Graduate Program Guide (MS)

Computer Science and Engineering

2016-2017

DEPARTMENT OF
COMPUTER SCIENCE AND ENGINEERING

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Preface

This brochure is not an official publication and the contents herein are not official policy of The University of Texas at Arlington or of The University of Texas System. In all matters, the Rules and Regulations of the Regents of The University of Texas System, The Handbook of Operating Procedures of The University of Texas at Arlington, and the Graduate Catalog of The University of Texas at Arlington shall supersede this brochure.

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PURPOSE OF THIS GUIDE

This document has been prepared to answer common questions about graduate programs offered by the UTA Computer Science and Engineering Department. It supplements the UTA Graduate Catalog with specific information for the program. Nothing herein is intended to conflict with information in the Catalog. Italicized items have their own definition elsewhere in this document.

All students are expected to be familiar with appropriate sections of this *Graduate Program Guide* and the information herein before seeking advice from the *Graduate Advisor*. Each student should watch for memos or notices posted on the CSE Department bulletin board that pertain to graduate students (outside room 630, Engineering Research Building.).

THE UNIVERSITY, COLLEGE, AND DEPARTMENT

The University of Texas at Arlington, at over 100 years old, is a comprehensive research, teaching and public service institution located in the heart of the dynamic Dallas-Fort Worth Metroplex. It is the second largest component of the world-renowned University of Texas System and the sixth largest university in Texas.

The University of Texas at Arlington is located in the heart of the Dallas/Fort Worth Metroplex, one of the fastest growing areas in the nation. UTA has emerged as a comprehensive teaching, research and public service university. UTA currently offers over 180 rigorous degree program (81 bachelor's, 75 master's and 31 doctoral degrees) within 11 colleges and schools. A modern 390-acre campus, comprised of over 5 million square feet of educational facilities, a few blocks from downtown Arlington offers easy access to museums, concerts, ballet, theater, family recreation, professional sports venues and other interests.

With an enrollment of approximately 35,000 students, UTA is the second largest of the 15 institutions in The University of Texas System. The student body has become increasingly diversified with students representing all 50 states and over 116 different countries.

The University's academic units include the School of Architecture, College of Business Administration, College of Engineering, College of Liberal Arts, School of Nursing, College of Science, School of Social Work, School of Urban and Public Affairs, and the Center for Professional Teacher Education. Additionally, the Graduate School oversees the administration of academic programs beyond the baccalaureate level.

In response to societal needs, UTA has evolved into a university of renown within the state and of emerging position nationally and internationally. The University's history of achievement can be attributed to its outstanding faculty; a student body of higher qualifications and greater diversity; a record of success by graduates in their respective disciplines; and the surrounding Dallas/Fort Worth, a nationally and internationally significant metropolis.

The university was elevated to senior college status in 1959 and was transferred from the Texas A&M System to The University of Texas System in 1965. Its final name change came in 1967, when it became The University of Texas at Arlington. The College of Engineering with approximately 7000 students is the third largest in Texas. The college presently has more than 150 faculty members. The goals of the College are to provide quality engineering education at both graduate and undergraduate levels and conduct cutting-edge research.

UTA is emerging as a major international research institution, and has recently achieved the highest ranking in the Carnegie rankings of comprehensive research universities.

Historically, the computer science program at UTA started in the early 1970's as a master's level program within Industrial Engineering. A Ph.D. program was started a few years later. The bachelor's degree was first offered in 1978. A separate Computer Science and Engineering Department was established in 1980. Since the program's inception, there has been a steady growth in enrollment and quality. The undergraduate program was the first in the state to be accredited by the Accreditation Board for Engineering and Technology (ABET) and also carries Computing Sciences Accreditation Board (CSAB) accreditation. Current CSE undergraduate enrollment exceeds one thousand students (1000). The graduate programs currently enroll around seven hundred (700) at the master's level and more than one hundred students (100) at the doctoral level. Our graduates are readily recruited by industry and can be found in exciting computer-related positions throughout the area and the nation and the world.

MASTERS PROGRAM GENERAL REQUIREMENTS

Entrance Requirements

To begin a graduate degree program in Computer Science or Computer Engineering, an applicant must submit a completed application and application fee to the Graduate Admissions Office. The Texas Common Application online application process can also be used and is accessible via the Graduate School website. In addition, the applicant must arrange for Graduate Record Examination (http://www.gre.org) (GRE) scores and official transcripts of all work beyond high school to be sent directly to the Graduate Admissions Office. When these application materials have all been collected, the complete package is forwarded to the Computer Science and Engineering *Graduate Advisor* for evaluation by an admissions committee.

