

Software Engineering

[SE 2340](#) ([COSC 2325](#)) Computer Architecture (3 semester credit hours) This course introduces the concepts of computer architecture by going through multiple levels of abstraction, and the numbering systems and their basic computations. It focuses on the instruction-set architecture of the MIPS machine, including MIPS assembly programming, translation between MIPS and C, and between MIPS and machine code. General topics include performance calculation, processor datapath, pipelining, and memory hierarchy. Credit cannot be received for both courses, ([CS 2340](#) or [SE 2340](#)) and ([CE 4304](#) or [EE 4304](#)). Prerequisites: ([CE 1337](#) or [CS 1337](#)) with a grade of C or better or equivalent and ([CE 2305](#) or [CS 2305](#)) with a grade of C or better. (Same as [CS 2340](#)) (3-0) S

[SE 2V95](#) Individual Instruction in Software Engineering (1-6 semester credit hours) Individual study under a faculty member's direction. May be repeated for credit as topics vary (6 semester credit hours maximum). Additional prerequisites may be required depending on the specific course topic. Instructor consent required. ([1-6]-0) R

[SE 3162](#) Professional Responsibility in Computer Science and Software Engineering (1 semester credit hour) Professional and ethical responsibilities of computer scientists and software engineers as influenced by growth in computer use and networks. Costs and benefits of computer technology. Risks and liabilities of safety-critical systems. Social implications of the Internet. Interaction between human values and technical decisions involving computing. Intellectual Property. Global impact of computing. Prerequisites or Corequisites: [CS 3345](#) and [CS 3354](#). (Same as [CS 3162](#)) (1-0) S

[SE 3306](#) Mathematical Foundations of Software Engineering (3 semester credit hours) Boolean logic, first-order logic, models of first-order logic. Introduction to program verification, applications in software engineering. Completeness Theorem. Regular expressions, regular sets, finite-state machines, and applications in software engineering. Graph Theory, graph algorithms. Statecharts, Petri Nets and their role in software engineering. Credit cannot be received for both courses, [CS 3305](#) and [SE 3306](#). Double majors are required to take [CS 3305](#). Prerequisite: ([CE 2305](#) or [CS 2305](#)) with a grade of C or better or equivalent. (3-0) S

[SE 3341](#) Probability and Statistics in Computer Science and Software Engineering (3 semester credit hours) Axiomatic probability theory, independence, conditional probability. Discrete and continuous random variables, special distributions of importance to CS/SE, and expectation. Simulation of random variables. Central limit theorem. Basic statistical inference, parameter estimation, hypothesis testing, and linear regression. Introduction to stochastic processes. Illustrative examples and simulation exercises from queuing, reliability, and other CS/SE applications. Credit cannot be received for both courses, ([CS 3341](#) or [SE 3341](#) or [STAT 3341](#)) and [ENGR 3341](#). Prerequisites: ([MATH 1326](#) or [MATH 2414](#) or [MATH 2419](#)) with a grade of C or better, and [MATH 2418](#) with a grade of C or better, and ([CE 2305](#) or [CS 2305](#)) with a grade of C or better. (Same as [CS 3341](#) and [STAT 3341](#)) (3-0) S

[SE 3345](#) Data Structures and Introduction to Algorithmic Analysis (3 semester credit hours) Analysis of algorithms including time complexity and Big-O notation. Analysis of stacks, queues, and trees, including B-trees. Heaps, hashing, and advanced sorting techniques. Disjoint sets and graphs. Course emphasizes design and implementation. Prerequisites: (([CE 2305](#) or [CS 2305](#)) with a grade of C or better or (Data Science major and [MATH 3315](#))) and ([CE 2336](#) or [CS 2336](#) or [CS 2337](#)) with a grade of C or better. Prerequisite or Corequisite: ([CS 3341](#) or [SE 3341](#) or [ENGR 3341](#)) or (Data Science major and [STAT 3355](#)). (Same as [CE 3345](#) and [CS 3345](#)) (3-0) S

[SE 3354](#) Software Engineering (3 semester credit hours) Introduction to software life cycle models. Software requirements engineering, formal specification and validation. Techniques for software design and testing. Cost estimation models. Issues in software quality assurance and software maintenance. Prerequisites: (([CE 2336](#) or [CS 2336](#) or [CS 2337](#)) with a grade of C or better or [CS 3333](#)) and ([CE 2305](#) or [CS 2305](#)) with a grade of C or better or equivalent. Prerequisite or Corequisite: [ECS 2390](#). (Same as [CE 3354](#) and [CS 3354](#)) (3-0) S

[SE 3377](#) Systems Programming in UNIX and Other Environments (3 semester credit hours) Basic UNIX concepts, commands and utilities, organization of UNIX file system including links and access control, creating and managing UNIX processes and threads, implementing algorithms using shell scripts, basic networking concepts including socket and client-server programming, inter-process communication using pipes and signals, using a version control system to manage work, and introduction to cloud computing. Design and implementation of a comprehensive programming project is required. Prerequisite: ([CE 2336](#) or [CS 2336](#) or [CS 2337](#)) with a grade of C or better or equivalent. (Same as [CS 3377](#)) (3-0) S

