MISSOURI S&T

University of Science & Technology

Computer Engineering Undergraduate Student Handbook

July 2019 Edition

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Chapter 1

Introduction

The department of Electrical and Computer Engineering (ECE) developed this handbook to assist you with your Computer Engineering (CpE) program. We provide the names of a number of professors and administrators that you can contact for various purposes. We also summarize information available in other Missouri S&T documents and provide web addresses where you can find more information.

This handbook is available at https://ece.mst.edu/academic-programs/ We recommend that you review the table of contents of this handbook so that you will know what information this document contains. We further suggest that you read all of chapters 1 and 3.

If there appears to be a discrepancy between information in this handbook and other university documents, contact your advisor or the CpE associate chair for undergraduate studies. We always welcome suggestions for improving or correcting this handbook. You should direct your comments to the associate chair for CpE undergraduate studies.

1.1   Departmental Administration

1.1.1   Vice Provost Academic Support

Dr. Jeffrey Cawlfield, 105 Norwood, 341-4390, cawlfieldj@mst.edu

To insure a uniformly high quality education the department of academic affairs enforces a number of graduation requirements for all undergraduate engineering programs. These include the engineering schools general education requirements (humanities and social sciences requirements), residency, GPA, and the freshman engineering requirements. If you wish to have any of these requirements waived, you must receive permission from your academic advisor, the CpE associate chair for undergraduate studies in the ECE department and then from Dr. Cawlfield, the vice-provost for undergraduate studies.

1.1.2   ECE Department Chair

Dr. Daryl Beetner, 139 EECH, 341-6203, daryl@mst.edu

The chair of ECE coordinates and monitors the efforts of the ECE faculty and enforces graduation requirements that are specific to ECE. Most questions and forms are handled by one of the four associate chairs. However, you should contact the department Chair directly when you have concerns, complaints, or even compliments regarding a member of the faculty.

1.1.3   Associate Chair for Graduate Studies

Dr. Chang-Soo Kim, 135 EECH, 341-4529, ckim@mst.edu

Anyone seeking admission into the ECE graduate program should contact this associate chair. He coordinates all aspects of the department's graduate program, including admission, and selection of chancellor's fellows, graduate teaching assistants (GTAs) and graduate research assistants (GRAs).

1.1.4   Associate Chair for Electrical Engineering Undergraduate Studies

Dr. Mehdi Ferdowsi, 121 EECH, 341-6321, watkins@mst.edu

Direct your inquiries about the electrical engineering (EE) degree program to this associate chair. He deals with all aspects of the EE undergraduate program, including admission. Relative to the EE program, he has the same signature authority that the associate chair for CpE undergraduate studies has for the CpE program.

1.1.5   Associate Chair for Laboratory Development

Dr. Kurt L. Kosbar, 227 EECH, 341-4894, kosbar@mst.edu

This associate chair supervises all required ECE laboratories. He is also responsible for improving and developing laboratory experiments and courses. If you have questions, suggestions, or problems concerning a laboratory course or GTA instructor for a laboratory course, this is the person to contact.

1.1.6   Associate Chair for Distance Education

Dr. Sahra Sedighsarvestani, 135 EECH, 341-7505, sedighs@mst.edu

This associate chair will assist you with inquiries about distance courses for the electrical and computer engineering undergraduate and graduate programs. She will assist you with questions regarding issues such as distance course enrollment and options for on- and off-campus students. She is the contact person for questions or suggestions about distance course offerings.

1.1.7   Associate Chair for Computer Engineering Undergraduate Studies

Dr. R. Joe Stanley, 127 EECH, 341-6896, stanleyj@mst.edu

The associate chair handles most of the questions and forms generated by undergraduate CpE students. He has the authority to sign for the chairman on these forms:

- ADD/DROP
- COURSE SUBSTITUTIONS AND WAIVERS
- REQUEST TO TRANSFER PART OF THE LAST 60 HOURS FOR A DEGREE
- NOTIFICATION OF SCHOLASTIC ACTION
- AUTHORIZATION TO CHANGE UNDERGRADUATE CATALOG YEAR
- UNDERGRADUATE READMISSION REQUEST
- REQUEST TO WITHDRAW FROM SCHOOL
- PETITION FOR EXCESS SCHEDULE ON PROBATION
- UNDERGRADUATE REQUEST TO CHANGE MAJORS

This associate chair can also sign other documents in the CpE department chair's absence. Most of these forms can be obtained from the undergraduate secretary in 140 EECH, the registrar's office, or on the web at http://registrar.mst.edu/forms/.

