

Computer Engineering

Fields of Study

Embedded computers are small and simple devices that can be found in many machines—for example, telephones, cellular phones, MP3 players, PDAs, TVs, digital cameras, robots, aircraft control systems, microwave ovens, remote controls, sound systems, and so on. Computer engineers deal with the design, implementation, and analysis of the hardware and software for computing systems. Computer engineering involves the design and development of future computing systems and the study of the theory and techniques used in designing hardware and software. Computer engineers will continue to play a major role in developing such systems.

The computer engineering (CPE) program is a multi-disciplinary program of study that promotes the integration of computer hardware, software, interfacing, and design through computer science and engineering curriculums. The program also offers elective flexibility for specialization in different aspects of computing and related areas.

Mission Statement

The bachelor science in computer engineering program at Shepherd University provides students with leadership and teamwork experiences in a global information society and the knowledge to design, build, operate, and maintain computer systems that meet a wide range of information processing requirements. The course of study includes hardware design and software systems, theory and applications of computers, mathematics, physics, chemistry, electrical signals and circuits, logic design, computer architecture, operating systems, database systems, data communications, microprocessors, embedded systems, computer programming, and artificial intelligence.

Opportunities

The use of computers in our daily lives is increasing dramatically. Hardware and software technology changes rapidly and computer-related companies are always looking for computing professionals. Computer engineering is one of the hottest area for job opportunities. According to the U.S. Department of Labor, the need for computer engineers is projected to grow between 10-20 percent by 2014. At the same time, data from the 2003 National Science Foundation's survey shows that the median salaries for computer engineering graduates are the highest at the bachelor's degree level, and the National Association of Colleges and Employers (NACE) and CNN Money repeatedly rank computer engineering as the top three "Most lucrative college degrees."

Suggested Course Schedule for Computer Engineering

Some of the general studies requirements could be taken during summer semester as and when the courses are offered. This would leave more time to concentrate on upper division courses. Furthermore, it is the responsibility of the student to meet with a faculty member and decide on a research topic for ENGR 490 at the end of the second year.

First Year Curriculum

First semester	16	Second semester.....	15
CIS 104 Introduction to CIS	3	MATH 207 Calculus I.....	4
ENGR 101 Introduction to Engineering	3	CHEM 207 General Chemistry I.....	3
MATH 100 Freshman Seminar.....	1	CHEM 207L General Chemistry Lab	1
MATH 155 Discrete Structures	3	ENGL 104 Science and Technical Writing	3
ENGL 101 Written English.....	3	ENGR 221 Introduction to Electrical Engineering.....	3
General studies.....	3	ENGL 222 Introduction to Electrical Engineering Lab.....	1

Second Year Curriculum

First semester	15	Second semester.....	17
MATH 208 Calculus II.....	4	CIS 234 Introduction to Networking.....	3
PHYS 221 General Physics I.....	3	MATH 254 Discrete Mathematics.....	3
PHYS 221L General Physics Lab	1	ENGR 224 Electrical Circuits	3
CIS 211 Computer Language Concepts	4	ENGR 224L Electrical Circuits Lab	1
General studies.....	3	PHYS 222 General Physics II.....	3
		PHYS 222L General Physics II Lab.....	1
		General studies.....	3

Third Year Curriculum

First semester	17	Second semester.....	16
MATH 307 Linear Algebra.....	3	CIS 390 Operating Systems	3
ENGR 305 Digital Logic	3	MATH 310 Differential Equations.....	4
ENGR 305L Digital Logic Lab	1	ENGR 326 Linear Systems	3
CIS 386 Computer Organization.....	4	General studies.....	6
ECON 205 Principles of Macroeconomics.....	3		
General studies.....	3		

Fourth Year Curriculum

First semester	17	Second semester.....	15
CIS 421 Computer Architecture.....	3	CIS 482 Realtime and Embedded System Design	3
CIS 433 Microprocessor System Design	3	ENGR 490 Engineering Capstone Project.....	3
CIS 433L Microprocessor System Design Lab.....	1	Technical elective.....	3
MATH 321 Probability and Statistics.....	3	General studies.....	6
Technical elective.....	4		
General studies.....	3		



For more information about Shepherd's computer engineering program, contact:

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Computer and Information Sciences

Computer science is the study of computers and computational systems: their theory, design, development, and applications. Computer scientists design and analyze algorithms to solve problems and develop and study the performance of computer hardware and software. Computer scientists work in challenging and rewarding jobs that encompass design, environmental planning, management, manufacturing, system engineering, law, medicine, teaching, and many other exciting areas.

