

COLLEGE OF ENGINEERING, TECHNOLOGY AND COMPUTER SCIENCE

Samuel Hargrove, Ph.D., Dean
203 Andrew P. Torrence Hall, (615) 963-5401
Mohan J. Malkani, Ph.D., Associate Dean
230E Andrew P. Torrence Hall, (615) 963-5400

The College of Engineering, Technology and Computer Science includes the departments of Architectural and Facilities Engineering, Civil and Environmental Engineering, Electrical and Computer Engineering, Mechanical and Manufacturing Engineering, Aeronautical and Industrial Technology and Computer Science. The College has about 34 faculty full-time faculty and about 80 percent of them hold Ph.D. degrees. The Engineering Research Institute, the research arm of the College, has an average operating budget of 1.5 million dollars per year and supports about fifteen different research projects.

DEGREE PROGRAMS

	Computer and Information Systems Engineering	Ph.D.
	Computer and Information Systems Engineering	M.S.
MAJOR:	Engineering	M.E.
	COMPUTER AND INFORMATION SYSTEMS ENGINEERING (CISE)	
DEGREE:	DOCTOR OF PHILOSOPHY (Ph.D.)	
Concentrations:	Computer Communication and Networks	
	Control System and Signal Processing	
	Robotics and Computer Integrated Manufacturing	
	Mohan J. Malkani, Ph.D., Coordinator	
	230 E Andrew P. Torrence Hall	
	(615) 963-5400	

The Doctor of Philosophy (Ph.D.) program in Computer and Information Systems Engineering (CISE) is a unique interdisciplinary program. It integrates the strengths of various disciplines of computer science, computer engineering, electrical engineering, mechanical/manufacturing engineering, information systems, and systems engineering. The program further provides advanced knowledge and research experiences in the following concentration areas;

Computer Communication and Networks
 Control System and Signal Processing
 Robotics and Computer Integrated Manufacturing

Goals

1. The primary goal of the Ph.D. program in Computer and Information Systems Engineering at Tennessee State University is to prepare its graduates with expertise in systems engineering approach to the development of computer based information and manufacturing systems.
2. To offer an outstanding and unique interdisciplinary Ph.D. degree program that is research-based and builds upon the educational and research expertise of existing faculty in the three concentrations and related areas.
3. To address the critical shortage of teaching and research faculty in the areas of computer communication and networks, control system and signal processing, and robotics and computer integrated manufacturing.

Admission Procedure

All students applying for admission must submit to the Graduate School: a completed Graduate Admission Application form, two copies of transcripts from all colleges and universities previously attended, and three letters of recommendation.

Admission Requirements

For admission to the Ph.D. in CISE program, the student must have a:

1. A Bachelor of Science degree in engineering or computer science from an accredited program or a Master of Science in CISE, or a Master of Engineering or a M. S. degree in a closely related area.
2. Student with a B.S. degree and/or Masters degree(s) from foreign universities must submit a Certificate of Proficiency in English or a minimum score of 550 or equivalent on the Test of English as a Foreign Language (TOEFL).
3. In addition to the above, the student must have a cumulative grade point average (GPA) of 3.00 or above on a 4.00 scale for a B.S. degree graduate while a Master of Engineering or a Master of Science in CISE or a closely related M.S. degree graduate must have a 3.30 grade point average on a 4.00 scale. In addition the student must have above average grades in all of the prerequisite courses in related mathematics, engineering science, communication systems, computer hardware and computer science courses. If an evaluation of a student's transcripts reveals course or prerequisite deficiencies, the student must eliminate all deficiencies by satisfactorily completing each of the prerequisite courses prescribed before unconditional status is achieved and before completing nine (9) graduate credit hours. Student must file a letter of intent to pursue the Ph.D. degree to the Coordinator of the Ph. D. program after receiving unconditional status. None of

the courses used to eliminate undergraduate deficiencies will be used to meet degree requirements.

Transfer Credits

Transfer students with Masters degrees and beyond may transfer up to a maximum of 24 credit hours of equivalent courses towards required and/or elective courses.

Major Advisor

Initially the Coordinator of the Ph.D. program will serve as an academic advisor for all new students entering the program. Each student in the Ph.D. program is expected to select a major advisor by the beginning of the second year. All major advisors must hold tenure or tenure-track full-time graduate faculty positions.