1.1.8   Undergraduate Advising and Recruiting

Dr. Robert Woodley, 115 EECH, 341-6500, rwoodley@mst.edu

Upon admission to the CpE program, you will be assigned an advisor to help you develop a coherent plan of study, career planning, and must approve your class schedule, adding and dropping classes, and any course substitution or waiver. The advising and recruiting specialist can assist you with these questions, as well as information available on the ECE department website (https://ece.mst.edu).

1.1.9   Faculty Advisors

In addition to teaching and research, all ECE faculty members advise undergraduate students, and you will be assigned an advisor. Your advisor can help you develop a coherent plan of study, career planning, and must approve your class schedule, adding and dropping classes, and any course substitution or waiver.

1.1.9   Changing Advisors

See the secretary for undergraduate studies in 140 EECH to change your advisor.

1.2   Required Reading for Every Undergraduate CpE Student

Your faculty advisor expects you to read certain documents published by the university that explain university rules and regulations. These documents can answer many of your questions and allow you more time to discuss important topics, such as career guidance, with your advisor. We provide a brief description of some important documents below. While you will never be tested on this material, failing to understand these requirements may needlessly delay graduation or cause other problems.

1.2.1   Missouri S&T Student Academic Regulations

The Student Academic Regulations is the definitive guide to the rules and policies governing all students at Missouri S&T. You are responsible for knowing and meeting these regulations. This document is available at http://registrar.mst.edu/academicregs/.

1.2.2   Missouri S&T Undergraduate Catalog

The Missouri S&T Undergraduate Catalog describes the undergraduate degree programs and requirements at Missouri S&T. It is published annually and can be found online at http://registrar.mst.edu/cataloginfo/cataloginfo.html.   You should read the sections relating to the CpE curriculum and courses.

We occasionally change graduation requirements to improve our program, but students attending Missouri S&T are allowed to continue under the catalog in force when they began their college studies. You should view the most recent copy of this catalog for the newest graduation requirements. If you prefer the new set of requirements, you may file a petition to change to the new program by filling out an AUTHORIZATION TO CHANGE UNDERGRADUATE CATALOG YEAR FORM obtained from the registrar's office or at http://registrar.mst.edu/forms/.

If you are a transfer student or have interrupted your studies, special rules may apply you. See section 3.1 for the details.

1.2.3   Schedule of Classes

You can find the most recent schedule of classes at http://registrar.mst.edu/classofferings/. This schedule describes which courses are offered, their reference numbers, meeting times, locations, section letters, and other information. In addition, this document contains a reporting schedule that lists dates such as when classes begin, final examination schedules, holidays, vacations, important dates for adding/dropping courses, and registering for classes. Before enrolling in a class, you should check the schedule of classes and make plans to attend every class meeting including the final examination. If you are unable or unwilling to attend some of these meeting times, you should either not enroll in the class, or contact the instructor prior to enrolling. Instructors have the authority to drop you from a class because of absences.

1.2.4   CAPS Report

The registrar's office maintains a computerized academic progress system (CAPS or degree audit) report for each student. Your CAPS report lists all of your courses and grades. The report also lists your degree requirements and which have been satisfied. You can view your CAPS report at https://joess.mst.edu/ at any time, and you should receive a current copy from your advisor during priority registration. The registrar's office publishes a short document describing how to interpret your CAPS report.

You should review your CAPS report every semester to insure that all information on your report is correct. This is particularly important as graduation approaches. The registrar's office will not allow you to graduate until all requirements listed on your CAPS report are satisfied.

1.2.5   CpE Undergraduate Bulletin Boards

Several bulletin boards are available in Emerson Electric Company Hall (EECH) to provide accurate and timely information for students.

