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Introduction

Keep This Handbook

Please keep this handbook intact for your reference. Updated versions are available approximately once a year on the Computer Science website. Also, please buy a Sacramento State Student’s Registration and Advising Handbook at the bookstore. It has valuable information not covered here. Course descriptions are available at http://catalog.csus.edu/.

Where to Find Blank Forms

Most blank CSC forms are available on our website, http://www.ecs.csus.edu/wcm/csc/academic/forms.html; very few forms are available in the office. All forms originating from the Office of Graduate Studies (OGS) are available in the River Front Center (RFC) Room 215 or at the OGS website: http://www.csus.edu/gradstudies/CurrentStudents/forms.html.

IMPORTANT: when submitting any form requiring Graduate Coordinator signature, please attach an unofficial copy of CSUS transcripts.

Who to Ask What

If you still have questions about the MS in Computer Science or the MS in Software Engineering after reading this handbook, please contact the Computer Science Graduate Coordinator, Dr. Jinsong Ouyang (csgrad@ecs.csus.edu).
MS in Computer Science
MS in Software Engineering

Program Goals

- To prepare students to serve as effective professional computer specialists and/or software engineers in our society;
- To prepare students for research, teaching, or further study towards the PhD in Computer Science and/or Software Engineering;
- To enable individuals with background in other areas to obtain the skills and knowledge necessary to enter and/or advance in employment in computer-related industries.
COMPUTER SCIENCE FACULTY AND STAFF

Cui Zhang, Department Chair
V. Scott Gordon, Associate Chair
Jinsong Ouyang, Graduate Coordinator

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FACULTY

Behnam Arad
Weide Chang
Yuan Cheng
Jun Dai
Nikrouz Faroughi
Isaac Ghansah
V. Scott Gordon
Ying Jin
Ted Krovetz
Meiliu Lu
Pinar Muyan-Ozcelik
Jinsong Ouyang
Ahmed Salem
Ghassan Shobaki
Xiaoyan Sun
Chung-E Wang
Cui Zhang

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Administrative Support
Veronica Pruitt, ASC II

Department Office
Riverside Hall 3018, (916) 278-6834
http://www.ecs.csus.edu/csc/

Office of Graduate Studies
River Front Center 215, (916) 278-6470
http://www.csus.edu/gradstudies/

Office of Global Education
Library 1001, (916) 278-6686
http://www.csus.edu/oge/
ADMISSION REQUIREMENTS

Admission as a fully classified graduate student in either Computer Science or Software Engineering requires:

1. A baccalaureate degree;
2. A minimum 3.0 GPA in the last 60 units attempted;
3. GRE general test (no minimum; score will be compared with those of other applicants);
4. Mathematical preparation including two semesters of calculus and one semester of calculus-based probability and statistics, corresponding to Sacramento State courses Math 30, Math 31, and Stat 50;
5. Computer Science lower-division preparation including programming proficiency, discrete structures, machine organization, and UNIX and PC-based program development environment proficiency, corresponding to Sacramento State courses CSC 15, CSC 20, CSC 28, CSC 35, and CSC 60, and as evidenced by a pass on the graduate student placement test or a baccalaureate degree in Computer Science;
6. Computer Science advanced preparation as evidenced by a 3.25 GPA in the following Sacramento State upper division Computer Science courses or their equivalent elsewhere: CSC 130, Data Structures; CSC 131, Computer Software Engineering; CSC 134, Database Management and File Organization; CSC 135, Computing Theory and Programming Languages; CSC 137, Computer Organization; CSC 138, Computer Networks and Internets; and CSC 139, Operating System Principles.

Other Requirements

Sacramento State requires that all graduate applicants, regardless of citizenship, whose native language is not English, and whose education at all levels was not completed in the English language, must pass the Test of English as a Foreign Language (TOEFL). A minimum score of 550 must be achieved on the written examination, or a minimum of 213 on the computer-based test, or a minimum of 80 on the Internet-based version. (Note: the computer-based test and the Internet-based tests are different versions.)

Applicants with deficiencies in the admission requirements are advised to remove any such deficiencies before applying.

PREPARATION FOR ADMISSION

Although a Bachelor’s Degree in Computer Science is not necessary, applicants for both the MS in Computer Science and MS in Software Engineering programs must meet the admission requirements described earlier. The Department may grant conditional admission to students who are likely to complete all admission requirements within one or two semesters after they enter the graduate program. See the “Undergraduate Computer Science Courses Satisfying Admission Requirements” on Page 10 of this document.
Students lacking a background in computer science may acquire it in one or more of the following ways:

1. Enroll at a local community college in courses equivalent to Sacramento State lower-division prerequisites and transfer to Sacramento State at a later date for the upper-division prerequisites (articulation agreements can be found at www.assist.org);

2. Enroll at Sacramento State as a second bachelor's degree student and after satisfying all deficiencies, apply for classification in the graduate program. Please note: CSUS is not currently accepting second bachelor’s degree. For up-to-date information, please visit http://www.csus.edu/admissions/.

3. Register in regular University classes through the “Open University” program offered by the College of Continuing Education (CCE). The CCE registration counter is located in Napa Hall. For more information, visit http://www.cce.csus.edu/open-university.