Ph.D. Advisory Committee

A Ph.D. Advisory Committee will consist of four (4) graduate faculty from the student's program with the major advisor as its chairperson. The Ph.D. Advisory Committee will be recommended by the major advisor, with input from the student, to the Coordinator of the Ph.D. program, for approval by the Dean of the College of Engineering, Technology and Computer Science and the Dean of Graduate Studies. Upon the student's completion of core courses and selection of a concentration, this Ph.D. Advisory Committee will review the student's prior transcripts, evaluate and recommend any transfer credits, and prepare a program of study for approval by the Coordinator of the Ph.D. program and the Dean of College of Engineering, Technology and Computer Science before submission to the Dean of Graduate Studies. The Committee will supervise the student's program, administer dissertation review and approval, and finally recommend the awarding of the degree.

Retention

Students must maintain a cumulative grade point average (GPA) of 3.00 or better on the scale of 4.00, and pass all pass/fail courses throughout the program to remain in good academic standing.

Students must have a grade of B or better in all core courses and may not have more than two C grades in other courses used to meet degree requirements. After completion of nine (9) semester hours of graduate work, if the student's cumulative GPA at the end of a given semester falls below 3.00, the student will be placed on academic probation for the next semester and must satisfy the existing University requirements to return to good academic standing. Students may be dismissed from the program upon recommendation of the Ph.D. Advisory Committee for continued probation beyond two consecutive semesters.

Comprehensive Written Examination

This is a written examination designed to evaluate the student's readiness to advance to candidacy status. It is scheduled after the student has met all of the core courses and major area required and elective course requirements specified in the student's program of study and upon the recommendation of the student's major advisor. The comprehensive examination committee will develop the written examination. This is an ad hoc committee consisting of at least three (3) graduate faculty in the program and is appointed by the Coordinator of the Ph.D. program in CISE, upon the recommendation of the major advisor.

This committee will determine the passing performance and inform the student, the Coordinator, and the student's major advisor of the final outcome of the examination. The comprehensive written examination will consist of questions from the core, the student's area of study and the knowledge considered essential background for the dissertation research.

Students who pass the comprehensive written examination and meet all other requirements for candidacy for the Ph.D. degree in CISE will receive written confirmation of the status of their candidacy from the Dean of Graduate School. Students who fail the examination may take it again after at least one semester. Students who fail the examination after two attempts will be dropped from the program. Students in the Ph.D. program with good standing who do not plan to pursue the Ph.D. degree may seek to meet the M.S. in CISE or the Master of Engineering degree requirements of the University.

Oral Defense of Dissertation Proposal

The dissertation proposal is submitted to the student's major advisor and the Ph.D. Advisory Committee for review. The committee will make recommendations as needed. The proposal must be orally defended by the candidate before the advisory committee, and it must be accepted by the committee. A signature of the committee members on the dissertation proposal constitutes approval to proceed with thesis research. Only after approval of the dissertation proposal may the student register for the CISE 790 Ph.D. Dissertation course.

Admission to Candidacy for Ph.D. Degree in CISE

Admission to candidacy for Ph.D. degree in CISE will require compliance with all existing Graduate School policies such as;

1. Completion of all core and concentration courses approved for the student's program of study.
2. A minimum cumulative GPA of 3.0 or better,
3. Successful passing of Comprehensive Written Examination, and
4. Successful oral defense of dissertation proposal.

Degree Requirements

The student must successfully complete the approved program of study with a minimum cumulative GPA of 3.0 or better.

1. After the approval of the dissertation proposal, student must complete dissertation research and submit completed dissertation to the advisory committee for approval.
2. Upon approval by the advisory committee and the graduate school, the student must defend the research before the advisory committee and a public seminar before the faculty, students, alumni and/or industrial representatives.
3. Upon successful defense of research, presentation of the written dissertation, and approval by the Coordinator of the Ph.D. program and the Graduate School, the major advisor with the consent of the Ph.D. Advisory Committee will initiate recommendation for awarding of the degree.

Other Requirements

Other requirements such as residency, maximum class load, transfer of credits, time limits for credits and preparation of dissertation will comply with all existing policies of the University,

the College of Engineering, Technology and Computer Science, and the Graduate School as listed in the Graduate Catalog.

Curriculum Description

This program requires a minimum of seventy-two (72) graduate semester credit hours beyond the bachelor's degree for the Ph.D. degree in CISE. Students with master's degree in a related field may transfer up to a maximum of 24 semester credit hours of the equivalent courses for this degree. However, if a student lacks certain prerequisites or course requirements, the student may be asked to take additional courses before the required graduate courses. The program in CISE is unique and interdisciplinary because it has a core requirement that provides the necessary foundation to computer based systems integration.

