) that implement verification and validation, and provides hands-on experience to apply these methods and techniques to some simple case studies. Automation of verification and validation methods will also be briefly discussed. Prerequisite: CS 741 or concurrent enrollment. Offered Fall.

CS 744 Cr.3
Software Project Management
This course addresses principles, standards, guidelines and techniques for software project management. Emphasis will be given to modern software development approaches. Topics covered in this courses include people management, work allocation, schedule, project planning, cost estimation, risk management, project deployment, licenses, and ethical and legal issues. Prerequisite: CS 741. Offered Spring.

CS 746 Cr.3
Software Modeling and Analysis
This course introduces various software models, and techniques to analyze software designs using these models. Both diagrammatic and mathematical models will be included. Informal, rigorous, and formal analysis will be covered. Prerequisite: CS 225, CS 340. Offered Spring.

CS 750 Cr.1-3
Topics in Software Engineering
This is a topics course in Software Engineering. New topics will be introduced based on the evolution of Software Engineering research. Some such topics are real-time systems, embedded systems, software for safety-critical applications, software architectures, component-oriented programming, CORBA, COM/DCOM, and CASE (Computer-Aided Software Engineering). Topics may vary each semester. Repeatable for credit - maximum six. Prerequisite: CS 741. Consent of instructor. Offered Occasionally.

CS 752 Cr.1-3
Independent Study
This course is meant for those who want to acquire an in-depth knowledge on any Software Engineering topic. Typically, the student may be required to focus on one particular topic and conduct some research on this topic, or to do some software development activities such as analysis, design, implementation or testing. If registered for more than once, a different topic must be chosen each time. Each student is required to submit a report at the end of the term. Repeatable for credit - maximum six. Prerequisite: CS 741. Consent of instructor. Offered Fall, Spring, Summer.

CS 795 Cr.1
Software Development Internship
An academically relevant field experience in government, industry, business, or community agencies. Students must have their internships approved and be advised by the computer science department. Determination of relevancy shall be made by the Career Services Office with the advice and consent of the computer science department. The experience will be supervised closely by the intern's on-site supervisor, by the Career Services Staff, and by the student's faculty internship adviser. Students should contact the Career Services Office. Internship does not count for credit towards the MSE program. Repeatable for credit – maximum two. Prerequisite: Master of Software Engineering graduate student status; nine MSE credits earned; 3.5 or higher GPA. Student must be on their internship work site during the semester for which they are registered for academic credit. Consent of instructor. Pass/Fail grading. Offered Fall, Spring, Summer.

CS 798 Cr.1-6
Software Development Project
A major project that requires a detailed analysis of the problem domain, detailed design, implementation and demonstration. The project will be guided by a graduate CS faculty member. Submission of a written project report is required, followed by an oral examination by the Project Evaluation Committee in the CS department. Repeatable for credit - maximum 12. Maximum of six credits per semester. Prerequisite: project proposal must be approved by the Project Evaluation Committee in the CS department. Pass/Fail grading. Offered Fall, Spring, Summer.