APPLICATION FOR ADMISSION

All prospective graduate students, including Sacramento State graduates, must file the following with the Sacramento State Office of Graduate Studies:

1. An online application for graduate admission; use the Sac State application website: http://www.csumentor.edu/AdmissionApp/;

2. Two sets of official transcripts from all other colleges and universities attended;

3. GRE general test scores;

4. Recommendation letters NOT required.

Please visit http://www.csus.edu/gradstudies/ for application deadlines and instructions on submitting application materials. International applicants - please also visit http://www.csus.edu/oge/.

ADMISSION DECISIONS

1. Applications are first processed by either the University's International Admissions Office (for international applicants) in Global Education or the Office of Graduate Studies (for domestic applicants) to ensure that all SAC STATE requirements have been met.

2. Although we may receive your application from International Admissions or Graduate Studies long before the deadline, no decision will be made until after the application deadline, in order to consider all qualified applications before making recommendations.

3. We may recommend that you be admitted as fully classified or conditionally classified. In the case of conditional classification, the courses required to remove deficiencies will be determined by an evaluation of your transcripts and will be specified in the letter of acceptance. (At this point a decision to deny admission is usually based on inadequate preparation in Computer Science.) Note: For MS students who are admitted with conditions stated in their admission letters (e.g. undergraduate courses), the department offers placement/waiver tests one week before the first semester of their MS program.
4. A decision regarding admission will be mailed to you by the Office of Graduate Studies or International Admissions.
Computer Science Requirements

- CSc 10
- CSc 15
- CSc 20
- CSc 28
- CSc 35
- CSc 60
- CSc 130
- CSc 134
- CSc 135
- CSc 137
- CSc 138
- CSc 139

Math Requirements

- Math 30
- Math 31
- Stat 50

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Prerequisite that may be taken concurrently

Prerequisite
UNDERGRADUATE COMPUTER SCIENCE COURSES
SATISFYING ADMISSION REQUIREMENTS

Prerequisites are listed in parentheses.

CSC 15 Programming Concepts & Methodology I (CSC 10 or programming experience)
CSC 20 Programming Concepts & Methodology II (CSC 15)
CSC 28 Discrete Structures for Computer Science (MATH 29, CSC 20; CSC 20 may be taken concurrently)
CSC 35 Introduction to Computer Architecture (CSC 15)
CSC 60 Introduction to Systems Programming in UNIX (CSC 20, CSC 35)
CSC 130 Data Structures and Algorithm Analysis (CSC 20, CSC 28; CSC 28 may be taken concurrently)
CSC 131 Computer Software Engineering (CSC 130; may be taken concurrently)
CSC 134 Database Management and File Organization (CSC 130)
CSC 135 Computing Theory and Programming Languages (CSC 28, CSC 35, CSC 130)
CSC 137 Computer Organization (CSC 28, CSC 35, CSC 130)
CSC 138 Computer Networks and Internets (CSC 35, CSC 60, CSC 130)
CSC 139 Operating System Principles (CSC 60, CSC 137; or equivalents)

FINANCIAL AID

The Department has a very small number of openings for Instructional Student Assistants (ISA’s), who may supervise laboratory work and/or grade student papers. Interested persons may leave their resume in the Department office after they join the program.

Federal Work Study, fellowships, grants, and various loans are available to students who are U.S. citizens. Please contact the Financial Aid Office on campus for an application package. Please note: Except for employment opportunities, there is no financial aid available for international students.

COMPUTER ACCOUNTS AND MAILING LIST

Every Sac State student must set up a SacLink email account with the University in order to access “My SacState” (https://my.csus.edu). You can do this at https://www.saclink.csus.edu/.

You should also set up a network account with the College of Engineering and Computer Science at http://www.ecs.csus.edu/index.php?content=accounts. Every graduate student should subscribe to the mailing list to get department and Graduate Coordinator’s announcements/notifications, to sign up follow this link: http://hera.ecs.csus.edu/mailman/listinfo/cscgradlist. Be sure to follow the confirmation step after receiving a confirmation email.
Tip: If you have multiple email accounts, make sure they all forward automatically to one that you check regularly so that you won’t miss any important messages.
ADVISING

You will be advised by the Graduate Coordinator until you are fully classified. Once you are fully classified, you will be assigned to an advisor. Please refer to the department's list of advising office hours and see the appropriate advisor during those hours. Once your advisor has signed and dated your form, submit it to the department. When you seek further advising, ask department staff for your form; get it updated and return it to the department.
MS SUBSTITUTION OR WAIVER PETITION

Use this form to establish approval of course substitutions or waivers in your department file. If this form is approved, you may list the substitution(s) on your application for advancement to candidacy.

Note: If you deviate from the courses listed on your advancement to candidacy application after it is filed with the Office of Graduate Studies, you must submit a “Petition for Exception.”

IMPORTANT: when submitting any form requiring Graduate Coordinator signature, please attach an unofficial copy of CSUS transcripts.

