semester hours for graduation, including the 42 advanced. Electives should be chosen in consultation with an advisor.

Courses of Instruction

All Courses of Instruction are located in one section at the back of this catalog.

Course and Subject Guide

The "Course and Subject Guide," found in the Courses of Instruction section of this book, serves as a table of contents and provides quick access to subject areas and prefixes.

Department of Computer Science and Engineering

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Krishna M. Kavi, Chair

Faculty

Professors Buckles, Kavi, Parberry, Renka, Shahrokhi, Swigger. *Associate Professors* Brazile, Jacob, Mikler, Sweany, Tarau. *Assistant Professors* Akl, Dantu, Huang, Li, Mihalcea, Mohanty, Oh, Yuan. *Visiting Assistant Professor* Garlick. *Lecturers* Keathly, Retzlaff.

Introduction

The Department of Computer Science and Engineering at the University of North Texas provides very high quality educational programs by maintaining a balance between theoretical and experimental aspects of computer science, as well as a balance between software and hardware issues, and by providing curricula that serve the citizens and industrial organizations of Texas in general, and those in North Texas in particular. The department facilitates a collegial atmosphere that is conducive

to intellectual and scholarly pursuits of the faculty and students. The department strongly encourages interdisciplinary research.

At present, the department offers a bachelor of arts with a major in information technology; bachelor of science and master of science, both with a major in computer science; bachelor of science and master of science degrees, both with a major in computer engineering; and a doctoral degree in computer science and engineering. Current research interests of the faculty include theoretical computer science, databases, game programming, wired and wireless networks, computer security, artificial intelligence, natural language processing, computer systems architecture, agent based systems, collaborative learning, parallel and distributed processing, numerical analyses, wireless communication, image understanding, sensor fusion, data mining, evolutionary computation, computational epidemiology, VLSI design, medical imaging, compilers, algorithm analyses, human factors, cryptography, image processing, and bioinformatics. The departmental research is supported by federal and state agencies as well as industrial concerns.

Vision and Mission

The vision of the Department of Computer Science and Engineering is to be a recognized leader for quality education and research in selected areas in information technology, computer science and engineering. The vision will be achieved by recruiting high caliber faculty and students, and by continuously improving on the curricula and teaching methods. The department aims to establish research and educational collaborations with international institutions of higher education. The department facilitates a collegial atmosphere that is conducive to intellectual and scholarly pursuits of the faculty and students. The department strongly encourages interdisciplinary research.

The mission of the Department of Computer Science and Engineering is to provide high quality education through its undergraduate and graduate degree programs in information technology, computer science and computer engineering, as well as to conduct nationally recognized research in selected areas of computer science and engineering. The BA with a major in information technology provides a high quality education in a liberal arts setting that is responsive to the needs in the surrounding business community. The BS with a major in computer science and the BS with a major in computer engineering provide very high quality education by maintaining a balance between theoretical and experimental aspects of computer science and computer engineering, as well as a balance between software and hardware issues,

College of Engineering

and by providing curricula that serve the citizens and industrial organizations in Texas in general, and those in North Texas in particular. The graduate programs, including the MS with a major in computer science, the MS with a major in computer engineering and the PhD with a major in computer science and engineering, provide very high quality educational experience in theoretical and experimental aspects of computer science and computer engineering by providing curricula that serve the citizens and industrial organizations and research institutions in Texas and the United States.

Programs of Study

The department offers undergraduate and graduate programs in the following areas:

- Bachelor of Arts with a major in information technology;
- Bachelor of Science, and
- Master of Science, both with a major in computer science;
- Bachelor of Science, and
- Master of Science, both with a major in computer engineering;
- Doctor of Philosophy with a major in computer science and engineering.

Bachelor of Arts with a Major in Information Technology

The Bachelor of Arts degree with a major in information technology is designed to provide a broad education so that the student can take advantage of a variety of professional opportunities.

Degree Requirements

1. **Hours Required and General/College Requirements:** A minimum of 121 semester hours, of which 42 must be advanced, and fulfillment of degree requirements for the Bachelor of Arts degree as specified in the "General University Requirements" in the Academics section of this catalog, and "Engineering Requirements" as specified in the College of Engineering section of this catalog. A minimum of 31 semester hours must be completed at UNT.