If there is delay in receiving some materials, the application may be deferred until all required materials are available. The applicant is notified by the Graduate School, generally via email, so that the materials may be supplied in a timely fashion.

Admission to master's programs is based on the applicant's ability to do graduate work in computer science. Students without sufficient background in computer science, but who meet the other admission criteria, may be admitted to our master's programs on a probationary basis, pending completion of specified *deficiency* courses.

Present departmental requirements for the master's programs include:

1. An undergraduate degree, preferably in an area related to computer science, computer engineering, or software engineering.
2. A 3.2 grade point average (on a 4.0 scale) on the last two years of undergraduate course-work. In particular, performance on Computer Science/Computer Engineering/Software Engineering related courses are emphasized.
3. Relevance of the student's degree (background) to the CSE curriculum.
4. Rigor of the student's Bachelor's degree. A three-year degree is not considered rigorous enough. Note: International applicants with a "3+2" Master's degree will be evaluated as equivalent to a 4-year Bachelor's degree.
5. Reputation of the University/College that the student has received his/her previous degrees from.
6. A sum of verbal plus quantitative scores of at least 305 on the GRE. Additionally:
    a. GRE quantitative score ≥ 160
    b. GRE verbal score ≥ 145
    c. The department does not require the advanced computer science test. A passing score on the Engineering-in-Training (EIT) exam is also given consideration for admission decisions.
7. Students may also be accepted with a GRE score of 300, but may be required to do additional coursework for their MS degree (see degree requirements on pages 8 through 12 of this documents). In this case:
    a. GRE quantitative score ≥ 155
    b. GRE verbal score ≥ 145
8. Students may also be accepted with up to three deficiency courses, but may be required to do additional coursework for their MS degree (see degree requirements on pages 8 through 12 of this documents).
9. (International Applicants) A Test of English as a Foreign Language (TOEFL) score of ≥ 90 with no area less than 20 on the iBT, or a score of ≥ 7.0 in all areas on the International English Language Testing System (IELTS).

Note: Applications with significant mathematics deficiencies may be deferred/denied pending completion of the required courses.

Note: We do not require letters of recommendation or a separate statement of purpose from MS applicants any more (they are optional). Hence, MS applicants must send their complete application package to the graduate school and they will forward the relevant material to the CSE department.

Note: Students with (or completing in the near future) a BS awarded by the CSE department at UTA or a comparable degree from another accredited U.S. university who have a GPA of at least 3.2 should contact the graduate advisor regarding a GRE waiver. UTA CSE students with a GPA of at least 3.5 should contact the graduate advisor regarding nomination for Advanced Admission (i.e. admission without application and fee). Baseline criteria for GRE waiver and Advanced Admission are established by the Graduate Dean and can be found in the current version of the UTA Graduate Catalog.

Transfers from other UTA departments

Students applying for admission to CSE while a student in another UTA graduate program must:

1. Satisfy CSE entrance requirements.
2. Be in good academic standing.

Acceptance of previous graduate work towards a CSE program of work is not guaranteed. First-semester graduate students seeking a transfer to CSE are expected to submit a copy of their admission letter and transcripts in advance of seeing a CSE graduate advisor.

Inter-department transfers are typically not accepted in a student's first semester, and are contingent on program capacity constraints and consent of the admitting program. Additional regulations apply for International students.

International Students

International students must have earned an appropriate degree to indicate that they are academically prepared and qualified to undertake graduate studies. Applicants to the Graduate School must have earned a degree equivalent to a bachelor's degree from a regionally accredited university in the U.S. (Three-year degrees are not acceptable. See the note above concerning "3+2" degrees.) In addition to meeting the standard admission requirements, an international student whose native language is not English is required to complete the Test of English as a Foreign Language (TOEFL, http://www.toefl.org) or the International English Language Testing System (IELTS). The CSE standard for the TOEFL is a score ≥ 90 on the Internet-based-test (and ≥ 20 in each individual TOEFL evaluation area), and for the IELTS a score ≥ 7.0 in all areas. An applicant who does not achieve these standards may be required to take the GESP (Graduate English Skills Program) qualifying exam upon arrival at UTA to determine the need for additional English language courses after admission to the Graduate School.

While not required for admission, all applicants whose native language is not English should take the Test of Spoken English prior to enrollment. Students cannot be appointed to assistantship duties having any teaching responsibility without a qualifying score on an accepted spoken English test. To repeat, students whose primary language is not English must satisfy the UTA English proficiency requirement to qualify for an assistantship.

