COMPUTER ENGINEERING (CSE)

CSE 500 International Course (1-12 Credits)
Engineering & Comp Sci
Offered through SUAbroad by educational institution outside the United States. Student registers for the course at the foreign institution and is graded according to that institution's practice. SUAbroad works with the S.U. academic department to assign the appropriate course level, title, and grade for the student's transcript.
Repeatable

CSE 561 Digital Machine Design (3 Credits)
Engineering & Comp Sci
Behavioral and structural design methods and examples using a hardware description language (VHDL). Control, arithmetic, bus systems, memory systems. Logic synthesis from hardware language descriptions.
Prereq: CSE 261

CSE 564 Vlsi Design Methods (3 Credits)
Engineering & Comp Sci

CSE 581 Introduction to Database Management Systems (3 Credits)
Engineering & Comp Sci
DBMS building blocks; entity-relationship and relational models; SQL/Oracle; integrity constraints; database design; file structures; indexing; query processing; transactions and recovery; overview of object relational DBMS, data warehouses, data mining.
Prereq: CSE 382 or CIS 351
Shared Competencies: Information Literacy and Technological Agility (https://coursecatalog.syracuse.edu/shared-competencies/information-literacy-and-technological-agility/)

CSE 590 Independent Studies (1-6 Credits)
Engineering & Comp Sci
Exploration of a problem, or problems, in depth. Individual independent study upon a plan submitted by the student. Admission by consent of supervising instructor(s) and the department.
Repeatable

CSE 591 Special Problems in Computer Systems Engineering (1-4 Credits)
Engineering & Comp Sci
Students work on special projects. Instructors present new or special material.
Repeatable 30 times for 30 credits maximum

CSE 607 Mathematical Basis for Computing (3 Credits)
Engineering & Comp Sci
Cross-listed with CIS 607
Mathematical logic including predicate calculus, induction, theories with equality relations and groups. Mathematical logic applied to structures like nonnegative integers, tuples, lists, and trees.

CSE 612 Cloud Computing (3 Credits)
Engineering & Comp Sci
Cross-listed with CIS 612
Virtualized data centers, including virtual machine management, power management, and networking; cloud computing applications; and mobile cloud computing.
Advisory recommendation Prereq: CSE 458

CSE 618 Machine Intelligence with Deep Learning (3 Credits)
Engineering & Comp Sci
Mathematical fundamentals of classification models; deep neural networks; convolutional and recurrent neural networks; analysis, implementation and acceleration of inference and learning; and state-of-art applications on high-performance computing platforms.

CSE 634 Assurance Foundations (3 Credits)
Engineering & Comp Sci
Cross-listed with CIS 634
Foundational theory, concepts, and computer-assisted reasoning tools necessary for assurance. Topics include functional programming, theorem proving, and logic for reasoning about access control, security, and trust.

CSE 640 Topics in Mobile Programming (3 Credits)
Engineering & Comp Sci
Cross-listed with CIS 640
Double-numbered with CIS 440
A variety of subjects surveyed or a particular subject in depth. Additional coursework required of graduate students.
Repeatable 3 times for 9 credits maximum

CSE 643 Computer Security (3 Credits)
Engineering & Comp Sci
Operating system security. Unix security. Trusted Computing Base. Authentication. Access control. Security models. Capability. Sandboxing. Software vulnerabilities. Worms. Viruses. Secure engineering principles. Secure programming. Auditing. Forensics.

CSE 644 Internet Security (3 Credits)
Engineering & Comp Sci
Internet architecture. Security and attacks on TCP/IP, DNS, and BGP protocols. Internet protocol security. Firewall. Intrusion detection. Network traceback. Web security. Encryption. Public Key infrastructure. One-way harsh function. Digital signature. Security protocols.

CSE 651 Mobile Application Programming (3 Credits)
Engineering & Comp Sci
Cross-listed with CIS 651
Double-numbered with CIS 444, CSE 444
Development of applications for different mobile devices. Creating effective user interfaces, efficient use of persistent storage, network services, GPS, maps and sensors. Additional work required of graduate students.

CSE 652 Building Assured Components (3 Credits)
Engineering & Comp Sci
Cross-listed with CIS 652
Development of system components with provable functional properties. Students gain hands-on experience walking the virtuous cycle of executable specifications, formal verification, and translation of specifications into a mainstream language.

