REQUIREMENTS FOR THE BACHELOR OF SCIENCE IN COMPUTER SCIENCE/MASTER OF SCIENCE

Accredited by ABET, Inc., (formerly the Accrediting Board for Engineering and Technology)

COLLEGE OF ENGINEERING

THE UNIVERSITY OF OKLAHOMA

For Students Entering the Oklahoma State System for Higher Education
Summer 2009 through Spring 2010

GENERAL REQUIREMENTS

Total Credit Hours . . . . . **138-142•**
Minimum Retention/Graduation Grade Point Averages:
Overall - Combined and OU **3.25**
Major - Combined and OU **3.25**
Curriculum - Combined and OU **3.25**
A minimum grade of C is required for each course in the curriculum.

Computer Science
F235 Q146
Bachelor of Science in Computer Science/ Master of Science

OU encourages students to complete at least 29 hours of applicable coursework each year to have the opportunity to graduate in five years.

Year	FIRST SEMESTER	Hours	SECOND SEMESTER	Hours
FRESHMAN	**ENGL 1113**, Prin. of English Composition (Core I)	3	**CHEM 1315**, General Chemistry (Core II, lab)	5
	MATH 1823, Calculus & Analytic Geometry I (Core I)	3	**ENGL 1213**, Prin. of English Composition (Core I), **or**	3
	P SC 1113, American Federal Government (Core III)	3	**EXPO 1213,** Expository Writing (Core I)	
	ENGR 1411, Freshman Engineering Experience	1	**MATH 2423**, Calculus & Analytic Geometry II (Core I)	3
	†Approved Elective: Artistic Forms (Core IV)	3		
	†Approved Elective: Social Science (Core III)	3	**§C S 1323**, Intro. to Computer Programming	3
	TOTAL CREDIT HOURS	**16**	**TOTAL CREDIT HOURS**	**14**
SOPHOMORE	**MATH 2433**, Calculus & Analytic Geometry III	3	**MATH 2443**, Calculus & Analytic Geometry IV	3
	C S 2334, Programming Structures & Abstractions	4	**C S 2813**, Discrete Structures	3
	C S 2603, Applied Logic for Hardware & Software	3	**C S 2413**, Data Structures	3
	PHYS 1311, General Physics Lab I (if taking two PHYS)	0-1	**C S 2613**, Computer Organization	3
	PHYS 2514, General Physics for Engineering & Science Majors (Core II)	4	**CHEM 1415,** General Chemistry**, or**	
			PHYS 2524, General Physics for Engineering & Science Majors**, and**	5
			PHYS 1321, General Physics Lab II	
	TOTAL CREDIT HOURS	**14-15**	**TOTAL CREDIT HOURS**	**17**
JUNIOR	**MATH 3113**, Intro. to Ordinary Differential Equations, **or**	3	**C S 3723**, Numerical Methods for Engineering Comp., **or**	3
	MATH 3413, Physical Mathematics I		✧**MATH 4073**, Numerical Analysis I	
	COMM 2613, Public Speaking	3	**ENGL 3153**, Technical Writing, **or**	3
	C S 3113, Intro. to Operating Systems	3	**B C 2813**, Business Communication	
	C S 3323, Principles of Programming Languages	3	**MATH 3333**, Linear Algebra	3
	ENGR 2002, Professional Development	2	**C S 3053**, Human Computer Interaction	3
			C S 3823, Theory of Computation	3
	TOTAL CREDIT HOURS	**14**	**TOTAL CREDIT HOURS**	**15**
SENIOR	**HSCI 3493**, The History of Media (Core IV - WC)	3	**HIST 1483**, U.S., 1492-1865, **or**	3
	C S 4263, Software Engineering I	3	**1493**, U.S., 1865-Present (Core IV)	
	C S 4413, Algorithm Analysis	3	**C S 4273**, Software Engineering II (Capstone)	3
	✢**C S** G4000/5000 Approved Elective	3	✢♠**C S** G4000/5000 Approved Elective	3
	1 of the following 3 courses:		‡♠**C S** Approved Elective	3
	✧**MATH 4753**, Applied Statistical Methods, **or**	3	†Approved Elective: Non-Western Culture (Core IV)	3
	I E 3293, Applied Engineering Statistics **or**			
	✧**MATH 4743,** Intro. to Mathematical Statistics			
	TOTAL CREDIT HOURS	**15**	**TOTAL CREDIT HOURS**	**15**