2. **Major Requirements:** 39 semester hours of computer science, including CSCE 1030, 1035, 1040, 1045, 2050, 2615, 3055, 3535, 3605, 4010, 4355, 4905 and 4925. An additional 9 hours are required in computer science concentration area courses.

Supporting Area: 18 hours are required to support the computer science specialty track. Check with advisor concerning eligible courses. Advanced courses in the supporting track will assist in reaching the 42 advanced hours required for the degree. A maximum of 6 hours of credit in CSCE 4890, 4920, 4940 and 4950 will count toward this degree.

3. **Other Course Requirements:**

   a. MATH 1710, Calculus I; MATH 1780, Probability Models; and MATH 2770, Discrete Mathematical Structures.

   b. 8 hours of laboratory science chosen from: BIOL 1710/1730, 1720/1740; CHEM 1410/1430; PHYS 1710/1730, 2220/2240 (may be used to satisfy the Natural Sciences requirement of the University Core Curriculum).

4. **Minor:** Optional.

5. **Electives:** See four-year plan.

6. **Other Requirements:** A GPA of at least 2.75 on all advanced computer science courses.

BA with a Major in Information Technology

Following is one suggested four-year degree plan. Students are encouraged to see their advisor each semester for help with program decisions and enrollment. Students are responsible for meeting all course prerequisites.

FRESHMAN YEAR

FALL	HOURS
CSCE 1030, Computer Science I	4
ENGL 1310, College Writing, or ENGL 1313, Computer Assisted College Writing I*	3
Humanities*	3
Social and Behavioral Science*	3
Total	13

SPRING	HOURS
CSCE 1035, Information Systems I	3
CSCE 1040, Computer Science II	3
MATH 1710, Calculus I	4
PSCI 1040, American Government*	3
Laboratory Science*	4
Total	17

SOPHOMORE YEAR

FALL	HOURS
CSCE 1045, Information Systems II	3
CSCE 2050, Computer Science III	3
ENGL 2700, Technical Writing*	3
MATH 2770, Discrete Mathematical Structures	3
Supporting area	3
Total	15

SPRING	HOURS
CSCE 2615, Enterprise Systems Architecture, Analysis and Design	3
ENGR 2060, Professional Presentations (may be used to satisfy a portion of the Understanding the Human Community requirement**)	3
HIST 2610, United States History to 1865*	3

PSCI 1050, American Government* 3
Supporting area 3
Total 15

JUNIOR YEAR

FALL	HOURS
CSCE 3055, IT Project Management	3
CSCE 4355, Database Design and Information Integration	3
MATH 1780, Probability Models	3
Understanding the Human Community*	3
Supporting area	3
Total	15

SPRING	HOURS
CSCE 3535, Introduction to Networks and Security Management	3
HIST 2620, United States History Since 1865*	3
Supporting area	3
CSCE concentration area	3
Laboratory Science*	4
Total	16

SENIOR YEAR

FALL	HOURS
CSCE 3605, IT Project Management	3
CSCE 4905, Capstone I	3
CSCE concentration area	3
Supporting area	3
Visual and Performing Arts*	3
Total	15

SPRING	HOURS
CSCE 4010, Engineering Ethics	2
CSCE 4925, Capstone II	3
Supporting area	3
CSCE concentration area	3
Laboratory Science*	4
Total	15

See the University Core Curriculum section of this catalog for approved list of course options.
*** See College of Engineering degree requirements section of this catalog for approved list of course options.*

Actual degree plans may vary depending on availability of courses in a given semester.
Some courses may require prerequisites not listed.
Students may wish to use opportunities for electives to complete a minor of their choice.

Bachelor of Science with a Major in Computer Science

The Bachelor of Science degree with a major in computer science is a professional degree designed to prepare the student for a career of further studies in the technology and application of computers.

The Bachelor of Science degree with a major in computer science is accredited by the Computing Accreditation Commission (CAC) of the Accreditation Board for Engineering and Technology (ABET), [111 Market Place, Suite 1050, Baltimore, MD 21202, 410-347-7700].

