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

B.S. Portion of the Program Accredited by the Engineering Accreditation Commission of ABET, **http://www.abet.org**

COLLEGE OF ENGINEERING

THE UNIVERSITY OF OKLAHOMA

For Students Entering the Oklahoma State System for Higher Education
Summer 2012 through Spring 2013

GENERAL REQUIREMENTS

Total Credit Hours . . . . . **144-147•**
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 Engineering and Computer Science
A225
Bachelor of Science in Computer Engineering/Master of Science (Computer Science) **F235 Q147**

OU encourages students to complete at least 29-30 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	**ENGL 1213**, Prin. of English Composition (Core I), **or**	3
	CHEM 1315, General Chemistry	5	**EXPO 1213**, Expository Writing (Core I)	
	MATH 1823, Calculus & Analytic Geometry I (Core I)	3	**MATH 2423**, Calculus & Analytic Geometry II	3
	HIST 1483, U.S., 1492-1865, **or**		**PHYS 2514**, General Physics for Engineering & Science Majors (Core II)	4
	1493, U.S., 1865-Present (Core IV)	3		
	ENGR 1411, Freshman Engineering Experience	1	**P SC 1113**, American Federal Government (Core III)	3
			C S 1323, Intro. to Computer Programming	3
	TOTAL CREDIT HOURS	**15**	**TOTAL CREDIT HOURS**	**16**
SOPHOMORE	**MATH 2433**, Calculus & Analytic Geometry III	3	**MATH 3113**, Introduction to Ordinary Differential Equations	3
	PHYS 2524, General Physics for Engr. & Science Majors	4	**C S 2413**, Data Structures	3
	C S 2334, Programming Structures & Abstractions	4	**C S 2813**, Discrete Structures	3
	ECE 2214, Intro. to Digital Design	4	**ECE 2723**, Electrical Circuits I	3
	ECE 2713, Digital Signals and Filtering	3	**ENGR 2002**, Professional Development	2
	TOTAL CREDIT HOURS	**18**	**TOTAL CREDIT HOURS**	**14**
JUNIOR	**MATH 2443**, Calculus & Analytic Geometry IV	3	**MATH 3333**, Linear Algebra I	3
	C S 3113, Intro. to Operating Systems	3	**‡ECE 3223**, Microprocessor System Design	3
	‡ECE 3723, Electrical Circuits II	3	**‡ECE 3793**, Signals and Systems	3
	‡ECE 3773, ECE Circuits Laboratory	3	**‡ECE 3873**, ECE Electronics Laboratory	3
	‡ECE 3813, Introductory Electronics	3		
	†Approved Elective, Core III: Social Science	3	†Approved Elective, Core IV: Artistic Forms	3
	TOTAL CREDIT HOURS	**18**	**TOTAL CREDIT HOURS**	**15**

☆ Students eligible to enter accelerated program after application is granted for unconditional enrollment in upper-division ECE courses and meeting minimum requirements, including a 3.50 retention and 3.50 combined retention grade point average.

Year	FIRST SEMESTER	Hours	SECOND SEMESTER	Hours
SENIOR	**C S 3823**, Theory of Computation	3	**‡ECE 4773**, Laboratory–Special Projects (Capstone)	3
	C S 4413, Algorithm Analysis	3	**ISE 3293**, Applied Engineering Statistics	3
	‡ECE 4273, Digital Design Laboratory	3	#**C S** G4000/5000 Approved Elective	3
	§**ECE G4000 or higher** Elective	3	**‡ECE 4613**, Computer Architecture	3
	†Approved Elective, Core IV: Western Civ. & Culture	3	†Approved Elective, Core IV: Non-Western Culture	3
	TOTAL CREDIT HOURS	**15**	**TOTAL CREDIT HOURS**	**15**

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

Year	FIRST SEMESTER	Hours	SECOND SEMESTER	Hours
FIFTH YEAR	#5000-level Approved Elective	3	#5000-level Approved Elective	3
	#5000-level Approved Elective	3	✸5000-level C S Electives	6-9
	✸5000-level C S Elective	3		
	TOTAL CREDIT HOURS	**9**	**TOTAL CREDIT HOURS**	**9-12**

☆ **Note: 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.

In the College of Engineering, in order to progress in your curriculum, and as a specific graduation requirement, a grade of C or better is required in each course in the curriculum. Any course for which a grade of C or better is not earned must be repeated the next semester enrolled, if a student plans to use the course in their curriculum. Please refer to the General Catalog for additional enrollment limitations.

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.

§ Electives to be selected from list available in the ECE Office, DEH-150. Technical electives must satisfy Depth Requirement.

Students must choose the following for these four C S electives: one C S theory elective, one C S systems elective, and two C S applications electives. No more than one of these courses may be at the G4000-level. Courses for the three areas are from an approved list from the School of Computer Science.

