B.S. IN SOFTWARE ENGINEERING

Overview

Software Engineering is concerned primarily with the systematic and disciplined approach to developing software systems. It requires the application of both computer engineering and computer science principles and practices to the creation, operation, and maintenance of software systems and applications. Software systems are becoming increasingly complex, and emerging technologies are pushing the boundaries of reusable components and software quality assurance. The growth of software use in all areas and aspects of everyday life has increased over the past decades and has now become an integral part of society. The reliance on software in critical areas including infrastructure, transportation, utilities, national security, and defense has resulted in the need for properly trained and motivated individuals. ACM along with IEEE, has also indicated in their Computing Curricula 2020 (Dec 31st. 2020), that there has also been a shift away from knowledge-based learning to competency-based learning. They define competency as a combination of Knowledge (know-what) + Skills (know-how) + Disposition (know-why). This program brings together these areas using fundamental software courses to provide base knowledge, mid-level and advanced application areas with practical examples to build the competencies and the communication, intellectual, social and moral dispositions needed in this field.

This Program prepares students for successful careers in various software related jobs such as Software Developers, Quality Assurance Analysts, Computer Programmers, Web Developers, Database Administrators, Information Security Analyst and Testers. This program will not satisfy the licensure requirements for professional engineering registration.

To prepare students to meet these challenges, this Program establishes a solid foundation of software system fundamentals, coupled with strong hands-on experience and an understanding of professional practice and conduct. In addition to the core curriculum in software engineering, students are introduced to the paradigms of real-time, adaptive, and collaborative software systems, through a wide range of technical elective courses from the Department of Electrical and Computer Engineering. Students may also use courses from other departments with academic advisor approval. The technical electives allow students to apply the knowledge they have gained to different application areas. This provides valuable hands-on experience in contemporary application areas, which enhances the students' potential career development opportunities.

Domain Areas

The program includes optional additional domain area concentrations as a guide for elective selection. These allow students to gain more depth in various domain areas of interest by taking advanced undergraduate courses in these areas. Each concentration provides courses that students should take to further their competency in the selected domain area. The domain area concentrations are Artificial Intelligence and Cybersecurity.

Curriculum Requirements

Code	Title	Credit Hours
Required Engineering Courses		
EGN 110	Innovation and Entrepreneurship in Engineering	3
or EGN 114	Global Challenges Addressed by Engineering and Technology	
EGN 123	Computing and Digital Solutions for the future	3
ECE 118	Introduction to Programming	3
ECE 211	Logic Design	3
ECE 212	Processors: Hardware, Software, and Interfacing	3
ECE 218	Data Structures	3
ECE 315	Digital Design Laboratory	1
ECE 318	Algorithms	3
ECE 322	Systems Programming	3
ECE 368	Internet Computing I	3
ECE 376	Introduction to Cybersecurity (NEW COURSE Introduction to Cybersecurity)	3
ECE 412	Software Engineering and Architecture	3
ECE 413	Software Design and Verification	3
ECE 421	Computer Operating Systems	3
ECE 467	Database Design and Management	3
ECE 470	Network Client-Server Programming	3
ECE 481	Senior Project I	1
ECE 482	Senior Project II	2
Software Engineering Technical Electives and/or Concentrations		**18**
SE Technical Electives		

300 Level and above ECE or CSC courses with approval of Academic Advisor. Two electives may also be taken from CIM412, CIM413, CIM422, CIM443, CIM453.		
Artificial Intelligence Concentration (9 credit hours)		
ECE 537	Principles of Artificial Intelligence	
ECE 548	Machine Learning	
ECE 553	Neural Networks	
Cybersecurity Concentration (9 credit hours)		
ECE 534	Communication Networks	
ECE 576	Internet and Intranet Security	
ECE 579	Mobile Computing	
Math + Science		
ECE 310	Introduction to Engineering Probability	3
MTH 151	Calculus I for Engineers (fulfills Quantitative Skills Proficiency Requirement))	5
MTH 162	Calculus II	4
MTH 210	Introduction to Linear Algebra	3
MTH 309	Discrete Mathematics I	3
Basic Science (/Lab)		12
Basic Science (/Lab) Electives are selected in consultation with the Academic Advisor from courses in Biology, Chemistry, Environmental Science, Geological Science, Marine Science, or Physics.		
General Education Requirements		
Written Communication Skills:		
WRS 105	First-Year Writing I	3
WRS 107	First-Year Writing II: STEM	3
Quantitative Skills:		
MTH 151	Calculus I for Engineers (fulfilled through the major)	
Areas of Knowledge:		
Arts & Humanities Cognate		9
People & Society Cognate		9
People & Society Cognate (9 credits) (fulfilled through the major)		
Total Credit Hours		**121**

Sample Plan of Study

Freshman Year		
Fall		**Credit Hours**
EGN 110 or 114	Innovation and Entrepreneurship in Engineering or Global Challenges Addressed by Engineering and Technology	3
ECE 118	Introduction to Programming	3
WRS 105	First-Year Writing I	3
MTH 151	Calculus I for Engineers	5
	Credit Hours	**14**
Spring		
EGN 123	Computing and Digital Solutions for the future	3
ECE 218	Data Structures	3
WRS 107	First-Year Writing II: STEM	3
MTH 162	Calculus II	4
	Credit Hours	**13**
Sophomore Year		
Fall		
ECE 211	Logic Design	3
ECE 318	Algorithms	3
MTH 210	Introduction to Linear Algebra	3

Basic Science (/Lab)		4
A&H Cognate Course		3
	Credit Hours	**16**
Spring		
ECE 212	Processors: Hardware, Software, and Interfacing	3
ECE 315	Digital Design Laboratory	1
ECE 310	Introduction to Engineering Probability	3
ECE 368	Internet Computing I	3
MTH 309	Discrete Mathematics I	3
P&S Cognate Course		3
	Credit Hours	**16**
Junior Year		
Fall		
ECE 322	Systems Programming	3
ECE 376	Introduction to Cybersecurity	3
ECE 412	Software Engineering and Architecture	3
Basic Science (/Lab)		4
A&H Cognate Course		3
	Credit Hours	**16**
Spring		
ECE 413	Software Design and Verification	3
ECE 421	Computer Operating Systems	3
ECE 467	Database Design and Management	3
Basic Science (/Lab)		4
P&S Cognate Course		3
	Credit Hours	**16**
Senior Year		
Fall		
ECE 481	Senior Project I	1
SE Elective		3
SE Elective		3
SE Elective		3
SEl Elective		3
A&H Cognate Course		3
	Credit Hours	**16**
Spring		
ECE 470	Network Client-Server Programming	3
ECE 482	Senior Project II	2
SE Elective		3
SE Elective		3
P&S Cognate Course		3
	Credit Hours	**14**
	Total Credit Hours	**121**

Program Mission
Program Educational Objectives

We expect that the alumni of the Software Engineering Program will exhibit the following:

1. Successful careers in dynamic and multidisciplinary fields with the ability to apply software engineering practices within societal, global, and environmental contexts in an ethical manner.
2. Demonstrating life-long learning through activities such as completion of graduate degrees and/or professional development.

Student Learning Outcomes

1. An ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics.
2. An ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors.
3. An ability to communicate effectively with a range of audiences.
4. An ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts.
5. An ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives.
6. An ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions.
7. An ability to acquire and apply new knowledge as needed, using appropriate learning strategies.