COMPUTER SCIENCE, MINOR

Program Requirements

Students majoring in other academic fields who wish to complete a minor in computer science must complete at least 18 hours of computer science, of which at least 6 semester hours must be at or above the 3000 level. The content of the course work for the minor must include the equivalent of:

Code	Title	Hours
Required Courses		
COSC 1435	Introduction to Problem Solving with Computers I	4
COSC 1436	Introduction to Problem Solving with Computers II	4
COSC 2437	Data Structures [1]	4
Electives		
Select 6 hours of Approved Computer Science electives (at or above the 3000 level) (p. 1)		6
Total Hours		**18**

[1]

It is assumed that the student has completed all mathematics prerequisites and corequisites for the required courses.

Approved Electives

Any 3000 level COSC course will satisfy **except**:

Code	Title	Hours
COSC 3371	Computer Information Systems Economics	3
COSC 3400	Skills for Computing Professionals	4
COSC 4100	Skills for Computing Professionals II	1
COSC 4354	Senior Capstone Project	3
COSC 4690	Contracted Field Experience in Computer Science	1-6

Courses

COSC 1315 Computer Literacy
3 Semester Credit Hours (3 Lecture Hours)
A balanced introduction to the use and application of computers in modern society involving both descriptive information and hands-on laboratory participation. Includes a discussion of the general principles of operation of a computer and a brief history of the development of computing. The use of a personal computer operating system, common application software, and simple computer programming concepts are introduced. Satisfies university computer literacy requirement.
TCCNS: COSC 1301

COSC 1320 C Programming
3 Semester Credit Hours (3 Lecture Hours)
Introduces the fundamental concepts of structured programming in the C language. Topics include data types; control structures; functions, structures, arrays, pointers, pointer arithmetic, unions, and files; the mechanics of running, testing, and debugging programs; introduction to programming; and introduction to the historical and social context of computing.
Prerequisite: (MATH 1314).

COSC 1330 Programming for Scientists, Engineers, and Mathematicians
3 Semester Credit Hours (3 Lecture Hours)
Introduction to computer programming for solving discipline specific problems using computers. Emphasis on the fundamentals of structured design, development, testing, implementation, and documentation. Includes coverage of language syntax, data and file structures, input/output devices, and disks/files.
TCCNS: ENGR 2304

COSC 1435 Introduction to Problem Solving with Computers I
4 Semester Credit Hours (3 Lecture Hours, 2 Lab Hours)
This course introduces the fundamental concepts of problem solving and algorithms. A brief introduction to computers and the programming life cycle is covered. The C++ programming language is used to develop basic computer programs demonstrating data types, fundamental control structures, functions, and arrays. MATH 1314 or placement beyond MATH 1314. Offered Fall, Spring, Summer.
Prerequisite: MATH 1314.
TCCNS: COSC 1436

COSC 1436 Introduction to Problem Solving with Computers II
4 Semester Credit Hours (3 Lecture Hours, 2 Lab Hours)
This course is a continuation of COSC 1435. An introduction to abstract data types and object-oriented programming is covered. Topics include basic searching and sorting algorithms, dynamic allocation, linked lists, inheritance, polymorphism, and recursion.
Prerequisite: COSC 1435.
TCCNS: COSC 1437

COSC 2325 Game Design
3 Semester Credit Hours (2 Lecture Hours, 2 Lab Hours)
This course will teach students the techniques for computer game design and how to work as part of a game development team from initial conception through release, including the game design process, game concepts, how and why we play games, character development, storytelling, user experience, game play, and core mechanics of games.

COSC 2334 Computer Architecture
3 Semester Credit Hours (3 Lecture Hours)
A concentrated study of internal computer concepts. Computer organization, machine and assembly language are emphasized.
Prerequisite: (COSC 1435 and MATH 2305).

COSC 2348 Introduction to Scripting
3 Semester Credit Hours (3 Lecture Hours)
This course introduces students to Windows and Unix/Linux shell scripting. The course covers basic scripting concepts including decision statements, control statements, functions and files manipulation. Advanced scripting tools such as grep, awk and sed are covered in this course.
Prerequisite: (COSC 1435).