Educational Objectives of the BS in Computer Science

Graduates will:

1. Have a broad knowledge of computer science necessary to create computer solutions to real problems.

2. Be prepared for a technical position in high-tech industry and/or be prepared for graduate study.

3. Have the ability to write technical documents such as specifications, user manuals or technical papers.

4. Have the ability to make effective technical oral presentations.

5. Be cognizant of ethical, legal and social issues of computing.

Degree Requirements

1. **Hours Required and General/College Requirements:** A minimum of 123 semester hours, of which 45 must be advanced, and fulfillment of degree requirements for the Bachelor's degree as specified in the "General University Requirements" in the Academics section of this catalog and the College of Engineering requirements.

2. **Major Requirements**: A minimum of 45 semester hours, including CSCE 1030, 1040, 2050, 2610, 3110, 3600, 4010 (2), 4110 and 4410; plus 18 hours of advanced computer science to reach 32 advanced CSCE hours required for the degree. A maximum of 6 hours of credit in CSCE 4890, 4920, 4940 or 4950 will count toward this degree.

3. **Other Required Courses:**

a. MATH 1710, Calculus I; MATH 1720, Calculus II; MATH 1780, Probability Models; and MATH 2770, Discrete Mathematical Structures; plus 3 semester hours selected from MATH 2700, Linear Algebra and Vector Geometry; MATH 3350, Introduction to Numerical Analysis; or MATH 3410, Differential Equations I.

b. EENG 2710, Digital Logic Design

c. 16 hours of laboratory science: PHYS 1710/ 1730 and 2220/2240; one natural life science chosen from BIOL 1710/1730, 1720/1740, CHEM 1410/1430; plus one additional course chosen from the above natural life sciences or ARCH 2800, GEOG 1710, GEOL 1610.

d. 3 hours selected from ENGL 4180, 4190, 4250.

4. **Minor**: Optional.

5. **Electives**: See four-year plan.

College of Engineering

6. **Other Requirements**: A grade point average of at least 2.75 is required for all advanced computer science courses.

BS with a Major in Computer Science

Following is one suggested four-year degree plan. Students are encouraged to see their advisor each semester for help with program decisions and enrollment. Students are responsible for meeting all course prerequisites.

FRESHMAN YEAR

FALL	HOURS
CSCE 1030, Computer Science I	4
ENGL 1310, College Writing I*	3
MATH 1710, Calculus I	4
PSCI 1040, American Government*	3
ENGR 2060, Professional Presentations (may be used to satisfy a portion of the Understanding the Human Community requirement)	3
Total	17

SPRING	HOURS
CSCE 1040, Computer Science II	3
ENGL 2700, Technical Writing**	3
MATH 2770, Discrete Mathematical Structures	3
PSCI 1050, American Government*	3
Visual and Performing Arts (MUMH 3000, Nineteenth Century Music, recommended)*	3
Total	15

SOPHOMORE YEAR

FALL	HOURS
CSCE 2050, Computer Science III	3
EENG 2710, Digital Logic Design	3
HIST 2610, United States History to 1865*	3
MATH 1720, Calculus II	3
Humanities* (World Literature I recommended)	3
Total	15

SPRING	HOURS
CSCE 2610, Computer Organization	3
CSCE 3110, Data Structures and Algorithms	3
HIST 4700, Texas History*	3
MATH 1780, Probability Models	3
Social and Behavioral Sciences*	3
Understanding the Human Community* (PSCI 3810, International Relations, recommended)	3
Total	18

JUNIOR YEAR

FALL	HOURS
CSCE 3600, Principles of Systems Programming	3
MATH 2700, Linear Algebra and Vector Geometry, or MATH 3350, Introduction to Numerical Analysis, or MATH 3410, Differential Equations I	3
PHYS 1710, Mechanics	3
PHYS 1730, Laboratory in Mechanics	1
Laboratory Science	4
Total	14