The computer and information sciences program at Shepherd University is a comprehensive program with concentrations in computer science (CS), computer programming and information systems (CPIS), networking and security (NS), and computer graphics and game design (CGG). Our approach is to teach students fundamental principles and problem-solving skills so that they are able to become creative problem solvers, develop and manage state-of-the-art computing systems, and have productive careers in computer science or information technology. Graduates of the program will be prepared to apply their knowledge professionally in the computer industry or to pursue graduate studies.

The four concentrations provide students flexibility to choose a course of study most interesting to them. Our students are encouraged to seek the opportunity to double-major in areas ranging from mathematics, engineering, economics, and business to psychology.

Concentrations

Computer Science

This is a traditional computer science curriculum with courses in data structures and algorithms, operating systems, databases, programming languages, and software engineering. This concentration builds a solid foundation of computing theories with their applications in mind.

Computer Programming and Information Systems

This track emphasizes applications of computer and information systems in businesses. Courses include systems analysis and design, management information systems, Windows programming, other upper-level computer science courses, and courses from the business department such as accounting and principles of management.

Networking and Security

This track focuses on concepts and skills related to design and management of computer networks. Courses include computer architecture, data communications, local area networks, inter/intra networking, and network security.

Computer Graphics and Game Design

This track focuses on concepts and skills that are essential to graphics programming in a popular graphics library such as OpenGL or DirectX, and the design and construction of interactive computer games. Courses include algorithms and data structures, software engineering, artificial intelligence, computer graphics, and game design and programming.

Suggested Course Schedule for Computer and Information Science

All four concentrations in CIS have similar course plans for the first two years. Some concentration may have a slightly different plan. For example, CPIS has ACCT 201 during the second year. The following table shows a typical course plan for the first two years in CIS.

First Year Curriculum

First semester.....	17	Second semester.....	16
MATH 100 Freshman Seminar.....	1	MATH 155 Discrete Structures.....	3
CIS 102 Microcomputer Applications.....	3	CIS 211 Computer Language Concepts.....	4
CIS 104 Introduction to Computer and Information Sciences...	3	CIS 234 Introduction to Networking.....	3
MATH 205/207 Calculus.....	4	General studies.....	6
General studies.....	6		

Second Year Curriculum

First semester.....	16	Second semester.....	16
CIS 314 Advanced Computer Language Concepts.....	4	CIS 321 Data and File Structures.....	4
MATH 254 Discrete Mathematics.....	3	MATH 314 Statistics.....	3
General studies.....	9	General studies.....	9

Third and Fourth Year Concentration Curriculum*

Computer Science

CIS 331	Programming Languages
CIS 421	Computer Architecture
CIS 431	Algorithms and Data Structures
CIS 487	Software Engineering

Computer Programming and Information Systems

CIS 302	Windows Programming
CIS 418	Management Information Systems
CIS 487	Software Engineering
MATH 354	Operation Research
ACCT 201	Introductory Accounting
BADM 310	Principles of Management
BADM 345	Business Communications

Networking and Security

ENGR 305	Logic Design and Lab
CIS 419	Data Comm and Computer Network
CIS 421	Computer Architecture
CIS 423	Server Operating Systems and System Programming
CIS 395	Introduction to Cryptography and Computer Security
CIS 486	Network Security

Computer Graphics and Game Design

CIS 302	Windows Programming
CIS 324	Introduction to Artificial Intelligence
CIS 405	Computer Graphics
CIS 431	Algorithms and Data Structures
CIS 450	Game Design and Programming

*CIS 386 Computer Organization, CIS 390 Operating Systems, and CIS 388 Database Management Systems are required for every concentration in CIS and are not listed.