COSC 2390 Selected Topics I
1,3 Semester Credit Hours (1,3 Lecture Hours)
Variable content. May be repeated for credit depending on topic. Offered on sufficient demand. Does not count toward total hours required for BS in Computer Science.

COSC 2391 Selected Topics II
1-3 Semester Credit Hours (1-3 Lecture Hours)
This is a selected topics course with no lab component. Variable content. May be repeated for credit depending on topic. Offered on sufficient demand. Does not count toward total hours required for BS in Computer Science.

COSC 2437 Data Structures
4 Semester Credit Hours (3 Lecture Hours, 2 Lab Hours)
This course provides a thorough study of standard structures used in the storing and retrieving of data and the processes by which these structures are created and manipulated. Topics include: object oriented design, linked lists, classes, trees, graphs, hashing, stacks, queues, sorting, searching, and recursion. A grade of C or better is required in the course to receive credit towards the Computer Science BS program.
Prerequisite: (COSC 1436) and (MATH 2305 or 2305*).
* May be taken concurrently.
TCCNS: COSC 2436

COSC 2465 Linux Systems
4 Semester Credit Hours (3 Lecture Hours, 2 Lab Hours)
This course focuses on providing students with essential knowledge and skills to implement, administer, and troubleshoot servers in a networked environment. Operating system concepts, such as installing a standalone system, file systems authentication, and user support services are explored. Topics will include security issues, user and group administration, active directory services, DHCP, DNS, SSH, backup and restoration strategies and techniques, integrated mass storage technologies and alternative client technologies.
Prerequisite: COSC 2348.

COSC 2466 Network Systems
4 Semester Credit Hours (3 Lecture Hours, 2 Lab Hours)
This course focuses on the standards and technologies used to establish inter-network structures that will support a TCP/IP data stream for higher-level services to operate over. This course introduces local area networks (LAN) and wide area networks (WAN). Topics include the TCP/IP and open system interconnection (OSI) models, cabling, switches, routers, protocols, subnetting, and networking hardware and software. Initial switch and router configuration will be examined and evaluated.
Prerequisite: COSC 2465.

COSC 2470 COBOL Programming
4 Semester Credit Hours (4 Lecture Hours)
A concentrated study of the COBOL language as applied to fundamental business computing problems and other data management applications.
Prerequisite: COSC 1435.

COSC 3100 Skills for Computing Professionals I
1 Semester Credit Hour (2 Lab Hours)
This course focuses on beginning to develop professional skills that computer scientists will need to be successful in their careers and lives. Communication skills will include writing and giving oral presentations. Ethical issues will be explored. This is a class for computing professionals. As such, professional decorum will be required at all times.

COSC 3300 Computing Ethics and Professional Skills
3 Semester Credit Hours (3 Lecture Hours)
This course introduces social and ethical issues related to computer science, and focuses on technical writing, workplace scenarios and professional skills that computer scientists will need to be successful in their careers and lives. This is a class for computing professionals.
Prerequisite: (ENGL 3310).

COSC 3301 Cyber Security
3 Semester Credit Hours (3 Lecture Hours)
This course introduces students to cyber security. A broad range of cyber security issues will be covered, including social engineering attacks, secure coding, computer security, Internet of Things (IoT) security, mobile security, data security, network security, physical security and forensics. This course will cover the concepts of prevention, detection, and response to cyber security threats.
Prerequisite: COSC 1435.

COSC 3324 Object-oriented Programming
3 Semester Credit Hours (3 Lecture Hours)
A study of concepts, terminology, and methodologies used in object-oriented systems, languages, and applications. Students will design and implement software systems using object-oriented analysis and design techniques.
Prerequisite: COSC 2437.

COSC 3325 Game Programming
3 Semester Credit Hours (3 Lecture Hours)
This course will introduce the student to techniques and tools used for all aspects of programming games. Topics will include game graphics, game physics, game AI, and sound. The course will contain lectures and hands-on labs. Students will work independently and in teams.
Prerequisite: COSC 2437.