Main Departmental Bulletin Board: This is in the first floor lobby near the north entrance of EECH. It contains general information for the current semester such as a schedule of classes, web addresses for ECE related sites, a listing of candidates for graduation, GTA offices, and special notices. **NOTE: Only departmental staff may post to this board.**

Undergraduate Job Postings Bulletin Board: This is located in the ECE student library, 113 EECH. Job openings of interest to students are posted here. **Only departmental staff may post to this board.**

Students/Student Organizations Bulletin Boards: The locations of the three bulletin boards in EECH where students may post approved notices are:

- Between rooms 101 and 102 EECH
- In the canteen area, G15 EECH
- Near G1 EECH
- Near 201 EECH (This board also contains advertisements from other universities)

All postings must be done using thumbtacks. **DO NOT USE TAPE OR STAPLES**. **No postings are allowed on doors, windows, or walls. Items posted improperly will be removed.** *Please see the undergraduate secretary (140 EECH) if you have any questions regarding where to post items.*

1.2.6   World Wide Web Documents

The ECE Department distributes a considerable amount of information over their website at http://ece.mst.edu/. This site lists information on faculty, staff, ECE computer labs, graduate and undergraduate students, and professional organizations. See Section 1.2.8 on how to create your computer account.

1.2.7   ECE Dept. Email Mailing List

The department distributes announcements concerning scholarships, job opportunities, schedule changes, and a host of other information by email. If you would like to be included in this list, check the website at http://ece.mst.edu/undergraduateprograms/ugradmailinglist.html.

1.2.8   Information Technology

104 Computer Science Bldg, 341-4357, helpdesk@mst.edu

The department of Information Technology is in charge of operating the computers on campus. As a Missouri S&T student, you are encouraged to have a computer account and use email. The staff of information technology will assist you in establishing your account and can answer your questions concerning the use of university computers. The information technology website is http://it.mst.edu. You can find a list of all Missouri S&T computer learning centers (CLC's) at http://helpdesk.mst.edu/generalinfo/about/tlss.html.

1.2.9   Disability Support Services

204 Norwood Hall, 341-4211, dss@mst.edu

Contact the coordinator of disability support services to request special accommodations regarding a disability related service. You can find the Missouri S&T policy related to students with disabilities at http://dss.mst.edu/.

Chapter 2

Admission/Admission Standards

You must be formally admitted into Missouri S&T, before you can apply for admission to enter the Freshman Engineering Program (FEP) or CpE. Your questions concerning general Missouri S&T admission procedures and requirements should be directed to the admissions office. You can answer many of your questions by visiting the admissions office website at http://admissions.mst.edu/.

You may enroll in CpE classes if you have completed the prerequisites and have the consent of your advisor. However, you can graduate with a B.S. CpE degree only if you have been accepted into the CpE program.

High School Seniors

Assistant Director of Admissions
Cindy Welch, 106 Parker Hall, 815-236-3256, welchcy@mst.edu

We do not admit high-school seniors directly into the ECE department. You should contact the admissions office and apply for admission into the Freshman Engineering Program (FEP). After completing the two-semester FEP, you may apply for admission to the CpE program. Read the next section for further details.

2.1   Freshman Engineering Students (FEP)

125 McNutt Hall, 341-4977, fep@mst.edu

The FEP program is designed to help you adjust to life at Missouri S&T and to make an informed selection of a career path. You will be routinely admitted into the B.S. CpE program if you have

- Earned a cumulative GPA of 2.250 or above and completed
- Phys 1135/23 Engineering Physics I with a grade of C or better
- Math 1214/14 Calculus for Engineers I with a grade of C or better
- Math 1215/15 Calculus for Engineers II with a grade of C or better
- Chem 1310/1 General Chemistry & Chem 1319/2 General Chemistry Lab
- FE 1100/10   Study and Careers in Engineering
- Engl 1120/20 Exposition and Argumentation
- Mc Eng 1720/IDE 20   Engineering Design with Computer Applications
- One or more courses in the humanities or social sciences

If you fail to meet these requirements, you should contact the CpE associate chair for undergraduate studies for counseling before applying to CpE. Experience has shown that few students who enter the B.S. CpE program with a Missouri S&T GPA below 2.50 are able to successfully complete the program. The average math ACT scores of incoming B.S. CpE students is 28. Students with math ACT scores below 25 may find the B.S. CpE program difficult.