<table>
<thead>
<tr>
<th>Computer Science Course Coordinator</th>
<th>Student</th>
</tr>
</thead>
<tbody>
<tr>
<td>[ ] The proposed substitute course has at least the same number of semester units and is an adequate substitution for the required course.</td>
<td>If approved, list the substitute course on your application for advancement to candidacy.</td>
</tr>
<tr>
<td>[ ] The substitute course has fewer units or quarter-system units but otherwise is an adequate substitution for the required course. (Check one below.)</td>
<td></td>
</tr>
<tr>
<td>___ An additional course is recommended. The course is: _________________.</td>
<td>If approved, list both courses on your application for advancement to candidacy.</td>
</tr>
<tr>
<td>___ Waiving the difference in units is recommended. The student already has a background that compensates for the units missing and will not be short units needed to graduate.</td>
<td>If approved, list the substitute course on your application for advancement to candidacy and the words “difference in units waived.”</td>
</tr>
</tbody>
</table>

APPROVED: ___________________________ Computer Science Course Coordinator

Date ____________________________

APPROVED: ___________________________ Computer Science Graduate Coordinator

Date ____________________________
BECOMING FULLY CLASSIFIED

If you are admitted as conditionally classified, classification **is not automatic** once you have completed the requirements to become fully classified. You must fill out a Classification Application form (available online at: http://www.csus.edu/gradstudies/CurrentStudents/forms.html) and submit it to the department with related documents attached (e.g. “MY SAC STATE” records, other transcripts, GRE test report, etc.). The Graduate Coordinator will make a recommendation on the form and forward it to the Office of Graduate Studies for approval, who in turn will send you a copy of the final decision.

**IMPORTANT:** when submitting any form requiring Graduate Coordinator signature, please attach an unofficial copy of CSUS transcripts.
WRITING PROFICIENCY

All graduate students must meet the Graduate Writing Assessment Requirement (GWAR). You are required to take the Sac State Writing Placement Exam for Graduate students (WPG). Please check http://www.csus.edu/gradstudies/CurrentStudents/GWAR.html for the examination schedule and take the WPG in the first semester of your MS Program. Criteria for waiving the WPG are listed in the form below, which is available in the Office of Graduate Studies. A waiver must be approved by the Dean of Graduate Studies. In all cases, writing proficiency must be demonstrated before a student can be advanced to candidacy.

Office of Graduate Studies
Writing Placement for Graduates (WPG)
Waiver Form

Last Name: First Name: M.I.: Student ID No.: Major: Area Code/Telephone No.: Concentration (if applicable): Student Email: Student Signature: Date: Second Bachelor’s students are not eligible for the waivers listed below.

Please check the box next to the standard you are using to seek a waiver and attach the required documentation:

- Have MA/MS, Ph.D., or JD from a US-accredited American University or an equivalent degree with coursework in the English language as evaluated by the Office of Graduate Dean (attach copy of school transcript with degree noted).
- Published a refereed first or single-authored academic journal article in the English language (attach a copy of the journal cover and first page of article with your name).
- Graduated with a baccalaureate degree or equivalent from a US-accredited University with a cumulative GPA of 3.7 or above (attach copy of baccalaureate degree transcript).
- Received a 4.5 or higher on the analytical writing portion of the GRE/GMAT (attach verification).
- Instructor of record of a college-level writing course taught in the English language at a US-accredited University approved by the Office of Graduate Dean (attach verification).

Submit the waiver form and attachments to the Office of Graduate Studies. A review of your request will be undertaken, and you will be notified of the decision via email (correspondence will be sent to yourSacState email).

Waiver: □ Granted □ Denied Date:

Graduate Dean: Office of Graduate Studies Comments:

California State University, Sacramento
Office of Graduate Studies
River Point Center 330
6000 J St.
Sacramento, CA 95818-6113
ADVANCEMENT TO CANDIDACY

1. File “Master’s Advancement to Candidacy” application and submit your form before the University deadline (see http://www.csus.edu/gradstudies/). You should begin this procedure as soon as you have:
   • Removed any deficiencies in admission requirements and become fully classified;
   • Cleared the WPG requirement;
   • Completed at least 12 units of graduate level (200 series) Computer Science courses with a minimum 3.0 GPA AND have overall CSUS GPA 3.0 or better.

2. The Application is ONLY available online (http://www.csus.edu/gradstudies/CurrentStudents/forms.html).

3. Plan your degree program in consultation with your graduate advisor.

4. Read and follow the instructions on the application.

5. Important: when submitting any form requiring Graduate Coordinator signature, please attach an unofficial copy of CSUS transcripts.

6. Your completed form must be signed by your Program Advisor & the Graduate Coordinator, who will then forward it to Graduate Studies for approval. (A copy will be sent to you by Graduate Studies once it has been approved.)

7. If you change your plan after it has been approved, you must file a “Petition for Exception.”

GUIDELINES FOR COMPLETING ADVANCEMENT TO CANDIDACY FORM MASTER’S DEGREE

These guidelines must be followed in completing the Advancement to Candidacy form. This form lists the specific requirements (i.e., courses, exams, thesis/dissertation) to be completed before a Master’s degree can be awarded. When the Advancement form is accepted and approved by the Graduate Dean, a student is officially advanced to degree candidacy. The student must submit three (3) copies (one original & two copies) of the signed form to the Office of Graduate Studies for processing.