Curricular Practical Training (CPT) – This is a voluntary internship program that allows International Students in good standing with an unconditional admission status to gain directly related work experience in conjunction with their studies. Doctoral and Master's thesis students wishing to pursue CPT must have the written consent of their supervising professor. MS students must have an overall GPA of at least 3.5, and must have completed at least 18-hours of graduate course work in order to be eligible for CPT. A student may not undertake CPT in their graduating semester. Furthermore, CPT employers and the specific job training opportunity must be approved by the department as part of the student's CPT application process.

Degrees and Degree Requirements

Students with an undergraduate degree in Computer Science, Computer Engineering, Software Engineering, or a directly related field, or who have completed the *Foundation Courses* specified herein may select a program leading to one of the following three degrees:

a) Master of Science in Computer Science (MS CS)

b) Master of Science in Computer Engineering (MS CpE)

c) Master of Software Engineering (M.Sw.E.)

MS CS and MS CpE thesis degree plans

Students in either the MS CS or MS CpE *thesis* degree programs must complete 30 semester-hours of graduate work including 24 hours of course work and six hours of thesis.

For either degree, MS CS or MS CpE, the student must submit a thesis to the Graduate School during the semester that graduation is anticipated. The thesis must be defended orally before the student's supervising committee and other members

of the university community. To facilitate the dissemination of thesis results, students may be required to coordinate with the research supervisor towards a concise publication such as a conference submission, technical note/letter to a journal or transactions, or a technical report. The publication (paper) must be submitted to the committee.

Recipients of departmental assistantships are expected to pursue either the MS CS or MS CpE thesis degrees.

MS CS and MS CpE non-thesis degree plans

Students in the MS CS or MS CpE program under the *Non-Thesis (Structured) Option* must complete 30 semester-hours of graduate course work.

This option is intended to serve the needs of students who, through their work, have experience doing projects but who do not wish to do a thesis. Specific requirements regarding the coursework are shown in the template found later in this document. Completion of requirements toward the degree also involves completing a mandatory survey in the semester that you plan to graduate.

M.Sw.E. Degree (non-thesis) plan

The Masters of Software Engineering degree program was developed in cooperation with the CSE Industry Advisory Board to satisfy the need in local/national industry for highly skilled software professionals. The details of this program are found in a later section of this Guide. Students must complete 30 semester hours of graduate course work.

General Degree Requirements for all MS degrees

a) General requirements for a master's degree that are independent of the chosen degree program must include no course for which the final grade was D or F.

b) A final grade point average of 3.0 (out of 4.0) must be achieved on all course work attempted at UTA; in addition, the GPA computed for courses listed on the Graduate Program of Work must be at least 3.0.

c) Up to six semester-hours of directly-related coursework may be transferred from another accredited institution. Transfer credits are allowed only for courses graded 'B' or better, and must directly fill a course requirement in the student's Graduate Program of Work. In most cases a maximum of six semester-hours of transfer credit will be allowed. (Transfer credits must be approved in advance by the graduate advisor, the chair of the CSE Graduate Studies Committee, and the Graduate Dean.)

d) At least one *advanced course* (6000-level) must be completed with a grade of C or better for thesis students, and at least two *advanced courses* (6000-level) for non-thesis students.

Deficiency (Foundation) Courses

A student entering CSE's MS programs is required to have an undergraduate preparation equivalent to a baccalaureate degree in Computer Science, Computer Engineering or Software Engineering, including at least four semesters of specified math courses. Students without a proper academic background, as determined by the graduate advisor at the time of the admission review, will be required to complete all assigned deficiency courses with passing grades (in addition to the normal graduate degree courses). Graduate credit is not given for the deficiency courses.

Required Foundation courses (each course name is followed by the UTA course number) are:

1. C Programming (CSE 1320)[1]
2. Computer Organization (CSE 2312).
3. Discrete Structures (CSE 2315)[1]. Please note that even though you may have taken "advanced" mathematics for an engineering degree, it is our experience that non-CS students have minimal exposure to the topics in this course. This is especially apparent when students attempt CSE 3315 without this background.
4. Theoretical Computer Science (CSE 3315)[1]
5. Algorithms & Data Structures (CSE 2320)
6. Operating Systems (CSE 3320)

The following courses constitute the Mathematics requirements[2]:

7. Calculus I (MATH 1426)
8. Calculus II (MATH 2325)
9. Linear Algebra (MATH 3330)
10. Probability and Statistics (MATH 3313), or Engineering Probability (IE 3301)

If a student's cumulative GRE score does not satisfy the entrance requirements (GRE total $\geq$ 305, GRE quantitative $\geq$ 160, GRE verbal $\geq$ 145) or a student's admission decision is probationary (conditional), then he/she is required to take 2 of the following 3 courses based on his/her intended degree plan (CS, CpE, or SwE), in addition to the 30 hours of course work. In addition, none of the courses listed below can count towards the 30 hours of coursework for the corresponding 30-hour MS degree plan (CS, CpE, or SwE).