2.2   Academic Advisors

You are assigned an academic advisor while in the FEP. Upon acceptance into the CpE program, you are assigned a new advisor by the ECE secretary for undergraduate studies.

2.3 Transfer Students/Courses

Information for transfer students is located at http://admissions.mst.edu/transfer.

2.3.1 Definition of a Transfer Student

If you are currently attending another university or college, or a Missouri S&T student enrolled in a major other than the FEP, and wish to transfer to ECE, we consider you to be a transfer student. We will routinely admit you to ECE if you have

- Earned a cumulative grade point average (GPA) above 2.750 and completed
- Over 50 credit hours of course work in a high quality pre-engineering program
- Phys 1135/23-Engineering Physics I with a grade of C or better
- Phys 2135/24-Engineering Physics II with a grade of C or better
- Math 1214/14-Calculus for Engineers I with a grade of C or better
- Math 1215/15-Calculus for Engineers II with a grade of C or better
- Math 2222/22-Calculus with Analytic Geometry III with a grade of C or better
- Math 3304/204-Elementary Differential Equations with a grade of C or better
- Chem 1310/1-General Chemistry & Chem 2 General Chemistry Laboratory
- Engl 1120/20-Exposition and Argumentation
- Mc Eng 1720/IDE 20-Engineering Design with Computer Applications
- One or more courses in the humanities or social sciences

If you fail to meet these requirements, you should contact the CpE associate chair for undergraduate studies for counseling before applying for the CpE program.

Experience has shown that few transfer students who enter the B.S. CpE program with a GPA below 2.75 are able to successfully complete the program. The good news is that in recent years over 90% of our transfer students have successfully completed the degree program.

2.3.2 Transferring Credit to Missouri S&T

Prior to graduation, you must transfer to Missouri S&T all college courses taken at institutions of higher education. These affect your cumulative GPA. Some of these courses may also fulfill some graduation requirements. The restrictions and procedures for transferring courses are too numerous to list here. You should contact the transfer coordinator for CpE undergraduate studies or the Missouri S&T transfer admissions coordinator to answer specific questions concerning transferring courses.

2.3.3 Transfer Coordinator

Computer Engineering Transfer Coordinator/Advisor
Dr. R. Joe Stanley, 127 EECH, 341-6896, stanleyj@mst.edu

Computer engineering students who transfer to Missouri S&T from another college or university are assisted by the CpE transfer coordinator/advisor to set up their first schedule of classes. The students are then assigned a permanent faculty advisor by the secretary for undergraduate studies in 140 EECH.

2.3.4 Model Transfer Agreements (Transfer Students Only)

Missouri S&T has Model Transfer Agreements with numerous other colleges and universities which list the Missouri S&T equivalent course numbers for specific courses at the other institutions. You may contact the Missouri S&T transfer coordinator in the admissions office to obtain a list of schools and courses covered by model transfer agreements. As a transfer student, you should acquire and keep a copy of the agreement with your school. Copies of model transfer agreements are available from the Missouri S&T transfer coordinator in the admissions office, or at https://registrar.mst.edu/transfercredit/.

2.3.5 Transferring Non-CpE Courses to Missouri S&T

You may wish to transfer a non-CpE course to Missouri S&T. If the course is not covered by a model transfer agreement, you should contact the Missouri S&T Transfer Admissions or the Missouri S&T department chair in the area in which the course is taught. The chair will decide if there is an equivalent course at Missouri S&T, and notify the Missouri S&T transfer coordinator. More information about course transfers and credit can be obtained at https://futurestudents.mst.edu/admissions/transfer/.

2.3.6 Transferring EE 2100/151 and EE 2120/153 Courses to Missouri S&T

To transfer Circuits I or Circuits II (equivalent to Missouri S&T EE 2100/151 and EE 2120/153) courses to Missouri S&T, you must pass special examinations known as the EE Advancement Exam I (EEAE I) and EE Advancement Exam II (EEAE II). You must pass EEAE I before attempting EEAE II. See sections 3.2.12 and 3.2.13.

2.3.7 Transferring Upper-Level CpE courses (CpE 2xxx and 3xxx/2xx, CpE 4xxx and 5xxx/3xx) to Missouri S&T

The department applies stringent rules to students who wish to transfer 2xxx and 3xxx/200- and 4xxx and 5xxx/300-level CpE courses to Missouri S&T. (These courses are also known as CpE 2xxx and 3xxx/2xx and CpE 4xxx and 5xxx/3xx). The rules for transferring courses depend on where the course was taken.