1. Name - Be consistent. Submit a Data Change form for name changes - keep our records current.
2. Enter your Student Identification number (see ID # on page).  
3. Address - Alert Graduate Center staff of address changes. Keep your address current. You may not relocate or change your address without first contacting the Graduate Center.
4. Mailing Address - We may need to contact you with questions about your record.
5. Major (i.e., Business, English, Psychology, Counseling, Social Work)
6. Concentration (i.e., Finance, Creative Writings) - Do not list areas of study such as Software Engineering for Computer Science.
7. Catalog - Enter catalog years used in listing courses completed (e.g., 2008-2010 catalog). All required courses listed in the catalog must be accounted for on the Advancement form of a course substitution made. It should be noted that an addition #1 on the Advancement form. After the Advancement to Candidacy form has been approved by the Graduate Dean all changes must be submitted for approval as a Petition for Exception.
8. Check if Graduate Writing Requirements have been completed. The writing proficiency requirement must be satisfied according to University policy before a student may advance to candidacy. Effective Fall 2016, students enrolled in the University may not use CSES or the English Language Test as a waiver for the Writing Proficiency Requirement.

9. List advisor and committee members - Please print first and last names. Members who are non-tenured or tenure-track faculty must receive approval from the Graduate Dean to serve on the Master's Committee.

The following applies to 901-912. At the Master’s level, no grade below a "B" (3.0 grade points per unit) may be counted toward the degree unless expressly permitted by a course-approved graduate program's written policies.

10. List the core courses as listed in the catalog year you are using. Any substitutions to the core courses must be noted, and a rational provided on a separate sheet.
11. List the courses taken for the area of study, electives, or concentration. If space is needed to list courses, a Page 2 is available at the Office of Graduate Studies, same Department offices or at www.csus.edu/admissions. (Must submit three (3) copies of the form with signatures).
12. List the Cumulative Experience you will be completing (e.g., GS01, 500). Include number of units to be taken.
13. Sign and Date the form
14. Advisor’s signature. (For Special Majors: The two committee members should sign on this line.)
15. The Graduate Coordinator’s (faculty member) signature is required, except in the case of a Special Major. Special Major - Applicants should obtain the signatures of their Committee Members on line 14. The Graduate Dean serves as the Graduate Coordinator for Special Major students.

NOTES: ATC cannot be discontinued if: Enrolled and not maintained Continuous Enrollment until final enrollment of Cumulative Experience
1. An MS project/thesis must be original work.

2. MS projects/theses are academic publications, which are public information. A work-related project must first resolve any intellectual property issues before it starts.

3. Completed work in any context other than an MS project should not be used to enroll into CSc 502.

4. A course project should not be used to enroll into CSc 502 unless there is a significant extension (of the work previously done) and approval by both the project supervisor and the original course instructor.

5. Students should choose their MS project supervisors carefully. In particular, students are encouraged to select faculty members with expertise in their MS project topic areas.

6. The oral presentation must be on the same project used toward the degree completion.

7. Project completion should be based on the quality of the project judged by the project committee. Other factors such as job commitment should not be used as excuses for demanding completion.

8. Each student is required to do an individual oral presentation.

9. Each student is required to write an individual MS project report and complete an “Academic Integrity Statement on Master's Project/Thesis.”

10. Students should follow other established guidelines for changing project supervisors and for completing the oral presentation requirement.
THESIS/PROJECT ENROLLMENT AND COMPLETION

1. You must have met the following requirements before you will be allowed to enroll in CSC 500/502:
   a. You have been advanced to candidacy (refer to requirements);
   b. You have completed CSC 209;
   c. You have a thesis/project topic and proposal, a faculty supervisor and a second reader (or committee if doing a thesis);
   d. You have submitted an “MS Thesis/Project Topic” form, approved by your faculty supervisor and second reader, to the Graduate Coordinator, with your proposal, methodology and timetable attached;
   e. You have submitted a “Supervisory Course Petition,” approved by your faculty supervisor, to the Graduate Coordinator. (You cannot register yourself; the department will register you after the Graduate Coordinator approves your petition.)

2. You must complete an oral presentation of your project or an oral defense of your thesis before you can graduate.
   a. You may present your MS project at the department’s Graduate Symposium held every semester, a separately scheduled seminar, a professional conference, or a graduate-level course with prior approval of both your project advisor and the course instructor; note that the oral presentation must be on the same project used for your degree completion.
   b. For an MS thesis, you must schedule an oral defense.

3. Your final written report must be approved by your faculty supervisor and second reader (or committee), and be submitted to the Graduate Coordinator for approval THREE (3) WEEKS BEFORE THE OFFICE OF GRADUATE STUDIES DEADLINE.
   a. Work with your supervisor to ensure timely submission of drafts in order to meet this deadline. Be sure to follow the “CSUS Guide for Thesis Format” (see http://www.csus.edu/gradstudies/);
   b. During this process, you must complete and submit an “Academic Integrity Statement on Master's Project/Thesis” to your first reader.
   c. After the Graduate Coordinator signs it, take your final thesis or project report to the Office of Graduate Studies with the Thesis/Project Receipt form and Microfilming and Binding Receipt (also available from the Graduate Studies website).

4. If you cannot finish your project or thesis within one semester, you must continue enrollment:
   a. If you are an international student who needs course credit in order to maintain your visa, submit a “Supervisory Course Petition” for CSC 299 (one unit/semester), with your faculty supervisor’s signature, to the Graduate Coordinator. You cannot register yourself; the department will register you after the Graduate Coordinator approves your petition.
   b. If you are a domestic student or an international student doing Optional Practical Training, register for CSC 599, “Continuous Enrollment,” with the Office of Graduate Studies. You will only have to pay College of Continuing Education fees. After three semesters of CSC 599, if you still cannot finish your project or thesis, you must re-enroll in CSC 500 or 502 and pay full fees.
Important:
when submitting any form requiring Graduate Coordinator signature, please attach an unofficial copy of CSUS transcripts.
Completion of Oral Presentation of MS Project

I have presented my MS Project.