MS CS Degree plan

1. DB 1: CSE 5330
2. Networks 1: CSE 5344
3. SE 1: CSE 5324

MS CpE Degree plan

1. Electronics 1: CSE 3323
2. Signal Processing: CSE 5366
3. Networks 1: CSE 5344

MS SwE Degree plan (the first two courses CSE 5324, CSE 5325 must be replaced by other SE courses)

1. SE 1: CSE 5324
2. SE 2: CSE 5325
3. DB 1: CSE 5330

[1] Screening exams may be offered for these courses to allow the student to demonstrate proficiency in the indicated topics. These examinations are available only to first-semester master's students.

[2] Applications missing a full-semester course equivalent to any of the four specified mathematics courses may be deferred

until those courses are completed. Most applicants with an Engineering or Science background tend to satisfy the Mathematics requirements (7-10 above).

Core Courses

All master's students are required to take:

CSE 5311: Design and Analysis of Algorithms

And one of the following three courses:

CSE 5301: Data Analysis and Modeling Techniques
CSE 5306: Distributed Systems
CSE 5317: Design and Construction of Compilers

Breadth Courses

Breadth courses are defined as any CSE course that is not in the student's major field(s) of study. These courses are intended to broaden the student's program of work into areas beyond the specific focus of the major track(s).

Both Thesis option students and Structured Option students will choose TWO breadth courses.

Elective Courses for Thesis option students only

Elective courses can be any graduate-level course, in any area that is directly related to your degree program or thesis research. Note: Not applicable for Non-Thesis Option students.

Major/Specialty Requirements

A "major", or "specialty," track is defined as a sequence of three courses, with at least one 6000-level course in a specific subject area. The major/specialty requirements are as follows:

- Thesis students must choose one major field of study and complete the corresponding major track.
- Non-thesis students must choose TWO major fields of study and complete the corresponding major tracks.
- Students in the Computer Engineering (CpE) degree plan must select Systems/Architecture as one of their major tracks (i.e., Computer Engineering thesis students must select this field as their major.)

NOTE: As specified above, courses in the major track cannot be used to satisfy the breadth requirements. For example, a student majoring in Intelligent Systems/Robotics is required to satisfy the breadth requirements from courses that are in any of the other fields (see major area courses below).

Major subject areas are determined according to the course offerings and the faculty supporting subject areas. Thus, the major subject areas may vary from time to time as reflected in updates to this guideline.

The current major areas and associated courses are listed below. (**Note:** This is not a complete list of courses in each specified field. Courses offered vary significantly from semester to semester, so students are advised to consult course listings each semester to determine courses available in their chosen major field. If in doubt about the field of a specific course, please contact a CSE Graduate Advisor.)

Bioinformatics/Health Informatics:

CSE 5370 - Bioinformatics
CSE 5379 - Special Topics in Bioinformatics
CSE 6379 - Advanced Special Topics in Bioinformatics

Data Sciences/Databases:

- CSE 5330 - Database Systems
- CSE 5331 - DBMS Models and Implementation Techniques
- CSE 5333 - Cloud Computing
- CSE 5334 - Data Mining
- CSE 5335 - Web Data Management
- CSE 5336 - Stream Data Management
- CSE 5339 - Special Topics in Database Systems
- CSE 5362 - Social Networks and Search Engines
- CSE 6331 - Advanced Topics in Database System
- CSE 6339 - Special Topics in Advanced Database Systems
- CSE 6363 - Machine Learning

Image Processing/Graphics/Multimedia:

- CSE 5348 - Multimedia Systems
- CSE 5365 - Computer Graphics
- CSE 5366 - Digital Signal Processing
- CSE 5389 - Special Topics in Multimedia, Graphics and Image Processing
- CSE 6366 - Digital Image Processing
- CSE 6367 - Computer Vision
- CSE 6389 - Special Topics in Advanced Multimedia, Graphics and Image Processing

Intelligent Systems/Robotics:

- CSE 5360 - Artificial Intelligence I
- CSE 5361 - Artificial Intelligence II
- CSE 5362 - Social Networks and Search Engines
- CSE 5364 - Robotics
- CSE 5367 - Pattern Recognition
- CSE 5368 - Neural Networks
- CSE 5369 - Special Topics in Intelligent Systems
- CSE 5334 - Data Mining
- CSE 5383 - Introduction to Unmanned Vehicle Systems
- CSE 5384 - Unmanned Vehicle System Development
- CSE 6363 - Machine Learning
- CSE 6366 - Digital Image Processing
- CSE 6367 - Computer Vision
- CSE 6369 - Special Topics in Advanced Intelligent Systems