- Courses taken at another ABET accredited B.S. CpE Program. If you take a course in a CpE program accredited by ABET, you may be allowed to transfer the course to Missouri S&T. You should contact the CpE associate chair for undergraduate studies to determine if there is a Missouri S&T equivalent course number for the course you want to transfer. Currently, the only ABET accredited CpE programs in the state of Missouri are Missouri S&T, UM-Columbia, St. Louis University, and Washington University in St. Louis.
- Courses taken at the Engineering Education Center (EEC). UMSL, St. Louis, MO. Missouri S&T offers a number of CpE courses at the EEC in St. Louis. There courses are targeted toward graduate students. However, undergraduate students who are temporarily place-bound in the St. Louis area may be able to take a 4xxx or 5xxx/300 level CpE course at the EEC. These courses have a Missouri S&T course number, and can be transferred to Missouri S&T.
- Courses taken at non-ABET accredited schools. If a school is not ABET accredited, it is difficult for Missouri S&T to determine the quality and scope of their upper level CpE courses. For this reason, you will be allowed to either transfer the course as a general-credit course, or you will need to receive credit by examination.

2.3.8   Distance and Continuing Education

216 Centennial Hall, 341-6222, dce@mst.edu

Missouri S&T offers a number of distance courses that may be taken by correspondence or over the internet. Missouri S&T treats these courses as if they were taken at the University of Missouri-Columbia campus. This means all model transfer agreements will apply. The grade in the course will affect the student's UM GPA, but not the student's Missouri S&T GPA, and the course will be considered off-campus for the last 60 hours on campus rule. Distance and correspondence courses from other schools are treated in the same way as other courses transferred from those institutions. Additional information about Missouri S&T distance courses may be found at http://dce.mst.edu/. Contact Dr. Sahra Sedighsarvestani at sedighs@mst.edu for ECE specific distance course questions.

Chapter 3

Graduation Requirements

To earn a Bachelor of Science in Computer Engineering, students must satisfy the following set of graduation requirements. These requirements apply to the fall 2007 or later catalog years.

3.1   Catalog Years

Each student is assigned a "Catalog Year" which appears in the upper right-hand corner of their CAPS report. One must satisfy the graduation requirements for their catalog year. The catalog year is generally the year the student first enrolled as a freshman, either at Missouri S&T or at a transfer institution.

When the University changes graduation requirements, currently enrolled students have the option of changing to the new catalog requirements. Students interested in changing their catalog year should pick up an AUTHORIZATION TO CHANGE UNDERGRADUATE CATALOG YEAR form from the Registrar's Office or at http://registrar.mst.edu/forms/.

Students who interrupt their studies for two or more consecutive semesters (excluding summer semesters) must meet the graduation requirements published at the time of their readmission into a degree program. For example:

- Spring 2000 - Graduates from High School
- '00/'01 Academic Year - Attends a Community College
- '01/'02 Academic Year - Attends Missouri S&T - has a catalog year of 2000
- '02/'03 Academic Year - Attends Missouri S&T - has a catalog year of 2000
- '04/'05 Academic Year - Does not attend any school of higher education.
- '05/'06 Academic Year - Attends a Community College
- '06/'07 Academic Year - Attends Missouri S&T - has a catalog year of 2006
- '07/'08 Academic Year - Attends Missouri S&T - has a catalog year of 2006

When this student returned to college in the fall of 2006, the student lost the right to use the 2000 catalog year because of nonattendance for two consecutive semesters.

