Certificate: Software Engineering

Software Engineering provides a systematic, disciplined and quantifiable approach to the development, operation and maintenance of software. The program includes a core engineering course plus electives chosen from software reliability, embedded systems, management, interface design and case studies. (12 credit hours)
Certificate offered on Campus and via Distance Learning

CIS 553 Software Engineering
3 credits
Software engineering characterizes software production and maintenance as a process to be managed. A software process includes specification, design, verification and testing, and maintenance over a lifecycle. Related topics include metrics, design reuse, techniques for quality improvement and project management, software reliability and fault tolerance.

CIS 565 Software Quality Assurance and Reliability
3 credits
This course focuses on the processes, methods, and techniques for developing quality software, and maintaining quality software. Software testing processes at the unit, module, subsystem, and systems levels are discussed. Testing methods covered include: automatic and manual generation of test data, static vs. dynamic analysis, functional testing, inspections, and reliability assessment.

CIS 575 Software Engineering Management
3 credits
Quantitative models of the software lifecycle; cost-effectiveness; uncertainty and risk analysis; planning and modeling a software project; software cost estimation (COCOMO, Function points); software engineering metrics; software project documentation. Special emphasis on emerging software process standards such as the Capability Maturity Model of the Software Engineering Institute, and other international ones.

CIS 577 Software User Interface Design
3 credits
Current theory and design techniques concerning how user interface for computer systems should be designed to be easy to learn and use. Focus on cognitive factors, such as the amount of learning required, and the information-processing load imposed on the user. Emphasis will be on integrating multimedia in the user interface.

CIS 505 Algorithm Analysis and Design
3 credits
Introduction to systems and systems engineering, tools in systems analysis, the system design process, design for operational feasibility and systems engineering management.

ECE 554 Embedded Systems
3 credits
Survey of real time, sampled data systems and embedded applications, e.g., digital controllers, fuzzy logic, neural networks, and diagnostic systems. Principles and

characteristics of sensors and devices; embedded microprocessors; processor/device interfaces; time critical I/O handling; data communications in embedded environments will be discussed. Overview of embedded operating systems, cross development techniques and tools. Design of real time systems with micro-controllers such as the 68HC11 and 68332. Object oriented software development, using both assembly language and high level languages. This is a project-oriented course.

ECE 576 Information Engineering
3 credits
This course will cover the fundamental concepts of information engineering including computation, storage, communication, and application. Examples of topics are multimedia data such as video, audio, image and text, multimedia transmission through local and wide area networks, multimedia data representation, storage and compression. Information engineering applications will be discussed and students are expected to complete a project in a selected application.

ECE 537 Data Mining
3 credits
Introduction to the fundamental concepts of data mining. In depth study of the principles, algorithms, techniques, implementations and applications of data mining, including mining sequential and structured data, stream data, text data, spatiotemporal data, Web data and other forms of complex data.

ECE 552 Fuzzy Systems
A study of the concept of fuzzy set theory including operations on fuzzy sets, fuzzy relations, fuzzy measures, fuzzy logic, with an emphasis on engineering applications. Topics include fuzzy set theory, applications to image processing, pattern recognition, artificial intelligence, computer hardware design, and control systems.

ECE 574 Advanced Software Techniques in Engineering Applications
3 credits
Graduate-level introduction to data structures, high-level engineering analysis languages, hardware description languages, algorithm complexity analysis; engineering applications.

ECE 583 Artificial Neural Networks
3 credits
Students will gain an understanding of the language, formalism, and methods of artificial neural networks. The student will learn how to mathematically pose the machine learning problems of function approximation/supervised learning, associative memory, and self-organization, and analytically derive some well-known learning rules, including back prop. In addition, the student will learn how to perform computer simulations of various neural net models, and learn how to select appropriate model parameters, such as network architecture, hidden layer size, and learning rate.