Networks:

- CSE 5344 - Computer Networks
- CSE 5345 - Fundamentals of Wireless Networks
- CSE 5346 - Networks II
- CSE 5347 - Telecommunication Networks Design
- CSE 5349 - Special Topics in Networking
- CSE 5355 - Computer System Performance Evaluation
- CSE 6344 - Advanced Topics in Communication Networks
- CSE 6345 - Pervasive Computing & Communications
- CSE 6347 - Advanced Wireless Networks & Mobile Computing
- CSE 6348 - Advances in Sensor Networks
- CSE 6349 - Special Topics in Advanced Networking

Security/Privacy:

- CSE 5380 - Information Security I
- CSE 5381 - Information Security II
- CSE 5382 - Secure Programming
- CSE 5388 - Special Topics in Information Security
- CSE 6388 - Advanced Special Topics in Information Security

Software Engineering:

- CSE 5320 - Special Topics in Software Engineering
- CSE 5321 - Software Testing
- CSE 5322 - Software Design Patterns
- CSE 5323 - Software Engineering Processes
- CSE 5324 - Software Engineering: Analysis, Design, and Testing
- CSE 5325 - Software Engineering: Management, Maintenance, and Quality Assurance
- CSE 5326 - Real-Time Systems Design
- CSE 5327 - Telecommunications Software Development
- CSE 5328 - Software Engineering Team Project I
- CSE 5329 - Software Engineering Team Project II
- CSE 5382 - Secure Programming
- CSE 6323 - Automated Software Engineering
- CSE 6324 - Advanced Topics in Software Engineering
- CSE 6329 - Special Topics in Advanced Software Engineering

Systems/Architecture:

- CSE 5306 - Distributed Systems
- CSE 5317 - Design and Construction of Compilers
- CSE 5333 - Cloud Computing
- CSE 5343 - Real-time Data Acquisition and Control Systems
- CSE 5348 - Multimedia Systems
- CSE 5350 - Computer Architecture II
- CSE 5351 - Parallel Processing
- CSE 5355 - Computer System Performance Evaluation
- CSE 5442 - Embedded Computer Systems (Also CSE 5342)
- CSE 5359 - Special Topics in Systems and Architecture
- CSE 5383 - Introduction to Unmanned Vehicle Systems
- CSE 5384 - Unmanned Vehicle System Development
- CSE 6306 - Advanced Topics in Operating Systems
- CSE 6350 - Advanced Topics in Computer Architecture
- CSE 6351 - Topics in Parallel and Distributed Computing
- CSE 6352 - Fault-Tolerant Computing
- CSE 6359 - Special Topics in Advanced Systems and Architecture

Theory/Algorithms/Languages:

- CSE 5301 - Data Analysis and Modeling Techniques
- CSE 5307 - Programming Language Concepts
- CSE 5311 - Design and Analysis of Algorithms
- CSE 5314 - Computational Complexity
- CSE 5315 - Numerical Methods
- CSE 5316 - Modeling, Analysis, and Simulation of Computer Systems
- CSE 5317 - Design and Construction of Compilers
- CSE 5318 - Applied Graph Theory and Combinatorics
- CSE 5319 - Special Topics in Theory and Algorithms
- CSE 6311 - Advanced Computational Models and Algorithms
- CSE 6314 - Advanced Topics in Theoretical Computer Science
- CSE 6317 - Advanced Topics in Languages and Compilers
- CSE 6319 - Special Topics in Advanced Theory and Algorithms

Program of Work and Guidelines

Students should plan a Graduate Program of Work in conjunction with a graduate advisor and, for thesis students, their supervising professor to support their area of interest and to prepare themselves for thesis research, and then properly choosing courses for the Thesis Option or Non-Thesis Option, as appropriate. Templates to guide course selection for the Graduate Program of Work are shown below, and can be obtained via download from the CSE graduate website.

General provisions for the program of work:

1. Thesis students must complete at least one advanced (6000 level) course: and Structured Option students must complete at least two advanced (6000 level) courses per guidelines provided above.
2. Thesis students are allowed to use a maximum of one Directed Study course (CSE 5393) towards their degree requirements. Directed Study may NOT be used for non-thesis programs except in exceptional cases.
3. At the discretion of the graduate advisor or the supervising professor, and with the approval of the chair of the CSE Graduate Studies Committee, one or more of the core or breadth courses may be waived for exceptionally well-prepared students (proper documentation is necessary). The waived course(s) will be replaced by major or elective course(s).
4. Clearance to register for a course is not a commitment to accepting that course on the degree plan.
5. Election of the thesis option by a student in their Graduate Program of Work is not a commitment that the student will be able to complete a thesis. Thesis option students must obtain the commitment and approval of a qualified thesis supervisor before beginning thesis research.
6. These provisions are guidelines for devising an acceptable graduate program of work. Programs that follow the spirit of these provisions, but have other merits, will be considered.