COSC 3335 Programming for Unmanned Aircraft Systems
3 Semester Credit Hours (3 Lecture Hours)
This course introduces software development for Unmanned Systems (US). Students will be introduced to a variety of relevant topics including the different US platforms, design and implementation of algorithms for US, user interface for US, and state-of-the-art US applications, challenges & solutions.
Prerequisite: (COSC 1435 or 1330) and (MEEN 3335).

COSC 3336 Introduction to Database Systems
3 Semester Credit Hours (3 Lecture Hours)
A study of contemporary database management system concepts, terminology, and methodology for use and implementation. Commercially available systems are discussed and used with emphasis upon the relational model.
Prerequisite: COSC 2437.

COSC 3346 Operating Systems
3 Semester Credit Hours (3 Lecture Hours)
Introduction to operating systems concepts, principles, and design. Topics include: processes and threads, CPU scheduling, mutual exclusion and synchronization, deadlock, memory management, file systems, security and protection, networking, and distributed systems. Selected existing operating systems are discussed, compared, and contrasted.
Prerequisite: (COSC 2437 and 2334).

COSC 3351 Internet Programming
3 Semester Credit Hours (3 Lecture Hours)
Study of prominent web technologies with a focus on creating interactive web applications. Both client-side and server-side programming will be covered. Students will design and implement a web based project using technologies covered in class.
Prerequisite: COSC 3336 or 3336*.
* May be taken concurrently.

COSC 3352 Mobile Programming
3 Semester Credit Hours (3 Lecture Hours)
This course introduces software development for mobile platforms. Students will learn skills for creating and deploying mobile applications. Includes software engineering topics as related to mobile programming, primarily in how software design differs on mobile platforms.
Prerequisite: COSC 2437.

COSC 3353 Survey of Programming Languages
3 Semester Credit Hours (3 Lecture Hours)
A study of selected programming languages for students familiar with programming. Students will write programs in a variety of languages.
Prerequisite: COSC 2437.

COSC 3360 Human-computer Interaction
3 Semester Credit Hours (3 Lecture Hours)
This course introduces concepts and techniques for Human Computer Interaction. Particular emphasis will be placed on vision, audio, and language solutions for use in human-computer interactive systems. In addition, the students will learn how to apply the methods to solve simple HCI problems.
Prerequisite: COSC 1436.

COSC 3370 Software Engineering
3 Semester Credit Hours (3 Lecture Hours)
This course introduces students to software engineering principles for the development and maintenance of high quality large software systems. Topics include: software life cycle, delivering on time and within budget, and the development and application of processes and tools for managing the complexities inherent in creating these systems.
Prerequisite: COSC 3324 or 3351.

COSC 3371 Computer Information Systems Economics
3 Semester Credit Hours (3 Lecture Hours)
An introduction to concepts in information technology and software engineering with a focus on economics and managerial issues. Topics include cost benefit analysis, software and effort estimation, feasibility analysis, information systems proposals, software team coordination, and project management. May not be used as a CS elective for CS majors.

COSC 3372 Network Security
3 Semester Credit Hours (2 Lecture Hours, 2 Lab Hours)
This course provides an introduction to the fundamentals of computer and network security and security laws and ethics, topics include, identification of vulnerabilities, forms of attack, appropriate countermeasures, and the detection and defense of the same. Techniques for the securing of hardware, software and data, including physical security are covered.
Prerequisite: COSC 2466.

COSC 3373 Software Project Management
3 Semester Credit Hours (3 Lecture Hours)
This course introduces students to the principles for software project management for small and medium-size projects. Many aspects of software project management, including management process, scope definition, time and cost estimation, quality control, human resources, communication, risks and project procurement management will be discussed. A number of applications and tools will be used to implement a class project.
Prerequisite: (COSC 3370).

COSC 3385 Numerical Methods
3 Semester Credit Hours (3 Lecture Hours)
This course introduces concepts for solving problems numerically using computers. Students will learn about number systems, errors of finite representation, and iteration. A survey of basic numerical methods including: solutions to nonlinear equations, solutions to linear systems, approximation, interpolation, zeros of functions, numerical differentiation and integration, and Monte-Carlo methods.
Prerequisite: MATH 2413 and (COSC 1330 or 1435).