Program of Study

The curriculum consists of 51 credit hours of course work and 21 credit hours of research dissertation. The course work consists of eighteen (18) credit hours of core courses and eighteen (18) credit hours of concentration, and fifteen (15) credit hours of guided electives. All graduate students must attend graduate seminars for at least two semesters.

Required Core Courses (18 semester credit hours)

CISE 5010	Data Structures and Algorithms	3
CISE 5020	Computer Architecture and Operating Systems	3
CISE 5030	Software Systems Design	3
CISE 5040	Systems Engineering	3
CISE 5220	Computer Aided Systems Design	3
CISE 5230	Computer Communications and Networks I	3

Concentration and Electives (33 semester credit hours)

Suggested courses in each of the three areas of concentration to be selected by student's Ph.D. Advisory Committee and approved by the Program Coordinator and the Dean of the College of Engineering, Technology and Computer Science.

Computer Communication and Networks

CISE 5110	Intro. to Artificial Intelligence	3
CISE 5200	Probability, Random Processes and Estimation Theory	3
CISE 5240	Management of Information Systems	3
CISE 6000	Database Management Systems	3
CISE 6100	Optimization in Operations Research	3
CISE 6340	Computer Communication and Networks II	3
CISE 6360	Distributed Computing Theory and Design	3
CISE 6440	Numerical Visualization	3
CISE 7100	System Modeling and Simulation	3
CISE 7300	Network Programming	3
CISE 7310	Metrics and Models in Software Quality Engr.	3
CISE 7340	High Performance Computing Applications	3
CISE 7350	Network Security and Risk Analysis	3
CISE 7370	Optical Communication	3
EECE 5230	Digital Image Processing	3
ENGR 5070	Object Oriented Programming for Engrs.	3

Control System and Signal Processing

CISE 5110	Intro. to Artificial Intelligence	3
CISE 5300	Fundamentals of Robotics	3

EECE 5220	Modern Signal Processing	3
EECE 5230	Digital Image Processing I	3
EECE 5640	Advanced Topics in Control Systems	3
EECE 6220	Robust Control Theory	3
EECE 6230	Nonlinear Control Systems	3
EECE 6250	Digital Spectral Analysis	3
EECE 6260	Pattern Recognition and Classification	3
EECE 7200	Statistical Signal Processing	3
EECE 7220	Intelligent Control Systems	3
EECE 7230	Adaptive Filtering and Stochastic Control Systems	3
CISE 7240	Computer Vision	3
CISE 7420	Advanced Robotics	3
CISE 7450	A. I. Robotics	3
ENGR 5100	Methods of Applied Math for Engr.	3
ENGR 5070	Object Oriented Programming for Engr.	3
ENGR 5200	Modeling and Simulation of Dynamic Sys.	3
CISE 7506	Special Topics	3

Robotics and Computer Integrated Manufacturing

MEEN 5010	Introduction to Manufacturing	3
MEEN 5040	Vibration Analysis	3
MEEN 5130	Flexible Manufacturing Systems	3
MEEN 5430	Intro. to Computational Fluid Dynamics	3
MEEN 5610	Computer Aided Design and Manufacturing	3
MEEN 5620	Design for Manufacturability	3
MEEN 5630	Manufacturing Quality Control and Managem.	3
MEEN 5640	Manufacturing Modeling and Simulation	3
MEEN 5650	Predictive and Preventive Maintenance	3
MEEN 5660	Concurrent Manufacturing	3
ENGR 5100	Methods of Applied Math for Engrs.	3
ENGR 5070	Object Oriented Programming for Engr.	3
ENGR 5200	Modeling and Simulation of Dynamic Syst.	3
CISE 5300	Fundamentals of Robotics	3
CISE 6400	Fundamentals of Robotics in Manufacturing	3
MEEN 6430	Manufacturing Diagnosis and Prognosis Tech.	3
CISE 6440	Numerical Visualization	3
MEEN 6450	Transport Phenomena in Manufacturing	3
CISE 7420	Advanced Robotics	3
CISE 7430	Mechatronics Systems	3
CISE 7450	A.I. Robotics	3
CISE 7507	Special Topics	3

Ph.D. Dissertation (21 semester credit hours)

CISE 7900	Ph.D. Dissertation	21
-----------	--------------------	----

Seminar (0 semester credit hours registration for two semesters is required)

CISE 7600	Seminar	0
-----------	---------	---

**MAJOR: COMPUTER AND INFORMATION
SYSTEMS ENGINEERING (CISE)
DEGREE: MASTER OF SCIENCE (M.S.)**

The Master of Science degree program in Computer and Information Systems Engineering is designed to meet the needs of information industry by preparing its graduates with background in computer hardware, computer software and systems approach to the design and development of computer integrated systems.