Student name: ____________________________

Student signature: _______________________

Title of presentation: _____________________

Date of presentation: ______

Location of presentation: __________________________

Project Advisor signature: ________________________

Graduate Coordinator signature: ________________

This form must be signed and submitted to the department no later than the submission of the final MS Project Report.

Academic Integrity Statement on Master’s Project/Thesis

I, ____________________________, (print name), certify that I have read, understood, and followed the University’s rules of academic integrity posted at http://www.csus.edu/umanual/AcademicHonestyPolicyandProcedures.htm in conducting my project/thesis work. My Master’s project/thesis work is original, and each and every use of existing work is cited with proper reference.

Student Signature: ____________________________

Date: __________________
CONTINUOUS ENROLLMENT

Graduate students who have been advanced to candidacy and who have completed all course work can maintain the required active degree program status without additional University registration by enrolling in CSC 599 (“Continuous Enrollment”) through Open University. (There are no units associated with this enrollment, so students who need units to maintain visa status should enroll in CSC 299 instead.) Enrolling in 599 requires a College of Continuing Education fee equal to one unit. Students are allowed a maximum of three semesters in 599 after first registering in 500/502 for a semester. A grade of “RP” will appear on their records as long as satisfactory progress is made toward completion and “continuous enrollment” is maintained. Students who do not complete the culminating experience within a total of four semesters will receive No Credit (“NC”) grades which cannot be removed from their records. They may re-enroll in 500/502 within the next two semesters and pay University fees in order to continue, as long as their 7-year deadline has not expired.
PETITION FOR EXCEPTION

If you change your “Advancement to Candidacy” plan after it has been approved (including changing from thesis to project), you must file a “Petition for Exception.”

Important: When submitting any form requiring Graduate Coordinator signature, please attach an unofficial copy of CSUS transcripts.
PETITION FOR CURRENCY

If completing your plan takes longer than expected, you may need to file a Petition for Currency. Course credit is valid for seven years only.
APPLICATION FOR GRADUATION

Important: when submitting any form requiring Graduate Coordinator signature, please attach an unofficial copy of CSUS transcripts.
SUMMARY OF MS DEGREE COMPLETION AND GRADUATION

- Complete all coursework with a minimum 3.0 GPA (in 30 units of MS Program and CSUS overall GPA) and no grade lower than a “C” in the 30 units of Graduate program;

- Complete your MS thesis or project, including the oral presentation or defense and the statement of academic integrity; register for “continuous enrollment” if necessary;

- Complete both of the above within seven years;

- Complete and file all required paperwork as outlined in this handbook, including your “Application for Graduation with a Master’s Degree”;

- If you plan to attend Commencement, sign up in the ECS Dean’s Office to have your name included in the printed program;

- Your degree will be posted to your transcript 6-8 weeks after the end of the semester. Your diploma will be mailed to you approximately three months after graduation. (Be sure to file a data change form with the Office of Graduate Studies if you change your address.)
DEGREE REQUIREMENTS – MS in Computer Science

The Master of Science in Computer Science requires completion of 30 units of course work, including at least 21 units of 200-level and 500-level courses, with a minimum 3.0 GPA. Only those courses completed within seven years prior to date of graduation will satisfy course requirements. An outline of degree requirements follows:

A. Required Courses (13 units)
   (3) CSC 201 Programming Language Principles (fully classified graduate status in Computer Science or Software Engineering)
   (3) CSC 204* Data Models for Database Management Systems (fully classified graduate status in Computer Science or Software Engineering)
   (3) CSC 205* Computer Systems Structure (fully classified graduate status in Computer Science, Software Engineering, or Computer Engineering)
   (3) CSC 206 Algorithms and Paradigms (fully classified graduate status in Computer Science or Software Engineering)
   (1) CSC 209 Research Methodology (fully classified graduate status in Computer Science or Software Engineering, a passing score on the WPG, completion of at least 12 units of 200-level courses in CSC)

*Students whose undergraduate preparation has covered a significant amount of the material in CSC 204 or 205 may be given a waiver by the department from taking one or more of these courses. In this case, for each course waived with department approval, the student must take three additional units of Restricted Electives, described in Section C below.

B. Breadth Requirement (9 units)
   Select one course from three of the following areas:
   **Computer Architecture/Computer Engineering**
   CSC 237 Microprocessor Systems Architecture (CSC 205)
   CSC 242 Computer-Aided Systems Design and Verification (CSC 205 or CSC/EEE 273)
   CSC 273 Hierarchical Digital Design Methodology (CSC 205 or CPE 64 or equivalent)
   CSC 280 Advanced Computer Architecture (CSC 205 and fully classified graduate status in Computer Science or Software Engineering)

   **Database Management Systems**
   CSC 212 Bioinformatics: Data Integration and Algorithms (CSC 130, STAT 50, and graduate status; BIO 10 recommended)
   CSC 244 Database System Design (CSC 174 or CSC 204)

   **Information Assurance and Security**
   CSC 250 Computer Security (fully classified graduate status in Computer Science, Software Engineering, or Computer Engineering)
   CSC 252 Cryptography Theory and Practice (fully classified graduate status in Computer Science, Software Engineering, or Computer Engineering)
   CSC 253 Computer Forensics (fully classified graduate status in Computer Science, Software Engineering, or Computer Engineering)
   CSC 254 Network Security (fully classified graduate status in Computer Science, Software Engineering, or Computer Engineering)