Students are eligible for graduate status upon graduation with the Bachelor of Science in Computer Science.

FIFTH YEAR	✢♠G5000-level Approved Elective	3	✢♠G5000-level Approved Elective	3
	✢♠G5000-level Approved Elective	3	✷♠5000-level C S Electives	6-9
	✷♠G5000-level C S Elective	3		
	TOTAL CREDIT HOURS	**9**	**TOTAL CREDIT HOURS**	**9-12**

✯ **Students may enter the accelerated program based on the undergraduate degree pattern offered in the year they first enrolled in the Oklahoma State System of Higher Education or later.**

NOTE: Engineering transfer students may take ENGR 3511 in place of ENGR 1411.

Courses designated as Core I, II, III, IV or Capstone are part of the General Education curriculum. Students must complete a minimum of 40 hours of General Education courses, chosen from the approved list.

†To be chosen from the **University-Wide General Education Approved Course List**. Three of these 12 hours must be upper-division (3000-4000). See list in the Class Schedule.

Students must successfully complete prerequisite courses (with a minimum C grade) before proceeding to the next course.

•Two college-level courses in a single foreign language are required; this may be satisfied by successful completion of 2 years in a single foreign language in high school. Students who must take foreign language at the University will have an additional 6-10 hours of coursework.

‡To be chosen from C S 4013, 4323, 4513, 4613, 4973 or any C S 5000-level course.

✧At least one of these three MATH courses must be completed.

✢ Students must choose the following for these five electives: one Theory elective; two Systems electives; and two Applications electives. No more than two of these courses may be at the 4000-level. Courses for the three areas are listed below.

Theory electives are to be chosen from C S 5413, 5433, 5813, or 5823.

Systems electives are to be chosen from C S 4323, 4613 at the 4000 level; C S 5023, 5113, 5123, 5133, 5143, 5153, 5163, 5633, or 6143 at the 5000 level.

Applications electives are to be chosen from C S 4013, 4513 at the 4000 level; C S 5033, 5043, 5053, 5083, 5213, 5513, 5613, 5743, or 5753 at the 5000 level.

♠ No more than two enrollments (six hours) in 5970, "Graduate Seminar" courses are allowed.

§This course fulfills the Computer Literacy Requirement for graduation as required by the Oklahoma State Regents for Higher Education.

✷Thesis option requires a total of 9 hours of 5000-level electives, which must include six hours of C S 5980. Non-thesis option requires a total of 12 hours of 5000-level electives.

COURSES IN COMPUTER SCIENCE (C S)

1323 Introduction to Computer Programming. Prerequisite: Mathematics 1523 or equivalent. Introduction to the design and implementation of computer software with an emphasis on abstraction and program organization. (F, Sp)

2334 Programming Structures and Abstractions. Prerequisite: 1323 and Mathematics 1823. Application of software engineering principles with examples from central areas of computer science. Use of abstract data types such as stacks, queues, lists, trees, file processing. Introduction to ethics in computer science, including philosophical ethics theories. Discussion of intellectual property rights and privacy. A program design tool will be used. (F, Sp)

2413 Data Structures. Prerequisite: 2334 and 2813 or 1813 or Mathematics 2513, or concurrent enrollment in 2813 or Mathematics 2513. Representation, analysis and implementation of widely used data structures and associated algorithms. Discussion of algorithms employing data structures with analysis. Written communications required in some projects. Discussion of ethical issues including computer crime, abuse, and hacker ethics. Tools and techniques used in writing secure applications will also be discussed. Windows operating system will be used. A debugging tool will be used. (F, Sp)