CSE 658 Data Networks: Design and Performance (3 Credits)
Engineering & Comp Sci
Cross-listed with ELE 658
Data network design principles. Performance, modeling, and analysis of networks. Delay models. Multi-access communications. Routing and flow control algorithms. Familiarity with basics of data networks.

CSE 661 Advanced Computer Architecture (3 Credits)
Engineering & Comp Sci
Advanced computer architecture including discussion of instruction set design (RISC and CISC), virtual memory system design, memory hierarchies, cache memories, pipelining, vector processing, I/O subsystems, co-processors, and multiprocessor architectures. Case studies of current systems.

CSE 664 Introduction to System-on-Chip Design (3 Credits)
Engineering & Comp Sci
Cross-listed with ELE 664
Design principles and fabrication of computer chips. Standard cell based system-on-chip design, top down design flow, RT level design and synthesis, pipelining and performance analysis, software-hardware co-design and co-simulation.

CSE 665 Principles and Practices of FPGA-based Design (3 Credits)
Engineering & Comp Sci
Become familiar with Field Programmable Gate Arrays architecture, programming and applications. A hands-on learning experience using commercially available development kits. Use the FPGA platform as a System on Chip in a parallel computing environment.
Advisory recommendation Prereq: CSE 561

CSE 670 Experience Credit (1-6 Credits)
Engineering & Comp Sci
Participation in a discipline or subject related experience. Student must be evaluated by written or oral reports or an examination. Permission in advance with the consent of the department chairperson, instructor, and dean. Limited to those in good academic standing.
Repeatable

CSE 671 Embedded System Design (3 Credits)
Engineering & Comp Sci
Cross-listed with ELE 667
Methodologies for systematic design of embedded systems. System specification, architecture modeling, component partitioning, estimation metrics, hardware software co-design. Embedded computing platforms and programming. ASIC, CPU, and glue logic. Individual project required.

CSE 674 Advanced Data Structures and Algorithms (3 Credits)
Engineering & Comp Sci
Internals of all major data structures. Algorithms for sorting, balancing trees, graph querying, hashing and compression are discussed. Cache effects. Parallel algorithms.

CSE 681 Software Modeling and Analysis (3 Credits)
Engineering & Comp Sci
Cross-listed with CIS 681
Project-based course covering software modeling, architecture, design, and implementation using diagramming, analysis tools, and common sense engineering methods to analyze performance of concurrent, message-driven systems.

CSE 682 Software Engineering (3 Credits)
Engineering & Comp Sci
Requirements and specifications including tools such as PSL/PSA, SREM, design techniques; Functional decomposition; data flow; data structure, theoretical issues in testing, testing strategies: path; domain; mutation and error specific, cost and reliability models.

CSE 683 Expert Systems (3 Credits)
Engineering & Comp Sci
Cross-listed with CIS 666
Production rules, forward/backward chaining, Rete algorithm, structured objects, introduction to an expert system language/shell, probabilistic inference networks, fuzzy logic, knowledge acquisition, and explanation generation. Programming project or term paper required.

CSE 684 Introduction to Artificial Intelligence (3 Credits)
Engineering & Comp Sci
Cross-listed with CIS 667
Double-numbered with CIS 467
Knowledge representation, production systems, search algorithms, game playing, uncertainty handling, learning, automated reasoning, computer vision, and natural language processing. Programming project or term paper required for CIS 667, not for CIS 467.
Shared Competencies: Critical and Creative Thinking (https://coursecatalog.syracuse.edu/shared-competencies/critical-and-creative-thinking/)

CSE 686 Internet Programming (3 Credits)
Engineering & Comp Sci
Cross-listed with CIS 688
A laboratory projects course. Programming models on web clients and servers. Topics include: browser and server object models, tagged languages, emphasizing HTML and XML, ASP programming, and database connectivity.

CSE 687 Object Oriented Design (3 Credits)
Engineering & Comp Sci
Cross-listed with CIS 687
Basic methods of object oriented software design and implementation. Object oriented software engineering methodologies: specification, hierarchical decomposition, reuse and extensibility. Implementation of projects in object oriented programming language and analysis of design case studies.