[SE 3V95](#) Undergraduate Topics in Software Engineering (1-9 semester credit hours) May be repeated for credit as topics vary (9 semester credit hours maximum). Additional prerequisites may be required depending on the specific course topic. Instructor consent required. ([1-9]-0) S

[SE 4347](#) Database Systems (3 semester credit hours) This course emphasizes the concepts and structures necessary for the design and implementation of database management systems. Topics include data models, data normalization, data description languages, query facilities, file organization, index organization, file security, data integrity, and reliability. Prerequisite: [CE 3345](#) or [CS 3345](#) or [SE 3345](#). (Same as [CS 4347](#)) (3-0) Y

[SE 4348](#) Operating Systems Concepts (3 semester credit hours) An introduction to fundamental concepts in operating systems: their design, implementation, and usage. Topics include process management, main memory management, virtual memory, I/O and device drivers, file systems, secondary storage management, and an introduction to critical sections and deadlocks. Prerequisites: ([CS 2340](#) or [SE 2340](#)) or equivalent and ([CS 3377](#) or [SE 3377](#)) and ([CE 3345](#) or [CS 3345](#) or [SE 3345](#)). (Same as [CS 4348](#)) (3-0) S

[SE 4351](#) Requirements Engineering (3 semester credit hours) Introduction to system and software requirements engineering. The requirements engineering process, including requirements elicitation, specification, and validation. Essential words and types of requirements. Structural, informational, and behavioral requirements. Non-functional requirements. Scenario analysis. Conventional, object-oriented and goal-oriented methodologies. Prerequisites: [SE 3306](#) and ([CE](#)

[3354](#) or [CS 3354](#) or [SE 3354](#)) or instructor consent required. (3-0) S

[SE 4352](#) Software Architecture and Design (3 semester credit hours) Introduction to software design with emphasis on architectural design. Models of software architecture. Architecture styles and patterns, including explicit, event-driven, client-server, and middleware architectures. Decomposition and composition of architectural components and interactions. Use of non-functional requirements for tradeoff analysis. Component based software development, deployment and management. Prerequisites: [SE 3306](#) and ([CE 3354](#) or [CS 3354](#) or [SE 3354](#)) or instructor consent required. (3-0) S

[SE 4367](#) Software Testing, Verification, Validation and Quality Assurance (3 semester credit hours) Methods for evaluating software for correctness and reliability, including code inspections, program proofs and testing methodologies. Formal and informal proofs of correctness. Code inspections and their role in software verification. Unit and system testing techniques, testing tools and limitations of testing. Statistical testing, reliability models. Prerequisites: [SE 3306](#) and ([CE 3354](#) or [CS 3354](#) or [SE 3354](#)) or instructor consent required. (3-0) S

[SE 4376](#) Object-Oriented Design (3 semester credit hours) In-depth study of the features/ advantages of object-oriented approach to problem solving. Special emphasis on issues of object-oriented analysis, design, implementation, and testing. Review of basic concepts of object-oriented technology (abstraction, inheritance, and polymorphism). Object-oriented programming languages, databases, and productivity tools. Prerequisites: ([CE 2336](#) or [CS 2336](#) or [CS 2337](#)) with a grade of C or better or equivalent and ([CE 3354](#) or [CS 3354](#) or [SE 3354](#)). (Same as [CS 4376](#)) (3-0) S

[SE 4381](#) Software Project Planning and Management (3 semester credit hours) Planning and managing of software development projects. Software process models, [ISO 9000](#), SEI's Capability Maturity Model, continuous process improvement. Planning, scheduling, tracking, cost estimation, risk management, configuration management. Prerequisite: [CE 3354](#) or [CS 3354](#) or [SE 3354](#). (3-0) Y

[SE 4399](#) Senior Honors in Software Engineering (3 semester credit hours) For students conducting independent research for honors theses or projects. Topics may vary. Additional prerequisites may be required depending on the specific course topic. Instructor consent required. (3-0) R

[SE 4485](#) Software Engineering Project (4 semester credit hours) This course is intended to complement the theory and to provide an in-depth, hands-on experience in all aspects of software engineering. The students will work in teams on projects of interest to industry and will be involved in analysis of requirements, architecture and design, implementation, testing and validation, project management, software process, software maintenance, and software re-engineering. Students will also explore the potential impact of software systems on society. Additionally, this course will cover topics related to the software engineering profession including ethics and professional responsibility, entrepreneurship, and leadership. Lab fee of \$30 required. Prerequisites: At least two of the following: [SE 4351](#) or [SE 4352](#) or [SE 4367](#) or [SE 4381](#). (4-1) S

[SE 4V95](#) Undergraduate Topics in Software Engineering (1-9 semester credit hours) May be used as SE Guided Elective on SE degree plans. Additional prerequisites may be required depending on the specific course topic. Instructor consent required. May be repeated for credit as topics vary (9

semester credit hours maximum). Prerequisite: [CS 3345](#) or [SE 3345](#) or [CE 3345](#). ([1-9]-0) R

[SE 4V98](#) Undergraduate Research in Software Engineering (1-9 semester credit hours) May be repeated for credit as topics vary (9 semester credit hours maximum). Additional prerequisites may be required depending on the specific course topic. Instructor consent required. ([1-9]-0) R