2603 Applied Logic for Hardware and Software. Prerequisite: 1323 and Mathematics 1823. Applications of logic in the analysis of hardware and software components. Topics include propositional and predicate calculus, Boolean algebra, combinational and sequential circuits, number systems and circuits for arithmetic, sets, inductive definitions, proof techniques including natural deducton, equational reasoning and mathematical inducton. (F, Sp)

2613 Computer Organization. Prerequisite: 2603 or Electrical and Computer Engineering 2213 or Electrical and Computer Engineering 2214. An introduction to the architecture, organization and design of uniprocessor-based computer systems. Topics include processor, control and memory design and organization, pipelining and vector processing, computer arithmetic, I/O organization, and computer systems security. (F, Sp)

2813 Discrete Structures. Prerequisite: 2603 or Electrical and Computer Engineering 2213 or 2214. Introduction to the theory of discrete structures useful in computer science. Topics include combinatorics, relations, functions, computational complexity, recurrences, and graph theory. (F, Sp)

3053 Human Computer Interaction. Prerequisite: 2413. An introduction to human-computer interaction and graphical user interfaces. Topics include: principles of human-computer interaction, human cognitive abilities, interface analysis and design, window systems, and social implications of computing. Current interface programming tools will be described and used. Oral presentations are required for some assignments. (F, Sp)

3113 Introduction to Operating Systems. Prerequisite: 2413 and, either 2613 or Electrical and Computer Engineering 3223. An introduction to the major concepts (including memory management, process management, information management, and computer security) and techniques of designing and implementing operating systems. Class projects require the design of medium-scale software systems. The Unix operating system will be used. A performance evaluation tool will be used. (F, Sp)

3323 Principles of Programming Languages. Prerequisite: 2413. Study of the theoretical foundations and principles that form the basis of programming language design; introduction to the functional programming paradigm. (F)

†G3723 C S Numerical Methods for Engineering Computation. Prerequisites: 1313 or 1323, and Mathematics 3113 or 3413. Basic methods for obtaining numerical solutions with a digital computer. Included are methods for the solutions of algebraic and transcendental equations, simultaneous linear equations, ordinary and partial differential equations, and curve fitting techniques. The methods are compared with respect to computational efficiency and accuracy. Any student who earns credit for P E 3723 cannot receive duplicate credit for AME 3723, C S 3723, or CH E 3723. This course may not be taken for graduate credit within the College of Engineering. (Sp)

3823 Theory of Computation. Prerequisite: 2413 or 4005. Introduction to abstract machine theory and formal language theory. Topics include turing machines, finite/pushdown automata, deterministic versus nondeterministic computations, context-free grammars, and mathematical properties of these systems. (F, Sp)

G4013 Artificial Intelligence. Prerequisite: 2413 or 4005. Study of the methods of search, knowledge representation, heuristics, and other aspects of automating the solution of problems requiring intelligence. (Sp)

4023 Introduction to Intelligent Robotics (Slashlisted with 5023). Prerequisite: 2413 or permission of instructor. History of intelligent robotics; functional models approach; reactive robots; ethology for robotics; architectures and methodologies; implementation; sensing; hybrid deliberative/reactive robotics; multi-robot systems; navigation; topological path planning; metric path planning; localization and mapping. No student may earn credit for both 4023 and 5023. (Sp)

4033 Machine Learning. (Slashlisted with 5033). Prerequisites: Mathematics 4753 or Engineering 3293 or Industrial Engineering 3293 or Mathematics 4743, and Mathematics 3333. Topics include decision trees, relational learning, neural networks, Bayesian learning, reinforcement learning, multiple-instance learning, feature selection, learning appropriate representations, clustering, and kernel methods. No student may earn credit for both 4033 and 5033. (F)