   **Intelligent Systems**
   CSC 214 Knowledge-Based Systems (fully classified graduate status in Computer Science or Software Engineering)
   CSC 215 Artificial Intelligence (fully classified graduate status in Computer Science, Software Engineering, or Computer Engineering)
   CSC 219 Machine Learning (fully classified graduate status in Computer Science, Software Engineering, or Computer Engineering)

   **Networks and Communications**
   CSC 255 Computer Networks (fully classified graduate status in Computer Science, Software Engineering, or Computer Engineering)
CSC 258 Distributed Systems (CSC 204 and fully classified graduate status in Computer Science, Software Engineering, or Computer Engineering)
CSC 275 Advanced Data Communication Systems (fully classified graduate status in Computer Science, Software Engineering, or Computer Engineering)

**Software Engineering**
CSC 230 Software System Engineering (fully classified graduate status in Computer Science or Software Engineering; OR fully classified graduate status in Computer Engineering and CSC 131)
CSC 231 Software Engineering Metrics (fully classified graduate status in Computer Science or Software Engineering)
CSC 232 Software Requirements Analysis and Design (fully classified graduate status in Computer Science or Software Engineering)
CSC 233 Advanced Software Engineering Project Management (fully classified graduate status in Computer Science or Software Engineering)
CSC 234 Software Verification and Validation (fully classified graduate status in Computer Science or Software Engineering; OR fully classified graduate status in Computer Engineering and CSC 131)
CSC 235 Software Architecture (fully classified graduate status in Computer Science or Software Engineering)
CSC 236 Formal Methods in Secure Software Engineering (fully classified graduate status in Computer Science or Software Engineering)
CSC 238 Human-Computer Interface Design (fully classified graduate status in Computer Science or Software Engineering)

**Systems Software**
CSC 239 Advanced Operating System Principles and Design (CSC 205)
CSC 245 Performance Modeling and Evaluation (fully classified graduate status in Computer Science or Software Engineering)
CSC 250 Computer Security (fully classified graduate status in Computer Science, Software Engineering, or Computer Engineering)
CSC 251 Principles of Compiler Design (CSC 151 or CSC 201)

**C. Restricted Electives (3-6 units)**
Prior to taking an elective course, students must obtain approval from their advisor, and either the Graduate Coordinator or the Department Chair. Students should choose their electives according to the following guidelines:
1. One of the following upper-division courses: CSC 148, CSC 155, CSC 159, CSC 165, CSC 176, CSC 177, as long as they have not been used towards another degree. (A maximum of 6 undergraduate units may be used in any graduate program.)
2. Any 200-level CSC courses not already used to satisfy the Breadth Requirement, with the exception of CSC 295 and CSC 299. Students not required to take CSC 204 or CSC 205 must, for each course waived, take an additional three units in this category.
3. Related 200-level courses from outside the Computer Science Department may only be taken with prior department approval and may not have been used in another program.

**D. Culminating Requirement (2-5 units)**
Select one of the following:
CSC 500 Master's Thesis (CSC 209; advanced to candidacy) OR
CSC 502 Master's Project (CSC 209; advanced to candidacy)

Students are required to make an oral presentation of their master's project or conduct an oral defense of their master's thesis. The recommended department-level deadline in each semester for submitting an MS project or thesis signed by the committee chair and its members to the Graduate Coordinator's Office is 10 weekdays prior to the University deadline.

**NOTE:** Full course descriptions as well as other information about our graduate programs can be found on the web at: [www.ecs.csus.edu/csc](http://www.ecs.csus.edu/csc).
DEGREE REQUIREMENTS – MS in Software Engineering

The Master of Science in Software Engineering program covers the entire software application development process from problem definition through requirements, design, implementation, testing, operation, and maintenance. It requires completion of 30 units of course work, including a project or thesis in Software Engineering, with a minimum 3.0 GPA. Only those courses completed within seven years prior to date of graduation will satisfy course requirements. An outline of degree requirements follows:

A. Required Software Engineering Courses (21 units)
   Select seven of the following eight courses:
   (3) CSC 230  Software System Engineering (fully classified graduate status in Computer Science or Software Engineering; OR fully classified graduate status in Computer Engineering and CSC 131)
   (3) CSC 231  Software Engineering Metrics (fully classified graduate status in Computer Science or Software Engineering)
   (3) CSC 232  Software Requirements Analysis and Design (fully classified graduate status in Computer Science or Software Engineering)
   (3) CSC 233  Advanced Software Engineering Project Management (fully classified graduate status in Computer Science or Software Engineering)
   (3) CSC 234  Software Verification and Validation (fully classified graduate status in Computer Science or Software Engineering; OR fully classified graduate status in Computer Engineering and CSC 131)
   (3) CSC 236  Formal Methods in Secure Software Engineering (fully classified graduate status in Computer Science or Software Engineering)
   (3) CSC 235  Software Architecture (fully classified graduate status in Computer Science or Software Engineering)
   (3) CSC 238  Human-Computer Interface Design (fully classified graduate status in Computer Science or Software Engineering)

