# REQUIREMENTS FOR THE BACHELOR OF SCIENCE IN COMPUTER SCIENCE

(Accredited by the Computer Science Accreditation Board)

## COLLEGE OF ENGINEERING
## THE UNIVERSITY OF OKLAHOMA

For Students Entering the Oklahoma State System for Higher Education: **Summer 2000 through Spring 2001**

**GENERAL REQUIREMENTS**
Total Credit Hours. . . . . . . . . . . . . . . . . . . . . . . . . 120•
**\*Minimum Retention/Graduation Grade Point Averages:**
Overall - Combined and OU . . . . . . . . . . . . . . . . . . . . 2.00
Major - Combined and OU . . . . . . . . . . . . . . . . . . . . . 2.00
Curriculum - Combined and OU . . . . . . . . . . . . . . . . 2.00
A minimum grade of C is required for each course in the curriculum.

Computer Science

**0701C**
Bachelor of Science in Computer Science

| Year | FIRST SEMESTER | Hours | SECOND SEMESTER | Hours |
|---|---|---|---|---|
| **FRESHMAN** | ENGL **1113**, Prin. of English Composition (Core I)<br>HIST **1483**, U.S., 1492-1865, **or**<br>**1493**, U.S., 1865-Present (Core IV)<br>MATH **1823**, Calculus & Analytic Geometry I (Core I)<br>P SC **1113**, American Federal Government (Core III)<br><br>†Approved Elective: Social Science (Core III) | 3<br>3<br><br>3<br>3<br><br>3 | CHEM **1315**, General Chemistry (Core II, lab)<br>ENGL **1213**, Prin. of English Composition (Core I)<br>MATH **2423**, Calculus & Analytic Geometry II (Core I)<br>C S **1323**, Fund. of Computer Programming | 5<br>3<br>3<br>3 |
| | **TOTAL CREDIT HOURS** | **15** | **TOTAL CREDIT HOURS** | **14** |
| **SOPHOMORE** | CHEM **1415**, General Chemistry, continued<br>MATH **2433**, Calculus & Analytic Geometry III<br>C S **1333**, Programming Structures & Abstractions<br>C S **1813**, Discrete Mathematics<br>ECE **2213**, Introduction to Digital Design | 5<br>3<br>3<br>3<br>3 | MATH **2443**, Calculus & Analytic Geometry IV<br>C S **2413**, Data Structures<br>C S **2613**, Computer Organization<br>PHYS **2514**, General Physics for Engineering and Science Majors (Core II)<br><br>¤Oral Communications Elective | 3<br>3<br>3<br>4<br><br>3 |
| | **TOTAL CREDIT HOURS** | **17** | **TOTAL CREDIT HOURS** | **16** |
| **JUNIOR** | MATH **3113**, Introduction to Ordinary Differential Equations<br>MATH **3333**, Linear Algebra<br>\*C S **3053**, Graphical User Interfaces<br>\*C S **3113**, Intro. to Operating Systems<br><br>1 of the following 3 courses:<br>MATH **4753**, Applied Statistical Methods, **or**<br>ENGR **3293**, Applied Engineering Statistics **or**<br>MATH **4743,** Intro. to Mathematical Statistics | 3<br>3<br>3<br>3<br><br>3 | ENGL **3153**, Technical Writing, **or**<br>B C **2813**, Business Communication<br><br>\*C S **3313**, Introduction to Compilers<br><br>§Approved General Elective<br><br>‡C S 4000-level Elective<br><br>†Approved Elective: Western Civ. & Culture (Core IV) | 3<br><br><br>3<br><br>3<br><br>3<br><br>3 |
| | **TOTAL CREDIT HOURS** | **15** | **TOTAL CREDIT HOURS** | **15** |
| **SENIOR** | \*C S **4263**, Software Engineering I<br>\*C S **4414**, Algorithm Analysis<br><br>‡C S 4000-level Elective<br><br>ENGR **3723**, Numerical Methods for Engineering Comp., **or**<br>MATH **4073**, Numerical Analysis I<br><br>†Approved Elective: Artistic Forms (Core IV) | 3<br>4<br><br>3<br><br>3<br><br><br>3 | \*C S **4273**, Software Engineering II (Capstone)<br><br>‡C S 4000-level Elective<br><br>§Approved General Elective<br><br>†Approved Elective: Non-Western Culture (Core IV) | 3<br><br>3<br><br>3<br><br>3 |
| | **TOTAL CREDIT HOURS** | **16** | **TOTAL CREDIT HOURS** | **12** |

\* In order to be admitted to upper-division C S classes, students must submit an application. At the time of the application, students shall have completed a set of requisite courses and have a 2.80 OU retention and 2.80 combined retention grade point average.

Courses designated as Core I, II, III or IV 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. Six 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. Please refer to the General Catalog for additional enrollment limitations.

Students should read the College of Engineering Scholastic Regulations which are posted on the Advising Bulletin Board across from CEC 104.

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.

§Approved general elective courses to be selected from list available in the Computer Science office and in consultation with faculty adviser.

¤Oral Communication Elective to be chosen from COMM 1113, 2113, 2213, or 2613.

‡To be chosen from C S 4013, 4053, 4113, 4133, 4313, 4433, 4513, 4613, 4743 and 4813.