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Mathematics

Mathematics is the basis of all sciences, and it can be argued that good training in mathematics enhances all intellectual activity in general. Mathematical training develops a flexible mind and an ability to quickly and efficiently learn new things and solve diverse problems that arise in all walks of life and can also help students succeed in fields other than mathematics. Frequently, the best programmers in computer science are mathematicians. Fields like economics, business, medicine, the fine arts, and literature often have people with a solid mathematical background.

The various concentrations below provide students with the flexibility to choose a course of study that is most interesting to them. As society becomes more technically oriented and science dependent, there will be a growing need for people who are well trained in the sciences and mathematics. Students with strong mathematical skills and a desire to be in a challenging major will have a clear edge in the job market. First-hand experience with our graduates demonstrates that all our mathematics majors find satisfactory employment and very positive feedback from employers

Concentrations

Industrial Mathematics

This comprehensive major is designed to land graduating students in an industrial job upon graduation. The department constantly monitors the needs of industry and tailors its course offerings in direct consultation with industries. In addition, faculty members frequently invite guest lecturers from nearby companies to talk with students.

Traditional Mathematics

This major is geared toward the more theoretical aspects of mathematics. Students in the traditional mathematics program are prepared for graduate school or a career in actuarial science. The department sponsors problem-solving seminars and contests to keep students engaged and challenged. Students receive lots of individual attention from faculty members even outside of class.

Engineering

The focus of this concentration is to prepare students for the third year of a baccalaureate degree in engineering. The concentration emphasizes providing a strong foundation in the mathematical, physical, computer, and engineering sciences which constitute the core of all areas of engineering. Specialization in a particular engineering field (electrical, mechanical, chemical, civil, etc.) will occur upon transfer. The first two years of this concentration are articulated with the school of engineering at West Virginia State University.

Mathematics Education

This major prepares students for a teaching career. There is a demand for mathematics teachers nationwide. Our students have been exceptionally successful in passing the required certification exam. Our mathematics education program is nationally accredited and NCATE/NCTM approved. The mathematics faculty members have a good rapport with a number of local high schools, and the department makes a special effort in preparing education majors to perform well on the certification exam.

Double Major

A double major in mathematics and computer science provides students with great flexibility in job placement.

Suggested Course Schedule for Industrial Mathematics

First Year Curriculum

First semester.....	17	Second semester.....	16
MATH 100 Freshman Seminar.....	1	MATH 208 Calculus II.....	4
ENGR 101 Engineering.....	3	ENGR 102 Engineering II.....	3
ENGL 101 Written English.....	3	BADM 150 Introduction to Business.....	3
MATH 155 Discrete Structures.....	3	ECON 205 Principles of Macroeconomics.....	3
MATH 207 Calculus I.....	4	MATH 254 Discrete Mathematics.....	3
General studies.....	3		

Second Year Curriculum

First semester.....	17	Second semester.....	17
MATH 321 Probability and Statistics.....	3	MATH 309 Calculus III.....	4
CIS 234 Introduction to Networking OR		MATH 310 Differential Equations.....	4
CIS 287 Systems Analysis and Design.....	3	ENGR 351 Introduction to Fluid Mechanics.....	3
ENGR 221 Introduction to Electrical Engineering.....	3	ECON 206 Principles of Microeconomics.....	3
ENGR 221L Introduction to Electrical Engineering Lab.....	1	General studies.....	3
PHYS 221 General Physics.....	3		
PHYS 221L General Physics Lab.....	1		
ENGL 104 Science and Technical Writing.....	3		