Processing of the Graduate Program of Work (GPOW)

Students will discuss their initial GPOW with a CSE graduate advisor before they enroll in classes in their first semester. The templates that follow are for use by the student in planning the program of work. The official graduate program of work is established and maintained online in the MyMav Student Information System. Students should review their plan frequently online and/or with one of the CSE graduate advisors to ensure that they stay on track toward completion of their degree requirements.

Transfer Credit

Students who plan to transfer courses from other universities or from a previous degree in another department at UTA for use in their CSE GPOW must file a formal request for course transfer with the graduate school, via the CSE graduate advisor. Per above, the maximum amount of credit that may be considered for transfer is six credit hours. Students must provide an official copy of the transcript that shows successful completion (grade of 'B' or higher) of the course(s) that are requested for transfer credit from an accredited U.S. university. The CSE graduate advisor will verify the course transfer(s) and determine which course they will replace in your GPOW. Additional documentation may be required. A Request for Course Transfer Credit form will be completed and forwarded to the Graduate Dean for final approval, via the CSE Graduate Advisor and the chairman of the CSE Graduate Studies Committee. Transfer courses are not credited toward your degree requirements until final approval by the Graduate School. Please check the UTA Graduate Catalog for additional regulations.

NOTE: It is the student's responsibility to initiate the transfer request and obtain other required documentation to support the transfer. Transfers do not occur unless the request is properly completed and approved.

GRADUATE ADVISOR

A CSE Graduate Advisor will serve as a point of contact to resolve questions/issues regarding the Graduate Program of Work. He/she is also available to advise students on degree plan alternatives, and can help with selection of courses appropriate for a specific degree plan. However, it is the responsibility of the student to select and enroll in courses that will satisfy the degree requirements specified in this document.

MASTERS CANDIDATE COURSE REQUIREMENTS CHECKLIST (Templates)

Thesis Option Template:

Core courses: 5311, _____ (one of: CSE 5301, CSE 5306, or CSE 5317)

Breadth courses: _____, _____

Elective: _____

3 courses in major area: (_____)

6000-level course _____
2nd major course: _____
1st major course: _____

Thesis II (CSE 5698)

Degree granted (circle one): MS CS or MS CpE

NON-Thesis Option Template:

Core courses: 5311, _____ (one of: CSE 5301, CSE 5306, or CSE 5317)

Breadth courses: _____, _____

3 courses in major area 1: (_____)

6000-level course _____
2nd major course: _____
1st major course: _____

3 courses in major area 2: (_____)

6000-level course _____
2nd major course: _____
1st major course: _____

Degree granted (circle one): MS CS or MS CpE

NOTE: Electronic versions of the CSE degree plan templates shown above are available for download on the CSE graduate website (http://cse.uta.edu/graduate/).

Masters Program in Software Engineering

Purpose and Philosophy

The Master of Software Engineering program (M.Sw.E) provides professional development in software engineering principles and practices. It was created in response to the needs of industry in the North Texas area for graduate level degree programs and is designed to accommodate working software professionals. Solutions to problems encountered in industrial software projects are emphasized. The department has several faculty members specializing in various aspects of software engineering.

Industry Endorsement

"This letter is written in support of the practice-oriented Master of Software Engineering Program. The objectives of the program are consistent with needs at the Lockheed Fort Worth Company and the defense industry in general. There are currently over 200 employees working in software engineering in my department. Many of these employees have bachelor degrees in engineering and computer science and would benefit from this degree program."

Engineering Manager
Avionics Software Engineering
Lockheed Fort Worth Company

"As a UTA alumnus and software engineering manager, I have been hoping that UTA would add a Master of Software Engineering Program. I am confident that your department could provide a quality Master of Software Engineering program that would meet the needs of working software engineers such as those here at Motorola Ft. Worth."

Fort Worth Research & Dev. Center
Cellular Infrastructure Group
Motorola, Inc.

"American Airlines fully recognizes the need for the institution of a Master's degree in Software Engineering. We are pleased to see that The University of Texas at Arlington will be providing this level of education."