The Master of Science degree requires: admission of all degree seeking students to candidacy for the degree after completion of all prerequisites identified at the time of initial admission and the completion of nine (9) required graduate credit hours in residence at the university; a minimum of thirty (30) graduate semester hours of course work, including at least eighteen (18) credit hours of required core courses, six (6) credit hours of thesis, and six (6) credit hours of electives to be chosen from a list of courses and with the consent of the advisor and the approval of the department head.

Substitution within the core courses may be permitted with the consent of the advisor and approval of the department head.

Admission Requirements

The program provides opportunities for students from electrical or other engineering fields, computer science, and business majors to pursue this degree through different levels of admission status.

For admission to the M.S. in CISE program, the student must have B. S. degree in Electrical Engineering, or other engineering disciplines or computer science from an accredited program.

For unconditional admission, the student must also have the necessary prerequisite courses and a cumulative grade point average (GPA) of 3.00 or above out of 4.00.

Conditional Admission: Since this is an interdisciplinary program, student's previous preparation in the basic and engineering sciences, electrical engineering and computer science must reflect successful completion of basic sciences and differential equations, numerical analysis, linear algebra, probability and statistics, engineering design and engineering economics, circuit theory, analog and digital electronics, communication theory, advanced programming, data structures and operating systems, computer networks or their equivalents. If an evaluation of the student's transcripts shows prerequisite deficiencies, or a cumulative GPA between 2.75 to 3.0, the student will be eligible for conditional admission. Students with a B. S. degree in Business or other related science areas with a cumulative GPA of 3.00 or above will be eligible for conditional admission. Also, students with a B.S. degree in engineering with a cumulative GPA between 2.50 to 2.74 and a passing score of 70 in Fundamentals of Engineering will be eligible for conditional admission. Students with exceptional experience in this field will be considered on an individual basis.

Admission to Candidacy

The university policy for admission to candidacy will be followed. However, students admitted conditionally must remove all deficiencies with a cumulative GPA of 3.25 in undergraduate prerequisite courses and accumulate no more than 9 graduate credits before achieving unconditional status.

PROGRAM OF STUDY

Courses Required - 24 credit hours

CISE 5010	Data Structures and Algorithms	3
CISE 5020	Computer Architecture & Operating System	3
CISE 5030	Software Systems Design	3
CISE 5040	Systems Engineering	3
CISE 5220	Computer Aided System Design	3
CISE 5230	Computer Communication and Networks	3
CISE 5905	Master of Science Thesis I	3
CISE 5906	Master of Science Thesis II	3

Two Electives from the list below with the consent of advisor - 6 credit hours

CISE 5060	Error Control Codes	3
CISE 5110	Intro. to Artificial Intelligence	3
CISE 5240	Management of Information Systems	3
CISE 5300	Fundamentals of Robotics	3
CISE 5400	Special Topics in CISE	3
CISE 6100	Optimization in Operations Research	3
CISE 6360	Distributed Computing Theory & Design	3

Electives will be selected with the consent of the advisor and approval by the department head.

**MAJOR: ENGINEERING
DEGREE: MASTER OF ENGINEERING (M.E.)
CONCENTRATIONS:**

**BIOMEDICAL ENGINEERING
CIVIL ENGINEERING
ENVIRONMENTAL ENGINEERING
ELECTRICAL ENGINEERING
MECHANICAL ENGINEERING
MANUFACTURING ENGINEERING**

The College of Engineering, Technology and Computer Science offers work leading to the Master of Engineering (M.E.) degree with six concentrations: Biomedical Engineering, Civil Engineering, Environmental Engineering, Electrical Engineering, Mechanical Engineering, and Manufacturing Engineering.

The Master of Engineering degree requires

1. admission of all degree seeking students to candidacy for the degree after the completion of nine (9) graduate credit hours in residence at the University;
2. a minimum of thirty-three (33) graduate semester hours of course work, including at least six (6) credit hours of mathematics, three (3) credit hours of laboratory based courses, three (3) credit hours of special problems in engineering applications (design project), and six (6) credit hours of electives with the consent of the advisor.

Substitution within the core courses may be permitted with the consent of the advisor and the department head.

Admission Requirements

For unconditional admission to the Master of Engineering degree program, the student must have a bachelor's degree in engineering or science from an accredited program and must have the necessary prerequisite courses. If the evaluation of a student's