COSC 3400 Skills for Computing Professionals
4 Semester Credit Hours (3 Lecture Hours, 2 Lab Hours)
This course focuses on the professional skills that computer scientists will need to be successful in their careers. There are two key areas of study, communication skills needed by computer scientists and their ethical responsibilities. Communication skills will include: technical writing from a computer science perspective, presentation skills, client interviewing, and reading technical articles. Ethical issues will be explored from a computer science perspective.
Prerequisite: ENGL 1302.

COSC 3474 Cyber Defense I
4 Semester Credit Hours (3 Lecture Hours, 2 Lab Hours)
This course covers cryptographic tools, cryptographic algorithms, types of malicious software, forms of attacks and software security. Strengths and weaknesses of cryptographic systems are covered as well as the types of attacks on cryptographic systems. Malicious activity signatures, analysis as well as detection will be covered. This course will also cover secure coding principles and types of software issues.
Prerequisite: COSC 3372.

COSC 4100 Skills for Computing Professionals II
1 Semester Credit Hour (2 Lab Hours)
This course focuses on technical writing, workplace scenarios and professional skills that computer scientists will need to be successful in their careers and lives. This is a class for computing professionals. As such, professional decorum will be required at all times.
Prerequisite: (COSC 3100 or 1100) and ENGL 3310.

COSC 4310 Digital Forensics
3 Semester Credit Hours (3 Lecture Hours)
This course will introduce undergraduate students to the fundamentals of computer forensics and cyber-crime scene analysis. The various laws and regulations dealing with computer forensic analysis will be discussed. Students will be introduced to the emerging international standards for computer forensic analysis, as well as a formal methodology for conducting computer forensic investigations. Several Forensics tools such as Encase and FTK will be used to conduct digital forensics investigations.
Prerequisite: COSC 2437.

COSC 4324 Image Processing
3 Semester Credit Hours (3 Lecture Hours)
This course introduces concepts and techniques for image processing. The objective of this course is to introduce the fundamental techniques and algorithms used for processing and extracting useful information from digital images. The students will learn how to apply the image processing methods to solve real-world problems.
Prerequisite: COSC 2437.

COSC 4325 Advanced Game Programming
3 Semester Credit Hours (3 Lecture Hours)
This course will introduce advanced concepts for game programming to the student. Topics will include game physics, game AI, advanced shaders, 3D techniques, multiplayer techniques, and networking. The course will contain lectures and hands-on labs.
Prerequisite: COSC 3325.

COSC 4328 Computer Graphics
3 Semester Credit Hours (3 Lecture Hours)
Basic principles and techniques for computer graphics on modern graphics hardware. Students will gain experience in interactive computer graphics using the OpenGL API. Topics include: 2D viewing, 3D viewing, perspective, lighting, and geometry.
Prerequisite: COSC 2437 and MATH 2413.

COSC 4330 Introduction to Artificial Intelligence
3 Semester Credit Hours (3 Lecture Hours)
Foundations, directions, and applications of artificial intelligence including search algorithms, knowledge acquisition, representation, and processing. Students will gain practical experience by implementing many of the basic algorithms.
Prerequisite: COSC 2437.

COSC 4342 Computer Networks
3 Semester Credit Hours (3 Lecture Hours)
Computer-based communication systems. Topics include: advanced computer network architectures, protocols, and programming.
Prerequisite: (COSC 2437 and MATH 2413).

COSC 4343 Algorithms
3 Semester Credit Hours (3 Lecture Hours)
Advanced programming techniques for algorithmic and heuristic solutions of problems. Topics include: analysis and design of algorithms, testing of algorithms, optimum and exhaustive solutions, and recursion.
Prerequisite: (COSC 2437 and MATH 2413).

COSC 4345 Introduction to Machine Learning
3 Semester Credit Hours (3 Lecture Hours)
This course gives a broad introduction to machine learning with more emphasis on intelligent system design. Topics to be covered include linear and logistic regression, neural networks, clustering, classification, decision tree, evolutionary computation, feature selection, and reinforcement learning. The courses will explore various applications of machine learning to computer science, process modeling, pattern and speech recognition, data mining, and bioinformatics.