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

✸ 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 CHEMISTRY AND BIOCHEMISTRY (CHEM)

1315 General Chemistry. Prerequisite: Mathematics 1503 or 1643, or math ACT equal to or greater than 23. First of a two-semester sequence in general chemistry. Topics covered: basic measurement, gas laws and changes in state, stoichiometry, atomic theory, electron configuration, periodicity, bonding, molecular structure and thermochemistry. **Laboratory** (F, Sp, Su) [II-LAB]

COURSES IN COMPUTER SCIENCE (C S)

1323 Introduction to Computer Programming. Prerequisite: Mathematics 1523 or concurrent enrollment, or placement into MATH 1743, or MATH 1823 or higher. 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: C S 1323 and Mathematics 1523 or higher. 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: C S 2334 and MATH 1823 and C S 2813 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)

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)

3113 Introduction to Operating Systems. Prerequisite: 2413 and 2813 or Mathematics 2513, 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)

3823 Theory of Computation. Prerequisite: 2813 or 4005 or Mathematics 2513. 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)

G4413 Algorithm Analysis. Prerequisite: 2413 or 4005, and 2813 or 4005 or Mathematics 2513. Design and analysis of algorithms and measurement of their complexity. (F)

COURSES IN ELECTRICAL AND COMPUTER ENGINEERING (ECE)

2214 Digital Design. Prerequisite: Mathematics 2423. Number systems, Boolean algebra, minimization procedures, combinational logic functions, introduction to sequential logic design, finite state machines and clocked (synchronous) sequential circuits. Analysis, synthesis and implementation are appropriately emphasized. (F, Sp)

2713 Digital Signals and Filtering. Prerequisites: ENGR 1411 or ENGR 3511 or concurrent enrollment; CS 1313 or CS 1323 or concurrent enrollment; and MATH 2423. Digital signals and filters, discrete Fourier and Z transforms, sampling. (F, Sp)

2723 Electrical Circuits I. Prerequisite: ECE 2713 or concurrent enrollment in ECE 2713, Mathematics 2423, Physics 2524. Introduction to circuit elements and the laws of electrical science. Loop and nodal analysis solution methods. Thevenin and Norton equivalent circuits. Superposition and source transformation methods. Guest lectures introducing advanced topics. (F, Sp)

3223 Microprocessor System Design. Prerequisite: 2214. Review of clocked sequential circuits; MSI/LSI devices and applications, including registers, busing, combinational functions; use of microprocessors and logic design using microprocessors. Emphasizes assembly of full functional units into workable systems. (F, Sp)

†G3723 Electrical Circuits II. Prerequisites: ECE 2713, ECE 2723; and, Mathematics 3113 or concurrent enrollment in MATH 3113. Analysis of electrical circuits in both the time and the frequency domains. Continuation of AC circuit theory, use of two port network theorems, impulse response, convolution, and differential equations. Laplace and Fourier transform analysis of electrical circuits. (F, Sp)

3773 Electrical and Computer Engineering Circuits Laboratory. Prerequisite: 2214 and either 3723 or enrollment in 3723. Electrical laboratory procedures, circuit construction, debug and experimental confirmation of the principles of circuit theory. Introduction to use of laboratory instrumentation, including skills in the use of the oscilloscope in the evaluation of DC and AC circuits. Use and application of diodes, operational amplifiers and programmable logic devices. (F, Sp)

†G 3793 Signals and Systems. Prerequisites: ECE 2713, ECE 2723, MATH 3113; and MATH 3333 or concurrent enrollment in MATH 3333. Linear systems; time domain analysis; frequency domain analysis; Fourier, Laplace and Z-transforms; introduction to communications and control. (F, Sp)

†G3813 Introductory Electronics. Prerequisites: ECE 2713, and ECE 2723; CHEM 1315; and MATH 2443 or concurrent enrollment in MATH 2443. Small and large signal characteristics and models of electronic devices; analysis and design of elementary electronic circuits. (F, Sp)

3873 Electrical and Computer Engineering Electronics Laboratory. Prerequisite: 3773, 3813, and Engineering 2002 or 2003. Electronic analog circuit design, simulation, construction, debugging and measurement of circuit performance quantities using advanced instrumentation techniques; circuit reliability theory; independent design skills development and technical writing. (F, Sp)

†G4273 Digital Design Laboratory. Prerequisites: ECE 3223 and ECE 3873. Design of digital systems with integrated circuits and MSI/LSI and microprocessor interfacing. **Laboratory** (F, Sp)

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

†G4773 Laboratory (Special Projects). Prerequisite:4273 or enrollment in 4273. Individually supervised special engineering problems of experimental nature. **Laboratory** (F, Sp) [V]

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 INDUSTRIAL AND SYSTEMS ENGINEERING (ISE)

†G3293 Applied Engineering Statistics. Prerequisite: Mathematics 2433. Introduction to probability, one and higher dimensional random variates, function of random variables, expectation, discrete and continuous distributions, sampling and descriptive statistics, parameter estimation, use of statistical packages. Not available for graduate credit for students in engineering disciplines. (F, Sp, Su)

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: MATH 2423 or MATH 2924. 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: MATH 2433 or MATH 2934 or permission of instructor. Systems of linear equations, determinants, finite dimensional vector spaces, linear transformations and matrices, characteristic values and vectors. (F, Sp, Su)

COURSES IN PHYSICS (PHYS)

2514 General Physics for Engineering and Science Majors. Prerequisite: Mathematics 1823 or Mathematics 1914 with grade of C or better. Not open to students with credit in 1205. Vectors, kinematics and dynamics of particles, work and energy systems of particles, rotational kinematics and dynamics, oscillations, gravitation, fluid mechanics, waves. (F, Sp, Su) [II-NL]

2524 General Physics for Engineering and Science Majors. Prerequisite: 2514 and Mathematics 2423. Not open to students with credit in 1215. Temperature, heat, thermodynamics, electricity, magnetism, optics. (F, Sp, Su)