Third Year Curriculum

First semester.....	16	Second semester.....	16
MATH 318 Numerical Analysis.....	3	MATH 433 Applied Mathematics.....	3
PHYS 222 General Physics II.....	3	ENGR 326 Linear Systems.....	3
PHYS 222L General Physics II Lab.....	1	ENGR 243 Engineering Mechanics of Materials.....	3
MATH 329 Mathematical Modeling.....	3	ENGR 305 Digital Logic and Design and Lab OR	
ENGR 241 Engineering Statics.....	3	CHEM 207 General Chemistry AND	
General studies.....	3	CHEM 207L General Chemistry Lab.....	4
		ENGR 242 Engineering Dynamics.....	3

Fourth Year Curriculum

First semester.....	15	Second semester.....	14
MATH 354 Operations Research.....	3	MATH 392 Cooperative Education in Mathematics.....	3
MATH 307 Introduction to Linear Algebra.....	3	General studies.....	11
BADM 310 Principles of Management.....	3		
General studies.....	6		



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Computer and Information Technology

The computer and information technology (CIT) program prepares students for existing and emerging jobs and careers in the application of information systems and technology. Students in this program will learn the most current knowledge, concepts, and tools in a variety of IT areas, and develop an appreciation of the connection between the real life and digital world. The core courses in CIT degree will ensure students have a solid foundation of information system, networking, database, information security, software development, and Web programming.

Concentrations

Information Technology

The bachelor of science in computer engineering program at Shepherd University provides students leadership and teamwork experiences in a global information society and the knowledge to design, build, operate, and maintain computer systems that meet a wide range of information processing requirements. The course of study includes hardware design and software systems, theory and applications of computers, mathematics, physics, chemistry, electrical signals and circuits, logic design, computer architecture, operating systems, database systems, data communications, microprocessors, embedded systems, computer programming, and artificial intelligence.

Biometrics and Information Security

This track is to provide students with key concepts of both biometrics and information security areas. Students will also learn how biometrics can be employed to enforce and enhance information security. The course of study includes biometrics fundamentals, biometrics and information security, management information systems, and network security. Graduates of this program are prepared to apply their knowledge and skills in financial institutes, law enforcement, and a variety of business and administrative organizations.

Web Programming and Design

This track is designed to provide students with fundamental concepts and the most current skills and tools related to the design and development of professional Web sites. Course offerings include programming languages (Java, C#, XHTML, etc.), database management system, XML and Web services technology, and Web design studio.

Suggested Course Schedule for Computer and Information Technology

All three concentrations in CIT have similar course plans for the first two years. The following table shows a typical course plan for CIT students in their first two years.

First Year Curriculum

First semester.....	14 or 17	Second semester.....	17
MATH 100	Freshman Seminar.....	MATH 155	Discrete Structures.....
CIS 102	Microcomputer Applications.....	CIS 211	Computer Language Concepts.....
CIS 104	Introduction to Computer and Information Sciences... 3	CIS 234	Introduction to Networking.....
MATH 108	Precalculus.....	General studies.....	7
General studies.....	7		

Second Year Curriculum

First semester	17	Second semester.....	17
MATH 314	Statistics.....	CIS 310	Information Security.....
CIS 287	Systems Analysis and Design.....	General studies	8
CIS 332	Web Programming.....	*Minor	6
*Minor	3		
General studies.....	5		

Third and Fourth Year Concentration Curriculum

Computer Information Technology

CIS 361	E-Commerce
CIS 386	Computer Organization
CIS 388	Database Management Systems
CIS 418	Management Information Systems
CIS 419	Data Communications and LAN
BADM 345	Business Communication

Biometrics and Information Security

CIS 372	Introduction to Biometrics
CIS 386	Computer Organization
CIS 388	Database Management Systems
CIS 418	Management Information Systems
CIS 419	Data Communications and LAN
CIS 486	Network Security

Web Programming and Design

CIS 302	Windows Programming
CIS 334	Web Programming II
CIS 386	Computer Organization
CIS 388	Database Management Systems
CIS 419	Data Communications and LAN
CIS 450	Web Design Studios

*Note all three concentrations in CIT require a minor for year three and four.



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