B. Required Research Methodology (1 unit)
   (1) CSC 209  Research Methodology (fully classified graduate status in Computer Science or Software Engineering, passing score on the WPG, completion of at least 12 units of 200-level courses in CSC)

C. Restricted Electives (3-6 units)
   Prior to taking an elective course, students must obtain approval from their advisor, and either the Graduate Coordinator or the Department Chair. Students should choose their electives according to the following guidelines:
   1. One of the following upper-division courses: CSC 148, CSC 155, CSC 159, CSC 165, CSC 176, CSC 177, as long as they have not been used towards another degree. (A maximum of 6 undergraduate units may be used in any graduate program.)
   2. Any 200-level CSC courses not already used to satisfy Requirements A and B, with the exception of CSC 295 and CSC 299. An additional three units in this category must be taken if a core course is waived.
   3. Related 200-level courses from outside the Computer Science Department may only be taken with prior department approval and may not have been used in another program.

D. Culminating Requirement (2-5 units)
   Select one of the following:
   CSC 500  Master’s Thesis (CSC 209; advanced to candidacy) OR
   CSC 502  Master’s Project (CSC 209; advanced to candidacy)
   Students are required to make an oral presentation of their master’s project or conduct an oral defense of their master’s thesis. The recommended department-level deadline in each semester for submitting an MS project or thesis signed by the committee chair and its members to the Graduate Coordinator’s Office is 10 weekdays before the University deadline.

NOTE: Full course descriptions as well as other information about our graduate programs can be found on the web at: www.ecs.csus.edu/csc.
The Certificates in Computer Science are designed to recognize students who have completed the core graduate courses – CSc 201, CSc 204, CSc 205 and CSc 206 – plus additional coursework in a specialty area. These certificates are available only for MS Computer Science matriculated students. Application forms are available in the department and on the department website at www.ecs.csus.edu/csc/ (select “Certificate Programs”).

Note: A grade point average of 3.0 must be attained for all courses taken in the program.

Certificate in Computer Architecture (9 units)

(3) CSC 242 Computer Aided Design Methodology for Computer Systems (CSC 205 or CSC 273)
(3) CSC 280 Advanced Computer Architecture (CSC 205 and fully classified graduate status in Computer Science or Software Engineering)
(3) Select one of the following:
   CSC 237 Microprocessor Systems Architecture (CSC 205)
   CSC 245 Performance Modeling and Evaluation (fully classified graduate status in Computer Science, Software Engineering, or Computer Engineering)
   CSC 258 Distributed Systems (CSC 204 and fully classified graduate status in Computer Science, Software Engineering, or Computer Engineering)
   CSC 273 Hierarchical Digital Design Methodology (CSC 205 or CPE 64 or equivalent)
   CSC 288 Special Topics in Computer Science – Computer Architecture/ Computer Engineering (fully classified graduate status in Computer Science or Software Engineering)

Certificate in Computer Engineering (9 units)

(3) Select one of the following:
   CSC 237 Microprocessor Systems Architecture (CSC 205)
   CSC 280 Advanced Computer Architecture (CSC 205 and fully classified graduate status in Computer Science or Software Engineering)
   EEE 285 Micro-Computer System Design II (CPE 186 or EEE 285)
(3) Select one of the following:
   CSC 242 Computer Aided Systems Design and Verification (CSC 205)
   CSC 273 Hierarchical Digital Design Methodology (CSC 205 or CPE 64 or equivalent)
(3) Select one of the following:
   CSC 159 Operating System Pragmatics (CSC 139)
   CSC 239 Advanced Operating System Principles and Design (CSC 205)

Certificate in Computer Networks and Communications (9 units)

(3) CSC 255 Computer Networks (fully classified graduate status in Computer Science, Software Engineering, or Computer Engineering)
(6) Select at least two of the following:
   CSC 254 Network Security (fully classified graduate status in Computer Science, Software Engineering, or Computer Engineering)
   CSC 258 Distributed Systems (CSC 204 and fully classified graduate status in Computer Science, Software Engineering, or Computer Engineering)
   CSC 275 Advanced Data Communication Systems (fully classified graduate status in Computer Science, Software Engineering, or Computer Engineering)
   CSC 288F Special Topics in Computer Science – Network Communication (fully classified graduate status in Computer Science or Software Engineering)

Certificate in Data Mining (9 units)

(3) CSC 177 Data Warehousing and Data Mining (CSC 134 and STAT 50)
(3) CSC 219 Machine Learning (fully classified graduate status in Computer Science, Software Engineering, or Computer Engineering)
(3) Select one of the following:
CSC 212  Bioinformatics: Data Integration and Algorithms (CSC 130, STAT 50, and graduate status; BIO 10 recommended)
CSC 244  Database Systems Design (CSC 174 or CSC 204)

Certificate in Data Management Systems (9 units)
(9) Select at least three of the following:
CSC 244  Database System Design (CSC 174 or CSC 204)
CSC 250  Computer Security (fully classified graduate status in Computer Science, Software Engineering, or Computer Engineering)
CSC 258  Distributed Systems (CSC 204 and fully classified graduate status in Computer Science, Software Engineering, or Computer Engineering)
CSC 288E  Special Topics in Computer Science – Database Management (fully classified graduate status in Computer Science or Software Engineering)