COSC 4348 Systems Programming
3 Semester Credit Hours (3 Lecture Hours)
The design and implementation of system software such as device drivers, application support libraries, and interprocess communication. Students will study and use systems programming tools.
Prerequisite: COSC 3346 and 3324.

COSC 4353 Compiler Construction
3 Semester Credit Hours (3 Lecture Hours)
This course introduces the basic concepts and mechanisms traditionally employed in language translators, with emphasis on compilers. Topics include: strategies for syntactic and semantic analysis, techniques of code optimization and approaches toward code generation.
Prerequisite: COSC 4360.

COSC 4354 Senior Capstone Project
3 Semester Credit Hours (3 Lecture Hours)
Teamwork and formal methods of systems analysis and design are emphasized. Students will complete a large team project. Fall, Spring.
Prerequisite: COSC 3370 and 3336 and (COSC 4100 or 3300).

COSC 4360 Principles of Programming Languages
3 Semester Credit Hours (3 Lecture Hours)
The study of programming language design including syntax, semantics, behavior, and implementation issues in imperative, functional, logic, and object-oriented languages. Other topics include type theory, concurrency, data dependency, and nondeterminism.
Prerequisite: COSC 2437.

COSC 4365 Windows Security
3 Semester Credit Hours (3 Lecture Hours)
This course focuses on advanced system administration topics. An in depth understanding of various concepts such as operating systems, servers, file systems authentication, and user support services are explored. Topics include security issues, user and group administration, server and work-station integration, central repositories for updates, Active directory, DMZ, web servers, email servers, electronic system update and maintenance, backup and restoration strategies and techniques, integrated mass storage technologies and alternative client technologies.
Prerequisite: (COSC 2348) and (COSC 2465).

COSC 4367 Firewall and Intrusion Detection Systems
3 Semester Credit Hours (3 Lecture Hours)
This is an applied course which focuses on the standards and technologies used to establish inter-network structures that will support a TCP/IP data stream for higher-level services to operate over. This course introduces firewalls, Intrusion Prevention Systems (IPS), and Intrusion Detection Systems (IDS) technology. Topics include Windows, Linux, Check Point and Cisco firewalls, TCP/IP and open system interconnection (OSI) models, attack traffic analysis, and network based and host based hardware and software. Device configuration will be examined and evaluated with appropriate exercises.
Prerequisite: (COSC 4365) and COSC 3372.

COSC 4368 Penetration Testing
3 Semester Credit Hours (3 Lecture Hours)
This course focuses to increase the students understanding of how to recognize a potential cyber attacker and identify vulnerabilities through the use of vulnerability analysis tools. Students will audit, monitor, and revise system security to ensure appropriate levels of protection are achieved. Incident response and handling, security log analysis, attacker identification, system recovery and postmortem procedures will be addressed.
Prerequisite: COSC 3474.

COSC 4369 Incident Response
3 Semester Credit Hours (3 Lecture Hours)
This course focuses on the standards and technologies used to establish organization structures that will support information technology incident response, business continuity and disaster recovery efforts. This course introduces incident response, business continuity and disaster recovery planning concepts as well as tools and techniques. Topics include the development and implementation of incident response, business continuity and disaster recovery plans, attack traffic analysis, and network-based and host-based hardware and software. Concepts will be examined and evaluated with appropriate exercises.
Prerequisite: COSC 3372.

COSC 4370 Models of Computation
3 Semester Credit Hours (3 Lecture Hours)
A study of formal languages, grammars, and associated abstract machine models. Topics include regular and context-free languages and grammars, finite state automata, Turing machines, and the Chomsky hierarchy.
Prerequisite: COSC 4343.

COSC 4396 Directed Independent Study
3 Semester Credit Hours
See College description. Offered on sufficient demand.

COSC 4590 Selected Topics
1-5 Semester Credit Hours (1-5 Lecture Hours)
Variable content. May be repeated for credit depending on topic. Offered on sufficient demand.
Prerequisite: COSC 4365.

COSC 4690 Contracted Field Experience in Computer Science
1-6 Semester Credit Hours (6 Lecture Hours)
Individual contract agreement involving student, faculty, and cooperating agency to gain practical experience in off-campus setting.