3.2   Required Courses for Students using the 2014 or Later Catalog

3.2.1   Computer Engineering Core

Computer Engineering students must complete all of the following courses or their equivalents:

Computer Engineering courses
- CpE 2210/111 - Introduction to Digital Logic
- CpE 2211/112 - Computer Engineering Lab I
- CpE 3150/213 – Introduction to Microcontrollers and Embedded System Design
- CpE 3151/214 – Computer Engineering Lab II
- CpE 3110/215 – Computer Organization and Design
- CpE 5410/319 – Introduction to Computer Communication Networks
- CpE 4096/391 – Computer Engineering Senior Project I
- CpE 4097/392 – Computer Engineering Senior Project II

Computer Science (CS) courses
- CS 1570/53 – Introduction to Programming
- CS 1580/054 – Introduction to Programming Lab
- CS 1200/128 – Discrete Mathematics
- CS 1575/153 – Data Structures
- CS 3800/284 – Introduction to Operating Systems

Electrical Engineering courses
- EE 2100/151 - Circuits I
- EE 2101/152 - Circuit Analysis Lab I
- EE 2120/153 - Circuits II
- EE 2200/121 – Introduction to Electronic Devices
- EE 2201/122 – Electronics Devices Lab
- EE 3410/215 – Digital Signal Processing

Students must earn a 'C' or higher on all core computer engineering courses.

3.2.2   Computer Engineering Electives (ABCDE Electives)

CpE Senior Elective A

CpE Senior Elective A must be selected from CpE/EE/CS 4xxx or 5xxx courses (CpE/EE/CS 3xx courses). This normally includes all 4xxx or 5xxx/3xx courses except CpE or EE 4000/300, 4099/390, 4096/391, and 4097/392, or CS 5000/300, 4010/310, 4600 or 5600/365, and 4099/390.

A grade of C or better is required in the Senior Elective A.

CpE Senior Elective B

CpE Senior Elective B must be selected from CpE 4xxx or 5xxx courses (CpE 3xx courses). This normally includes all 4xxx or 5xxx/3xx courses except CpE 4096/391, and 4097/392.

A grade of C or better is required in the Senior Elective B.

CpE Senior Electives C, D and E

CpE Senior Electives C, D and E are to be selected from an approved list. This list contains most 3xxx, 4xxx and 5xxx/2xx and 3xx level science, mathematics and engineering courses. **At least six (6) of these fifteen (15) hours must be engineering or computer science courses.** Not more than three hours of CpE or EE 3002/202, 4000/300, or 4099/390 may be applied to the CDE electives.

- Aerospace Engineering – Any 3xxx or 4xxx or 5xxx/200 or 300 level course except AE 4099/202
- Chemical Engineering – Any 3xxx or 4xxx or 5xxx/200 or 300 level course
- Ceramic Engineering – Any 3xxx or 4xxx or 5xxx/200 or 300 level course except ChE 4099/202
- Chemistry – Any 3xxx or 4xxx or 5xxx/200or 300 level course
- Civil Engineering – Any 3xxx or 4xxx or 5xxx /200 or 300 level course except CE 4099/202
- Computer Engineering – Any 3xxx or 4xxx or 5xxx /200 or 300 level course except 4096/391, 4097/392 and required courses
- Computer Science – Any 3xxx or 4xxx or 5xxx /200 or 300 level course except CS 4099/202 and required courses

- Electrical Engineering – Any 3xxx or 4xxx or 5xxx/200 or 300 level course except EE 2800/281, 4096/391, 4097/392, and required courses
- Engineering Management – Any 3xxx or 4xxx or 5xxx/200 or 300 level course except EMgt 4099/202
- Engineering Mechanics – Any 3xxx or 4xxx or 5xxx/200 or 300 level course except EM 4099/202
- Geological Engineering – Any 3xxx or 4xxx or 5xxx/200 or 300 level course
- Geology – Any 3xxx or 4xxx or 5xxx/200 or 300 level course
- Geophysics – Any 3xxx or 4xxx or 5xxx/200 or 300 level course
- Biological Science – Any 3xxx or 4xxx or 5xxx/200 or 300 level course
- Mathematics – Any 3xxx or 4xxx or 5xxx/200 or 300 level course except Math 2002/202, Math 3304/204 and Math 3329/229
- Mechanical Engineering – Any 3xxx or 4xxx or 5xxx/200 or 300 level course except ME 4099/202
- Metallurgical Engineering – Any 3xxx or 4xxx or 5xxx/200 or 300 level course
- Mining Engineering – Any 3xxx or 4xxx or 5xxx/200 or 300 level course
- Nuclear Engineering – Any 3xxx or 4xxx or 5xxx/200 or 300 level course
- Petroleum Engineering – Any 3xxx or 4xxx or 5xxx/200 or 300 level course
- Physics – Any 3xxx or 4xxx or 5xxx/200 or 300 level course

A grade of C or better is required in all ABCDE electives.