Certificate in Information Assurance and Security (9 units)
(9) Select at least three of the following:
CSC 236  Formal Methods in Secure Software Engineering (fully classified graduate status in Computer Science or Software Engineering)
CSC 250  Computer Security (fully classified graduate status in Computer Science, Software Engineering, or Computer Engineering)
CSC 252  Cryptography Theory and Practice (fully classified graduate status in Computer Science, Software Engineering, or Computer Engineering)
CSC 253  Computer Forensics (fully classified graduate status in Computer Science, Software Engineering, or Computer Engineering)
CSC 254  Network Security (fully classified graduate status in Computer Science, Software Engineering, or Computer Engineering)

Certificate in Intelligent Systems (9 units)
(3) CSC 215  Artificial Intelligence (fully classified graduate status in Computer Science, Software Engineering, or Computer Engineering)
(6) Select at least two of the following:
CSC 214  Knowledge-Based Systems (fully classified graduate status in Computer Science or Software Engineering)
CSC 219  Machine Learning (fully classified graduate status in Computer Science, Software Engineering, or Computer Engineering)
CSC 288B  Special Topics in Computer Science – Intelligent Systems (fully classified graduate status in Computer Science or Software Engineering)

Certificate in Software Engineering (9 units)
(9) Select at least three of the following:
CSC 230  Software System Engineering (fully classified graduate status in Computer Science or Software Engineering; OR fully classified graduate status in Computer Engineering and CSC 131)
CSC 231  Software Engineering Metrics (fully classified graduate status in Computer Science or Software Engineering)
CSC 232  Software Requirements Engineering (fully classified graduate status in Computer Science or Software Engineering)
CSC 233  Advanced Software Engineering Project Management (fully classified graduate status in Computer Science or Software Engineering)
CSC 234  Software Verification and Validation (fully classified graduate status in Computer Science or Engineering; OR fully classified graduate status in Computer Engineering and CSC 131)
CSC 235  Software Architecture (fully classified graduate status in Computer Science or Software Engineering)
CSC 236  Formal Methods in Secure Software Engineering (fully classified graduate status in Computer Science or Software Engineering)
CSC 238  Human-Computer Interface Design (fully classified graduate status in Computer Science or Software Engineering)
CSC 288D  Special Topics in Computer Science – Software Engineering (fully classified graduate status in Computer Science or Software Engineering)

Certificate in Systems Software (9 units)
(3) CSC 239  Advanced Operating System Principles and Design (CSC 205)
(6) Select at least two of the following:
   CSC 245  Performance Modeling and Evaluation (fully classified graduate status in Computer Science or Software Engineering)
   CSC 250  Computer Security (fully classified graduate status in Computer Science, Software Engineering, or Computer Engineering)
   CSC 251  Principles of Compiler Design (CSC 151 or CSC 201)
   CSC 258  Distributed Systems (CSC 204 and fully classified graduate status in Computer Science, Software Engineering, or Computer Engineering)
   CSC 288C  Special Topics in Computer Science – Systems Software (fully classified graduate status in Computer Science or Software Engineering)
Department of Computer Science

TENTATIVE TWO-YEAR SCHEDULE OF GRADUATE COURSES

### MS in Computer Science: Required Courses

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<th>Fall 2014</th>
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### MS in Computer Science: Breadth Requirement

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<th>Fall 2013</th>
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<th>Spring 2015</th>
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<tbody>
<tr>
<td>Software Engineering</td>
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<td>231, 232</td>
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<td>245, 250</td>
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### MS in Software Engineering

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<td>Software Engineering Courses</td>
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<td>Required Research Methodology</td>
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Note: This is a planning document and not an implied guarantee that the schedule will be followed. Additional offerings of new graduate courses and experimental courses (296) may be scheduled as appropriate. CSC 295, 299, 500, and 502 are scheduled every term including Summer Session. The department reserves the right to cancel the class in the event that there is insufficient enrollment to financially justify the class. Please enroll early if you want the class.

Rev. 2/27/2013

VP
COMPUTER SCIENCE FACULTY AREAS OF INTEREST

**Behnam Arad**
computer engineering, computer architecture, parallel processing, neural networks

**Weide Chang**
speech and image recognition, embedded systems, intelligent interfaces and devices

**Jun Dai**
network and distributed system security, cloud security, mobile security big data in enterprise cyber security space, cyber physical system security

**Nikrouz Faroughi**
computer architecture, computer-aided design testability, design validation

**Isaac Ghansah**
computer networking, computer architecture, distributed systems, simulation modeling, security

**V. Scott Gordon**
artificial intelligence, genetic algorithms, neural networks, programming languages, database design, game tree search, software engineering, computer games and graphics

**Ying Jin**
application integration, database technology, object-oriented distributed computing, software engineering

**Ted Krovetz**
cryptography, network security, algorithms, computing theory, computer architecture

**Meiliu Lu**
data mining, machine learning, bioinformatics technology

**Pinar Muyan-Ozcelik**
computer graphics and games, mobile computing, GPU computing

**Jinsong Ouyang**
manageability, security, and reliability of networking and distributed systems; embedded system design; network engineering; Web and Internet systems architecture, middleware, and application

**Ahmed Salem**
software engineering, software testing, software process improvement, computer security

**Ghassan Shobaki**
compilers; algorithms and Theory of computation; operating systems.

**Chung-E Wang**
computer networks, data compression, Chinese OCR, design and analysis of algorithms

**Cui Zhang**
programming languages, formal methods for secure software engineering, computer-aided specification and verification, information assurance and security