4053 Computer Graphics (Slashlisted with 5053). Prerequisite: 2413 and Mathematics 3333. An introduction to computer graphics. Topics include coordinate systems, transformations, rendering in both two and three dimensions, and graphical programming. No student may earn credit for both 4053 and 5053. (Sp)

4113 Operating Systems Theory (Slashlisted with 5113). Prerequisite: 3113 and Mathematics 4753 or Industrial Engineering 3293 or Mathematics 4743 or Engineering 3293. Continuation of study from 3113. Advanced topics and examples and simulation techniques used in performance evaluation. No student may earn credit for both 4113 and 5113. (Sp)

4133 Data Networks (Slashlisted with 5133). Prerequisite: 3113 or permission of instructor. Comprehensive treatment of data networking principles including: layered protocol design and their functions, tools for performance analysis, multi-access communication, routing and flow control. No student may earn credit for both 4133 and 5133. (F)

4163 Embedded Systems (Slashlisted with 5163). Prerequisites: 2613 and 3113 and Matematics 3333. Theory and practice of connecting computational systems to the physical world through sensors and actuators. No student may earn credit for both 4163 and 5163. (Sp)

4263 Software Engineering I. Prerequisite: 3323 and Communication 2613 and English 3153 or Business Communication 2813 and permission of instructor. Methods and tools for software specification, design, and documentation. Emphasis on architectural modularity, encapsulation of software objects, and software development processes such as design review, code inspection, and defect tracking. Students working in teams apply these ideas to design and document software products. Study of professional ethics, responsibility, and liability. (F)

†G4273 Software Engineering II. Prerequisite: 4263 and 3053 and permission of instructor. Methods and tools for software development, testing, and delivery. Emphasis on data abstraction and reusable components. Students working in teams implement a significant software product, including design documents, user's guide, and process reports, using methods and processes studied in Software Engineering I. Students will practice oral and written communication skills. (Sp)

G4323 Compiler Construction. Prerequisite: 3323. Introduction to the theory and implementation of programming language compilers and interpreters. Class projects require the design of medium scale software systems. (Sp)

G4413 Algorithm Analysis. Prerequisite: 2413 or 4005. Design and analysis of algorithms and measurement of their complexity. (F)

4433 Computational Methods in Discrete Optimization (Slashlisted with 5433). Prerequisite: Mathematics 3333 and 4413 or concurrent enrollment in 4413. Linear programming: simplex method for LP problems, degeneracy and anticycling strategies, duality theory and complementary slackness conditions, revised simplex method, sensitivity analysis and simplex method for general LP problems. Network optimization: the transshipment problem, network simplex method, shortest path algorithms, the maximum flow problem, and the primal dual method. No student may earn credit for both 4433 and 5433. (F)

G4513 Database Management. Prerequisite: 2413 and senior standing or 4005. Emphasizes concepts and structures necessary to design and implement a database management system. (F)

G4613 Computer Architecture (Crosslisted with Electrical and Computer Engineering 4613). Prerequisite: 2613 or Electrical and Computer Engineering 3223, or 4004. Covers basic concepts of computer system design and communication between components, along with current and historical examples of computer architecture. (F, Sp)

4743 Scientific Computing I (Slashlisted with 5743). Prerequisite: Mathematics 3333 and Aerospace and Mechanical Engineering 3723 or Mathematics 4073 or Engineering 3723. Interaction between applications, architectures, and algorithms. Review of linear algebra, serial, pipelined vector processors, cluster of processors. Measures of proformance of parallel algorithms. Parallel algorithms for the solution of linear systems. No student may earn credit for both 4743 and 5743. (F)

4973 Special Topics. Prerequisite: 2413 and permission of instructor. May be repeated with change of subject matter; maximum credit nine hours. A special topics course necessitated by the rapidly changing nature of computer sciences. Topics offered under this number will be accepted as approved Computer Science electives for Computer Science majors. (Irreg.)