CSE 690 Independent Study (1-6 Credits)
Engineering & Comp Sci
Exploration of a problem, or problems, in depth. Individual independent study upon a plan submitted by the student. Admission by consent of supervising instructor(s) and the department.
Repeatable

CSE 691 Special Problems in Computer Systems Engineering (1-4 Credits)
Engineering & Comp Sci
Topics vary and represent current interests in computer engineering.
Repeatable

CSE 731 VLSI Timing Analysis (3 Credits)
Engineering & Comp Sci
Cross-listed with ELE 761
Delay modeling and timing analysis of interconnections and gates. Critical path analysis and delay budgeting. Buffer insertion and device sizing. Switch and circuit level simulations.
Advisory recommendation Prereq: CSE 664

CSE 762 Distributed Computing Systems (3 Credits)
Engineering & Comp Sci
Distributed systems modeling using languages such as ADA and CSP. Issues of concurrency control, deadlocks, synchronization,resource allocation, failure recovery and knowledge representation in distributed operating systems, data bases and AI systems; including case studies.
Advisory recommendation Prereq: CSE 585, 661

CSE 764 Advanced Topics in Synthesis of VLSI Systems (3 Credits)
Engineering & Comp Sci
Issues in design and synthesis of modern VLSI systems from abstract high-level behavioral specifications: temporal and spatial optimizations, synthesis for low power, reconfigurale computing, (digital/analog and SW/HW) co-design, formal specification and verification.
Advisory recommendation Prereq: CSE 561, 664

CSE 765 System Verification and Testing (3 Credits)
Engineering & Comp Sci
Cross-listed with ELE 765
Concepts, methods, and technology for effective verification of complex systems. Coverage metrics, event- and assertion-based verification, and formal methods including model checking and logical equivalence checking. Testing strategies, architecting testbenches, and design for verification.

CSE 771 Sequential Machine Theory (3 Credits)
Engineering & Comp Sci
Theoretical aspects and algebraic structure of sequential machines. Characterization of complete and incomplete machines, decomposition, and state assignment problems. Deterministic and nondeterministic finite state machines and regular expressions. Linear machines and machine identification.

CSE 772 Testing of Digital Circuits (3 Credits)
Engineering & Comp Sci
Physical circuit failures and fault models. Test generation algorithms. Fault stimulation and fault coverage. Random pattern testing. Sequential circuit testing. Test application and response processing techniques. Memory, PLA, and function testing. Design for test.

CSE 773 CAD: Formal Design (3 Credits)
Engineering & Comp Sci
This course teaches the theory, practice, and tools for using higher-order logic as a means for describing, designing, and verifying computer systems.
Advisory recommendation Prereq: CSE 561, 607

CSE 774 Principles of Distributed Access Control (3 Credits)
Engineering & Comp Sci
Cross-listed with CIS 774
Specification, verification, and design of secure networks using formal logic. Includes historical access control models, role-based access control, and logics for reasoning about authentication, authorization, audit, delegation, and trust.
Advisory recommendation Prereq: CIS 607 OR CSE 607

CSE 775 Distributed Objects (3 Credits)
Engineering & Comp Sci
Cross-listed with CIS 775
Design and implement software components using the Component Object Model (COM). Students will develop programs with COM components, ActiveX controls, and distributed applications.
Advisory recommendation Prereq: CSE 681 and 687

CSE 776 Design Patterns (3 Credits)
Engineering & Comp Sci
Cross-listed with CIS 776
A seminar course based on the book "Design Patterns." Object oriented design methods emphasizing conceptual understanding rather than software development projects.
Advisory recommendation Prereq: CSE 681 and 687

CSE 778 Advanced Windows Programming (3 Credits)
Engineering & Comp Sci
Cross-listed with CIS 778
Seminar/projects course including: MFC library; windows architecture Graphics Device Interface; common, ActiveX, and Explorer controls; bitmaps; property sheets; toolbars; and status bars.
Advisory recommendation Prereq: CSE 681 or CSE 687

CSE 781 Database Management Systems (3 Credits)
Engineering & Comp Sci
Group discussion of papers in the field. Data and storage structures, interrogation and update, data base creation, architectural alternatives, problem specification languages, and modeling and optimization. Research proposal required.
Advisory recommendation Prereq: CSE 581