**NOTE**: See an adviser in the Arts and Sciences Advising Center (PhSc 429) about a possible minor in mathematics.

## 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)

**1415 General Chemistry (Continued).** Prerequisite: 1315 with a minimum grade of C or a satisfactory score on the chemistry placement examination. Topics covered include: nature of solutions, equilibrium, thermodynamics, acid and base properties, kinetics and electrochemistry. **Laboratory** (F, Sp, Su)

## COURSES IN COMMUNICATION (COMM)

**1113 Principles of Communication.** Introductory study of human communication emphasizing both theoretic understanding of the process as well as skillful application of communication principles and techniques within a variety of settings. (F, Sp, Su)

**2113 Introduction to Organizational Communication.** Seeks to enhance the student's awareness and appreciation of communication processes in organizational settings, as well as to provide information about the roles of communication specialists in organizations. Career opportunities in organizational communication are discussed. (F, Sp)

**2213 Interpersonal Communication.** Introduces the student to the complex interaction of social and psychological forces operating in human communication. Theories will be considered, but in the context of real communication situations in industry, education, medical and legal practice, etc., as well as in empirical research. The most recent laboratory and field research results will be discussed. (F, Sp)

**2613 Public Speaking.** Develops skill in the composition and delivery of speeches suitable to various common speech situations and criteria for judging speeches heard or read. Topics include: nature of public speaking; choosing and presenting a topic; analyzing an audience; organizing and outlining. (F, Sp, Su)

## COURSES IN COMPUTER SCIENCE (C S)

**1323 Fundamentals of Computer Programming.** Prerequisite: Mathematics 1523 or high school equivalent. Introduction to basic programming techniques: expressions, functions, conditionals, iteration, data abstraction. Practice in the use of high-level programming languages. Emphasizes principles of software engineering and illustrates with examples from central areas of computing science. An introduction to ethics in computer science including philosophical ethics theories. (F, Sp, Su)

**1333 Programming Structures and Abstractions.** Prerequisite: 1323. Organizing data to facilitate programming and computation. Use of pointers and dynamic memory allocation to represent stacks, queues, linked lists, trees. File processing. Continued practice in the use of high-level programming languages and the application of software engineering principles with examples from central areas of computing science. Discussion of intellectual property rights and privacy. (F, Sp)

**1813 Discrete Mathematics.** Prerequisite: 1323. Introduction to the mathematical foundation of computer science. Topics include combinatorics, logic, relations, functions, computational complexity, automata, and graph theory. (F, Sp)

**2413 Data Structures.** Prerequisite: 1333, 1813. Object-oriented representation of widely used data structures and associated algorithms. The design of medium-size software systems. Written communication required in some projects. Discussion of ethical issues including computer crime, abuse, and hacker ethics. (F, Sp, Su)

**2613 Computer Organization.** Prerequisite: Electrical and Computer Engineering 2213. Introduction to the organization and structuring of the major components of computers and the transfer of information among these components for control and data processing. (F, Sp)

**3053 Graphical User Interfaces.** 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 concept areas and techniques of designing and implementing operating systems. Class projects require the design of medium-scale software systems. (F, Sp)

**3313 Introduction to Compilers.** Prerequisite: 2413. Introduction to the structure and implementation of programming language compilers and interpreters. Class projects require the design of medium-scale software systems. (F, Sp)

**G4013 Artificial Intelligence.** Prerequisite: 1813, 2413. Study of the methods of search, knowledge representation, heuristics, and other aspects of automating the solution of problems requiring intelligence. (Sp)

**4053 Computer Graphics (Slashlisted with 5053).** Prerequisite: 2413, Mathematics 2433, 3333 and senior standing. An introduction to computer graphics. Topics include coordinate systems, transformations, rendering in both two and three dimensions, and programming in X windows. No student may earn credit for both 4053 and 5053. (Sp)

**4113 Operating Systems Theory (Slashlisted with 5113).** Prerequisite: 3113, Mathematics 4753 or Engineering 3293. Continuation of study from 3113, with 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)

**4263 Software Engineering I.** Prerequisite: 3313 or 3113 or concurrent enrollment in 3113. 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. 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)

**G4313 Programming Languages.** Prerequisite: 3313. Study of the principles that form the basis of programming language design: abstraction, parameterization, scoping, argument association mechanisms, intepreters. (F)

**G4414 Algorithm Analysis.** Prerequisite: 2413. Design and analysis of algorithms and measurement of their complexity. (F)

**G4513 Database Management.** Prerequisite: 3113. 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. Covers basic concepts of computer system design and communication between components, along with current and historical examples of computer architecture. (F)

**4743 Large-Scale Scientific Computing (Slashlisted with 5743).** Prerequisite: Mathematics 3333, Engineering 3723 or Mathematics 4073. An introduction to basic concepts and techniques of large-scale scientific computing using advanced computer architectures, and to related areas of research. Topics are selected from large-scale linear and nonlinear problems. No student may earn credit for both 4743 and 5743. (F)

**4813 Automata and Formal Languages (Slashlisted with 5813).** Prerequisite: 1813, 3313. An introduction to the area of formal language study, abstract machine study and the limits of machine computability. No student may earn credit for both 4813 and 5813. (F)

## COURSES IN ELECTRICAL AND COMPUTER ENGINEERING (ECE)

**2213 Introduction to 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)

## COURSES IN ENGINEERING (ENGR)

**†G3293 Applied Engineering Statistics.** Prerequisite: 1112, 1001 or Computer Science 1313 or 1323; Mathematics 2433. Introduction to probability, one and higher dimensional random variates, functions 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)

**†G3723 Numerical Methods for Engineering Computation.** Prerequisite: 1112, 1001 or Computer Science 1313 or 1323, and Mathematics 3113. Basic methods for obtaining numerical solutions with a digital computer. Included are methods for the solution 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. (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 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)

**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)

**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: 2443 or concurrent enrollment. Duplicates two hours of 3413. First order ordinary differential equations, linear differential equations with constant coefficients, Laplace transformations, power-series solutions of differential equations, Bessel functions. (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)

**G4073 Numerical Analysis I.** 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)

## COURSES IN PHYSICS (PHYS)

**2514 General Physics for Engineering and Science Majors.** Prerequisite: Mathematics 1823. 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)