3.2.3 Fundamental Sciences (Chemistry and Physics)

Computer engineering students must complete all of the following courses or their equivalents:

- Chem 1310/1 - General Chemistry
- Chem 1319/2 - General Chemistry Lab
- Phys 1135/23 - Engineering Physics I (**Must earn a grade of C of higher.**)
- Phys 2135/24 - Engineering Physics II (**Must earn of grade of C or higher.**)

The "C or higher grade" rule applies to the substitute classes just as it applies to the standard courses listed above.

3.2.4 Engineering Science Elective

Computer engineering student must complete three (3) hours of science electives. Students must take one of Mech Eng 2340, Mech Eng 2519, Mech Eng 2527, Physics 2311, Physics 2401, Chem 2210, Bio Sci 2213, Bio Sci 2223, Civ Eng 2200, Mech Eng 2350, Physics 2305, Physics 4311, Cer Eng 4240, or Nuc Eng 3205.

3.2.5 Fundamental Mathematics (Calculus)

Computer engineering students must complete all of the following courses or their equivalents:

- Math 1214/14 – Calculus with Analytic Geometry I (**Must earn a grade of C or higher.**)
- Math 1215/15 – Calculus with Analytic Geometry II (**Must earn a grade of C or higher.**)
- Math 2222/22 – Calculus with Analytic Geometry III (**Must earn a grade of C or higher.**)
- Math 3304/204 – Elementary Differential Equations (**Must earn a grade of C or higher.**)
- Statistics 3117/217 – Introduction to Probability and Statistics

A list of standard substitutions is provided below. No forms need to be filled out when using these substitutions. The substitutions will be applied automatically by the Registrar's Office.

- Statistics 3115/215 – Engineering Statistics or Statistics 5643/343 – Probability and Statistics, may be taken in place of Statistics 3117/217.

The "C or higher grade" rule applies to the substitute classes just as it applies to the standard courses listed above.

3.2.6 Remedial Mathematics (Algebra and Trigonometry)

Students who have not had strong High School Algebra and Trigonometry courses may wish (or be required) to enroll in:

- Math 1140/4 – College Algebra
- Math 1160/6 – Trigonometry

*Note that Math 1140/4 and Math 1160/6 are considered remedial courses for CpE majors. For this reason, these courses cannot be used to satisfy any graduation requirement aside from their effect on the student's cumulative and UM GPA. These courses are not used when calculating the total number of credit hours earned toward a B.S. CpE degree.

3.2.7 Mathematics Elective

Computer engineering students must complete at least one course from the following list:

- Math 3103/203 – Matrix Algebra
- Math 3108/208 – Linear Algebra I
- Math 3109/209 – Foundations of Mathematics
- Math 5302/302 – Intermediate Differential Equations
- Math 5603/303 – Mathematical Modeling
- Math 5105/305 – Modern Algebra I
- Math 5106/306 – Modern Algebra II
- Math 5107/307 – Combinatorics and Graph Theory
- Math 5108/308 – Linear Algebra II
- Math 5209/309 – Advanced Calculus I
- Math 5211/311 – Advanced Calculus II
- Math 5215/315 – Introduction to Real Analysis
- Math 5222/322 – Vector and Tensor Analysis
- Math 5325/325 – Partial Differential Equations
- Math 4530/330 – Topics in Geometry
- Math 5737/337 – Financial Mathematics
- Math 5351/351 – Introduction to Complex Variables
- Math 5154/354 – Mathematical Logic I
- Math 4096/361 – Problem Solving in Pure Mathematics
- Math 5483/383 – Operational Calculus
- Math 5585/385 – Introduction to Topology
- Statistics 5644/344 – Mathematical Statistics
- Statistics 5346/346 – Regression Analysis
- Statistics 5353/353 – Statistical Data Analysis

Use of other courses for the Mathematics Elective requires approval of the student's advisor and the Associate Chair for Computer Engineering Undergraduate Studies.