CSE 782 Models and Metrics in Software Engineering (3 Credits)
Engineering & Comp Sci
Need of models and metrics; software science; cyclomatic complexity; and extensions; error analysis; reliability, cost and productivity models.
Advisory recommendation Prereq: CSE 682

CSE 784 Software Engineering Studio (3 Credits)
Engineering & Comp Sci
Cross-listed with CIS 784
Applied software engineering and project management. Students are expected to analyze, plan, design, implement, test, and evaluate original software system to stand alone or be integrated into an existing environment. All work performed in teams.
Advisory recommendation Prereq: CSE 681 or CSE 687

CSE 787 Analytical Data Mining (3 Credits)
Engineering & Comp Sci
Cross-listed with CIS 787
Knowledge discovery process, data warehouses, OLAP, data mining inference based on statistics and machine learning, rule generation; emphasis on analytical aspects; applications.
Advisory recommendation Prereq: CIS 675, ELE 606, CSE 607

CSE 788 Computer-Aided Design for VLSI and Digital Systems (3 Credits)
Engineering & Comp Sci
Cross-listed with ELE 762
Computer aids for automatic physical design of digital systems. Algorithms for partitioning, placement, wire routing, layout compaction, etc. Programming competence required.
Advisory recommendation Prereq: CSE 664

CSE 789 Comuter Aided Design of Digital Systems: Logic Design (3 Credits)
Engineering & Comp Sci
Computer aids for automatic logic design. Heuristic algorithms for single and multiple output, two-level and multiple-level logic minimization, logic synthesis, design verification, simulation and formal methods, hardware accelerators.
Advisory recommendation Prereq: CSE 561, 607

CSE 790 Independent Study (1-6 Credits)
Engineering & Comp Sci
Exploration of a problem, or problems, in depth. Individual independent study upon a plan submitted by the student. Admission by consent of supervising instructor(s) and the department.
Repeatable

CSE 791 Special Problems in Computer Systems Engineering (1-4 Credits)
Engineering & Comp Sci
Topics vary and represent current interests in computer engineering.
Repeatable 6 times for 24 credits maximum

CSE 864 Topics in VLSI Design (3 Credits)
Engineering & Comp Sci
Seminar on the design and analysis of very large scale integrate circuits and systems. Opportunities for chip fabrication and testing.
Advisory recommendation Prereq: CSE 664

CSE 890 Independent Study (1-6 Credits)
Engineering & Comp Sci
Exploration of a problem, or problems, in depth. Individual independent study upon a plan submitted by the student. Admission by permission of supervising instructor or instructor and the department.
Repeatable

CSE 891 Special Problems in Computer Systems Engineering (1-4 Credits)
Engineering & Comp Sci
Work on special projects. Instructor presents new or special material.
Repeatable

CSE 970 Experience Credit (1-6 Credits)
Engineering & Comp Sci
Participation in a discipline or subject related experience. Student must be evaluated by written or oral reports or an examination. Permission in advance with the consent of the department chairperson, instructor, and dean. Limited to those in good academic standing.
Repeatable

CSE 990 Independent Study (1-6 Credits)
Engineering & Comp Sci
Exploration of a problem, or problems, in depth. Individual independent study upon a plan submitted by the student. Admission by consent of supervising instructor(s) and the department.
Repeatable

CSE 995 Engineer Degree Project (0-6 Credits)
Engineering & Comp Sci
Independent investigation or original research on engineering problem under faculty supervision.
Repeatable

CSE 996 Master's Project (0 Credits)
Engineering & Comp Sci
Engineering investigation or analysis and evaluation of a journal paper. Written report in accordance with current departmental guidelines. Required of all students electing the nonthesis option for the master's degree.
Repeatable

CSE 997 Masters Thesis (1-6 Credits)
Engineering & Comp Sci
Independent investigation on a topic of interest under supervision of a member of the graduate school faculty. Credit to be arranged.
Repeatable

CSE 999 Dissertation (1-15 Credits)
Engineering & Comp Sci
Research on a doctoral dissertation under the supervision of a member of the graduate school faculty. Credit to be arranged.
Repeatable 30 times for 999.99 credits maximum