Managing Director
Methods & Standards
SABRE Development Services

"We are pleased to know that your department is planning to offer a Master's Degree in Software Engineering at The University of Texas at Arlington. The new degree program at UTA would partially fill the gab between conventional Computer Science education, and the ever-growing industry demand for software engineering professionals. We hope that UTA will implement and continue improving the new program using CMS/SEE curriculum as a model."

Vice President
Research & Development
Alcatel Network Systems, Inc.

"The demand for this degree program is high. In a limited informal survey, thirty-three of our software professionals expressed interest in earning a masters degree in software engineering if it was available in the local area. As EDS and other companies continue improving the maturity of their software processes, this demand will continue to grow."

Director

EDS Systems and Methods

Degree Requirements

Thirty (30) semester hours of graduate course work beyond the B.S. degree. The MSwE curriculum is divided into four categories. Foundation and core courses (18 hours) focus on software engineering and supporting material, including mathematical formalisms and a two-course software engineering project sequence. This project is team-oriented and will culminate with a significant written and oral report of results. Courses in the other two categories consist of electives that provide depth in software engineering and knowledge in potential application domains. In addition, students must satisfy the general degree requirements of the department.

Delivery

All required courses will be scheduled at least once per year on the UTA campus, over TAGER, or by video tape. Elective courses will be offered with sufficient frequency to allow a part-time student to complete the program within three years.

Curriculum Requirements

Specific course requirements for the MSwE degree are given below. Catalog descriptions are provided in the UTA Graduate Catalog.

Foundation Course

CSE 5311 - Design and Analysis of Algorithms

Core SE Courses (In the 30-hour plan, CSE 5324 and CSE 5325 must be replaced by CSE 5321 and CSE 5322)

CSE 5324 - Software Engineering: Analysis, Design, and Testing
CSE 5325 - Software Engineering: Management, Maintenance, and Quality Assurance
CSE 5328 - Software Engineering Team Project I
CSE 5329 - Software Engineering Team Project II

SE Elective Courses (Select a minimum of two courses – at least one 6000-level)

CSE 5321 - Software Testing
CSE 5322 - Software Design Patterns
CSE 6324 - Advanced Topics in Software Engineering
CSE 6329 - Special Topics in Advanced Software Engineering

Domain Electives Select a minimum of one CSE course. Total number of SE and Domain electives must be at least fifteen (15) credit hours.

Sample Programs of Study

Full-Time Students:

Year 1 Fall (9 hours)	Year 1 Spring (9 hours)
CSE 5311	CSE 5321
CSE 5322	Elective
Elective	Elective
Year 2 Fall (9 hours)	Year 2 Spring (3 hours)
CSE 5328	CSE 5329
Elective	
Elective	

Part-Time Students:

Year 1 Fall (6 hours)	Year 1 Spring (6 hours)
CSE 5322	CSE 5321
Elective	Elective
Year 2 Fall (6 hours)	Year 2 Spring (6 hours)
CSE 5311	Elective
Elective	Elective
Year 3 Fall (6 hours)	Year 3 Spring (6 hours)
CSE 5328	CSE 5329

Comparing the UTA Curriculum to the SEI Curriculum

Software Engineering Institute (SEI) (http://www.sei.cmu.edu) is a DoD-supported organization whose primary mission is to advance the state of the practice of software engineering by accelerating the transition of promising new methods and technologies from concept demonstration to routine use.

The UTA program includes all the necessary courses and content specified in the SEI MSwE degree program, but the material is packaged somewhat differently. A mapping of the UTA curriculum into the SEI curriculum is provided below.

UTA Course	SEI Course
CSE 5324 Software Engineering: Analysis, Design, and Testing	Software Systems Engineering, Software Analysis, System Design Principles
CSE 5325 Software Eng. Management, Maintenance, and Quality Assurance	Software Project Management part of Software Creation and Maintenance
CSE 5326 Real Time Systems Design	Advanced System Design Principles, Software Analysis
CSE 5328 & 5329Team Projects	Software Development Studio
CSE 6324 Advanced Topics in Software Engineering	Software Analysis, Verification & Validation, Software Engineering Seminar

Software Engineering at UTA

Software engineering was added as an area of emphasis by the Computer Science and Engineering Department in 1982 to serve the needs of the local aerospace and defense industry. The first faculty member was hired to provide leadership in the development of this new activity. In later years, additional faculty members with software engineering backgrounds have been added. Currently, the CSE Department has several faculty members whose primary interests are in software engineering. Course offerings in software engineering have expanded to six graduate and two undergraduate courses. These courses have proven to be popular with students and continue to have strong enrollments. Graduate students are able to pursue master's and doctorate programs with an emphasis in software engineering.