COURSES IN ENGINEERING (ENGR)

1411 Freshman Engineering Experience. Prerequisite: declared major in Engineering or permission of instructor. Required of all entering freshmen with a declared Engineering major. Lecture hours cover a variety of topics including: majors and minors; career planning; advising; and extra-curricular activities. Students also work on multi-disciplinary engineering projects in smaller groups during the lab hour. (F)

2002 Professional Development. Prerequisite: sophomore standing. Develop an understanding of engineering ethics, teamwork, leadership, and professional responsibility through the concepts of contemporary, social, and global issues. (F, Sp)

COURSES IN HISTORY OF SCIENCE (HSCI)

3493 The History of Media. Prerequisite: junior standing, or completion of one History of Science lower-division course, or permission of instructor. An introduction to the history of informational technologies and communications media from the printing press to the internet. Topics will include the print revolution, the advent of electronic communications, the growth of broadcast media, the development of the digital computer, and the internet boom. Course materials include novels and films as well as non-fiction. (Irreg.) [IV-WC]

COURSES IN MATHEMATICS (MATH)

1823 Calculus and Analytic Geometry I. Prerequisite: 1523 at OU, or satisfactory score on the placement test, or, for incoming freshmen direct from high school, satisfactory score on the ACT/SAT. Topics covered include equations of straight lines; conic sections; functions, limits and continuity; differentiation; maximum-minimum theory and curve sketching. A student may not receive credit for this course and 1743. (F, Sp, Su) [I-M]

2423 Calculus and Analytic Geometry II. Prerequisite: 1823. Integration and its applications; the calculus of transcendental functions; techniques of integration; and the introduction to differential equations. A student may not receive credit for this course and 2123. (F, Sp, Su) [I-M]

2433 Calculus and Analytic Geometry III. Prerequisite: 2423. Polar coordinates, parametric equations, sequences, infinite series, vector analysis. (F, Sp, Su)

2443 Calculus and Analytic Geometry IV. Prerequisite: 2433. Vector calculus; functions of several variables; partial derivatives; gradients, extreme values and differentials of multivariate functions; multiple integrals; line and surface integrals. (F, Sp, Su)

†G3113 Introduction to Ordinary Differential Equations. Prerequisite: 2423. Duplicates two hours of 3413. First order ordinary differential equations, linear differential equations with constant coefficients, two-by-two linear systems, Laplace transformations, phase planes and stability. (F, Sp, Su)

†G3333 Linear Algebra I. Prerequisite: 2433 or permission of instructor. Systems of linear equations, determinants, finite dimensional vector spaces, linear transformations and matrices, characteristic values and vectors. (F, Sp, Su)

†G3413 Physical Mathematics I. Prerequisite: 2443 or concurrent enrollment. Complex numbers and functions. Fourier series, solution methods for ordinary differential equations and partial differential equations, Laplace transforms, series solutions, Legendre's equation. Duplicates two hours of 3113. (F)

G4073 Numerical Analysis. Prerequisite: 3113 or 3413. Solution of linear and nonlinear equations, approximation of functions, numerical integration and differentiation, introduction to analysis of convergence and errors, pitfalls in automatic computation, one-step methods in the solutions of ordinary differential equations. (F)

4743 Introduction to Mathematical Statistics (Slashlisted with 5743). Prerequisite: 4733. Mathematical development of basic concepts in statistics: estimation, hypothesis testing, sampling from normal and other populations, regression, goodness-of-fit. No student may earn credit for both 4743 and 5743. (Sp)

G4753 Applied Statistical Methods. Prerequisite: 2123 or 2423 or permission of instructor. Estimation, hypothesis testing, analysis of variance, regression and correlation, goodness-of-fit, other topics as time permits. Emphasis on applications of statistical methods. (F, Sp, Su)