SPRING	HOURS
CSCE Option (advanced)	3
CSCE Option (advanced)	3
ENGL 4180, Advanced Technical Writing, or ENGL 4190, Technical Editing, or ENGL 4250, Writing Technical Procedures and Manuals	3
PHYS 2220, Electricity and Magnetism	3
PHYS 2240, Laboratory in Wave Motion Electricity, Magnetism and Optics	1
Elective (advanced)	3
Total	16

SENIOR YEAR

FALL	HOURS
CSCE 4110, Algorithms	3
CSCE 4410, Software Development I	3
CSCE Option (advanced)	3
Elective (advanced)	4
Total	13

SPRING	HOURS
CSCE 4010, Engineering Ethics	2
CSCE Option (advanced)	3
CSCE Option (advanced)	3
CSCE Option (advanced)	3
Laboratory Science	4
Total	15

*See the University Core Curriculum section of this catalog for approved list of course options.
** See College of Engineering degree requirements section of this catalog for approved list of course options.

Actual degree plans may vary depending on availability of courses in a given semester.
Some courses may require prerequisites not listed.

Bachelor of Science with a Major in Computer Engineering

The Bachelor of Science degree with a major in computer engineering is designed for students who wish to specialize in computer hardware, communication systems, digital signal processing, micro-controllers, real-time and embedded systems. Computer engineering students are exposed to both theoretical and practical issues of both hardware and software in laboratories with state-of-the art equipment. The program provides a strong engineering background, with an understanding of the principles and techniques of computing. A professional degree, which includes a two-term/semester senior design project sequence, the BS is designed to meet the criteria of the Engineering Accreditation Commission

(EAC) of the Accreditation Board for Engineering and Technology (ABET). The degree program prepares the graduates for a career and graduate studies in computer engineering and related fields.

Educational Objectives of the BS in Computer Engineering

Graduates will:

1. Be able to design; evaluate material, computational and personnel resources to solve problems; work in multi-disciplinary teams; and communicate effectively.

2. Pursue graduate studies or challenging careers involving VLSI design, real-time systems, communications and networks or computer systems.

3. Exhibit an awareness of professional responsibility, ethics and the need to engage in lifelong learning.

4. Demonstrate a strong background in the breadth of computer engineering as evidenced by a good balance between software and hardware systems, including software development, design of digital systems, microprocessors, embedded systems, real-time systems and digital communication systems.

Degree Requirements

1. **Hours Required and General/College Requirements:** A minimum of 123 semester hours, of which 45 must be advanced, and fulfillment of degree requirements for the Bachelor's degree as specified in the "General University Requirements" in the Academics section of this catalog and the College of Engineering requirements.

2. **Major Requirements:** A minimum of 42 semester hours, including CSCE 1030, 1040, 2050, 2610, 3010, 3020, 3612, 3730, 4010, 4910, 4915; EENG 2610, 2710, 3510; two required Computer Engineering Specialty Area core courses from one of four specializations: Real-Time and Embedded Systems, VLSI and Electronics, Communication and Networks, and Computer Systems; one elective from the same specialization; and any two advanced-level technical electives (with approval of advisor).

3. **Other Required Courses:**

   a. MATH 1710, Calculus I; MATH 1720, Calculus II; MATH 1780, Probability Models; MATH 2700, Linear Algebra and Vector Geometry; MATH 2730, Multivariable Calculus; MATH 2770, Discrete Mathematical Structures.

   b. PHYS 1710/1730; 2220/2240; CHEM 1410.

   c. Mathematics or Science Elective (3 hours, advanced, with advisor approval).

4. **Minor:** Optional.

5. **Electives:** See four-year plan.

6. **Other Requirements**: A grade point average of at least 2.75 is required for all advanced computer engineering courses.

BS with a Major in Computer Engineering

Following is one suggested four-year degree plan. Students are encouraged to see their advisor each semester for help with program decisions and enrollment. Students are responsible for meeting all course prerequisites.