RESEARCH FACILITIES

Excellent computing facilities are available on campus for research and teaching activities. Academic Computing Services (ACS) operates IBM, Dell, SUN and Silicon Graphics systems, each of which may be accessed from numerous computing and graphics terminals on campus. Supported operating system environments include Windows and numerous UNIX variations. The CSE department operates SUN, VAX and HP workstations and/or servers along with dual and quad-processor Linux/SMP systems. Numerous Windows and Macintosh personal computers are also available, as are development systems from Motorola and Intel and other manufacturers, along with other hardware and software resources needed to support the development of microprocessor-based systems.

The UTA Engineering Research Building

The CSE department is located at the Engineering Research Building, which has approximately 234,000 square feet of space for state-of-the-art, multidisciplinary research and teaching labs and classrooms, faculty and graduate student offices, administrative offices, conference rooms and support areas. The building's design incorporates several energy-saving features, including green and light-reflecting roofs, window designs for improved use of available light, rain and condensate water capture and storage for landscaping, use of recycled materials, and others allows the facility to meet requirements for LEED Silver certification.

RESEARCH AREAS

The Computer Science and Engineering Department currently supports Ph.D. studies in the following areas:

1. Computer Architecture and Systems (Parallel processing, Fault tolerance, Distributed Operating Systems, and others) E-mail address: hong.jiang AT uta.edu
2. Database and Information Systems (converting data to knowledge, crowdsourcing and human computation, data modeling and summarization, data exploration, data reduction, data warehousing, database testing, deep web and social media mining, entity query, information integration, information retrieval, knowledge discovery, query processing and optimization, real-time databases, searchable file systems, spatial databases, usability challenges in querying graph data, Web data management, XML) E-mail address: elmasri AT cse.uta.edu
3. Big Data and Large-Scale Computing (big data analytics and mining, cloud computing, computational journalism, data exploration, data science, distributed computing, environmental and tracking data analysis, parallel algorithms,

parallel computing, scalable and distributed graph-processing, scalable memory and storage systems, scientific computing, systems support for big data, warehouse-scale computing) E-mail address: gdas AT uta.edu

4. Biocomputing and Health Informatics (assistive technologies, bioinformatics, computational neuroscience, computer aided rehabilitation, health informatics, human computer interaction, medical informatics) E-mail address: gao AT uta.edu
5. Information Security and Privacy (systems for providing Internet privacy, location privacy, security and privacy in ubiquitous computing, and secure P2P systems) E-mail address: jiang.ming AT uta.edu
6. Networking and Telecommunications (anonymity and privacy online, content-centric networking, Internet distributed traffic control, Internet router interface programming, network function virtualization, next-generation networks, opportunistic networks, pervasive computing, secure peer-to-peer systems, sensor networks, software-defined networking, wireless networks) E-mail address: zaruba AT cse.uta.edu
7. Embedded Systems and Mobile Computing (cyber-physical systems, data acquisition and control, hybrid systems, instrumentation, Internet of Things, mobile and pervasive devices and technologies, mobile applications, modeling and simulation, network simulation and test bedding, real-time systems, reliable and fault tolerant computing, verification and validation, virtual reality, wireless localization, wireless sensor networks) E-mail address: hche AT cse.uta.edu
8. Machine Learning and Data Mining (deep web and social media mining, environmental and tracking data analysis, matrix-based machine learning, neural networks, pattern recognition, similarity-based indexing, social network, spatio-temporal data analysis and mining, sparse learning, statistical and combinatorial algorithms, statistical optimization and data analytic, tensors) E-mail address: heng AT uta.edu
9. Intelligent Systems (Knowledge representation, Knowledge acquisition, Machine learning, Neural networks, Parallel AI and others) E-mail address: huber AT cse.uta.edu
10. Software Engineering (agile methods, automated software engineering, automated testing, formal methods, mobile software engineering, object-oriented software engineering, program analysis, program repair, reverse engineering, software cost estimation, software design patterns, software engineering processes, software methodology, software process, software security, testing object-oriented software, verification and validation) E-mail address: csallner AT uta.edu
11. Computer Vision and Multimedia (endoscopic vision, gesture recognition, human motion analysis, image processing, neural networks, pattern recognition, robotic vision, sign language recognition, signal processing, video compression, visualization) E-mail address: kamangar AT uta.edu
12. Sustainable Computing (define standards for power-aware hardware and software, design power efficient architectures, energy-aware computing resource provisioning, energy-aware routing in sensor networks, evaluate power and performance tradeoff, green data center architectures, restructure software and applications, spatial indexing for sensor queries) E-mail address: iahmad AT cse.uta.edu

General course work to support each of the above areas is available. Other areas are possible if the appropriate faculty is willing to support them. See the section on the faculty and their research.