FRESHMAN YEAR

FALL	HOURS
CHEM 1410, General Chemistry	3
CSCE 1030, Computer Science I	4
ENGL 1310, College Writing I, or ENGL 1313, Computer Assisted College Writing I*	3
HIST 2610, United States History to 1865*	3
MATH 1710, Calculus I	4
Total	17

SPRING	HOURS
CSCE 1040, Computer Science II	3
ENGL 2700, Technical Writing**	3
HIST 4700, Texas History*	3
MATH 1720, Calculus II	3
PHYS 1710, Mechanics	3
PHYS 1730, Laboratory in Mechanics	1
Total	16

SOPHOMORE YEAR

FALL	HOURS
CSCE 2050, Computer Science III	3
EENG 2710, Digital Logic Design	3
ENGR 2060, Professional Presentations (may be used to satisfy a portion of the Understanding the Human Community requirement**)	3
MATH 2700, Linear Algebra and Vector Geometry	3
PHYS 2220, Electricity and Magnetism	3
PHYS 2240, Laboratory in Wave Motion, Electricity, Magnetism and Optics	1
Total	16

SPRING	HOURS
CSCE 2610, Computer Organization	3
EENG 2610, Circuit Analysis	3
MATH 1780, Probability Models	3
MATH 2730, Multivariable Calculus	3
MATH 2770, Discrete Mathematical Structures	3
Total	15

JUNIOR YEAR

FALL	HOURS
CSCE 3010, Signals and Systems	3
CSCE 3612, Embedded Systems Design	3
PSCI 1040, American Government*	3
Technical Elective (advanced)	3

College of Engineering

Social and Behavioral Sciences*	3
Total	15

SPRING	HOURS
CSCE 3020, Fundamentals of Communication Theory	3
CSCE 3730, Reconfigurable Logic	3
EENG 3510, Electronics I (Devices and Materials)	3
PSCI 1050, American Government*	3
CSCE Specialty Area (advanced)	3
Total	15

SENIOR YEAR

FALL	HOURS
CSCE 4910, Computer Engineering Design I	3
CSCE Specialty Area (advanced)	3
Mathematics or Science Elective (advanced)	3
Visual and Performing Arts (MUMH 3000, Nineteenth-Century Music, recommended)*	3
CSCE Option (advanced)	3
Total	15

SPRING	HOURS
CSCE 4010, Engineering Ethics	2
CSCE 4915, Computer Engineering Design II	3
CSCE Specialty Area Elective	3
Understanding the Human Community*	3
Humanities*	3
Total	14

See the University Core Curriculum section of this catalog for approved list of course options.
*** See College of Engineering degree requirements section of this catalog for approved list of course options.*

Actual degree plans may vary depending on availability of courses in a given semester.
Some courses may require prerequisites not listed.

Minor in Computer Science

A minor in computer science consists of a minimum of 18 semester hours of computer science courses, including 6 advanced hours. Required courses are CSCE 1030, 1040 and 2050. Six hours of advanced courses must be taken at UNT.

Graduate Degrees

The Department of Computer Science and Engineering offers degree programs leading to the Master of Science and Doctor of Philosophy. Graduate minors in computer science may be selected at introductory and advanced levels. For information, consult the *Graduate Catalog*.

Courses of Instruction

All Courses of Instruction are located in one section at the back of this catalog.

Course and Subject Guide

The "Course and Subject Guide," found in the Courses of Instruction section of this book, serves as a table of contents and provides quick access to subject areas and prefixes.

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Murali Varanasi, Chair

Faculty

Professors Garcia, Varanasi. *Assistant Professors* Deng, Fu, Guturu, Li.

Introduction

The Department of Electrical Engineering at the University of North Texas provides an innovative program in electrical engineering, combining cognitive skills, industry-university joint projects and business skills with courses that form the foundation of electrical engineering discipline. Combining theory and practice, the curriculum is designed to serve the citizens and industries in Texas, particularly the North Texas region, and the nation.

The department is housed in a new facility designed to promote intellectual and scholarly endeavors of faculty and students. The department currently offers a Bachelor of Science degree and a Master of Science degree. There are currently six faculty members, and the department is actively recruiting several additional outstanding faculty. Research interests of the faculty include digital signal processing, radar and image processing, pattern recognition and wireless sensor networks.

The department received support from the National Science Foundation to offer an "Innovative Design- and Project-Oriented Electrical Engineering Program" under the Department-Level Reform initiative.