3.2.8 Humanities and Social Sciences

To help develop a student's humanities education, the school requires students to enroll in a number of Humanities (Hum) and/or Social Science (SocSci) courses. CpE students must enroll in a minimum of 21 hours (7 courses) of Humanities/Social Science courses, according to the following rules:

- All courses must be on the approved list of Humanities and Social Sciences courses. A complete list of these courses can be found online at http://ugs.mst.edu/documents/Approved_HSS_Courses_for_Engineering_Degrees.pdf.
- One of the courses must be an economics course (see below)
- One of the courses must be a U. S. History course (see below)
- The courses may be taken in any order, and in any semester (subject to prerequisite restrictions).
- Courses that do not appear on the approved lists may only be used if the student completes a COURSE SUBSTITUTION AND WAIVER FORM, and has the form signed by their advisor, the Associate Chair for Computer Engineering Undergraduate Studies, and the Vice Provost for Academic Affairs. Before completing the substitution form, the student should request a letter from the instructor who is teaching the course explaining the course content.
- Special topics courses, special problems courses, and seminars are allowed only with the approval by the Associate Chair for Computer Engineering Undergraduate Studies and the Vice Provost for Academic Affairs.
- Skills courses (such as English Composition and Technical Writing) are not considered Humanities or Social Sciences courses.
- Foreign language courses are considered Humanities courses, if they are not in the student's native language. Students may receive Humanities credit for foreign language courses in their native tongue, only if the course is at the 4xxx or 5xxx/300 level.
- Students often wish to transfer Humanities and Social Sciences courses to Missouri S&T from other institutions of higher education. One should review Chapter 2 on transferring credit and speak with their advisor before taking any courses off campus.

3.2.8.1 U. S. History

Students must enroll in one course on American History or Government from the following list:

- Hist 1200/112 – Modern Western Civilization
- Hist 1300/175 – American History to 1877
- Hist 1310/176 – American History Since 1877
- Pol Sc 1200/90 – American Government

Students must enroll in one course on Microeconomics selected from the following list:

- Econ 1100/121 - Principles of Microeconomics
- Econ 1200/122 – Principles of Macroeconomics

3.2.8.2 "Any Level" Humanities and Social Science Requirement

This requirement can be satisfied by taking two courses (any) listed in
http://ugs.mst.edu/documents/Approved_HSS_Courses_for_Engineering_Degrees.pdf. Students that take courses off campus should check with their academic advisor to determine if a particular off campus course will satisfy this requirement.

3.2.9 Communication Skills

Computer engineering students must complete all of the following courses or their equivalents:

- Engl 1120/20 - Exposition and Argumentation (English Composition)
- Engl 3560/160 - Technical Writing or Engl 1160/60 Writing and Research
- SpM 1185/85 - Principles of Speech or SpM 3282/283 – Business and Professional Communication

3.2.10 Professional Development

Students must take one of the following courses to satisfy this requirement:
- Bus 5980 Business Models for Entrepreneurship and Innovation (LEC 3.0)
- Econ 4430 Cost-Benefit Analysis (LEC 3.0)
- Econ 5337 Financial Mathematics (LEC 3.0)
- Eng Mgt 2310 Introduction to System Engineering (LEC 3.0)
- Eng Mgt 3320 Introduction to Project Management (LEC 3.0)
- Eng Mgt 4110 General Management-Design and Integration (LEC 3.0)
- Eng Mgt 5514 Patent Law (LEC 3.0)
- Phil 3225 Engineering Ethics (LEC 3.0)
This course requirement has is intended to enhance the experience for students in Preparation for Professional Service, Systems and Project Engineering, and/or System Resource Management.

3.2.11 Freshman Engineering Orientation

All students who enter Missouri S&T as freshman must enroll in the following orientation course:

- FE 1100/10 - Study and Careers in Engineering

Students that transfer to Missouri S&T as sophomores, juniors, or seniors do not have to enroll in this orientation course. Students that transfer into CpE as sophomores, juniors, or seniors from non-engineering majors (such as Computer Science, Physics, etc.) also do not have to enroll in FE 1100/10.

3.2.12 Electrical Engineering Advancement Examination I (EEAE I)

After completing EE 2100/151, Computer Engineering students must take the EEAE I (Electrical Engineering Advancement Examination I). Students must earn a passing grade on this examination before they will be allowed to enroll in EE 2120/153 or subsequent EE courses at Missouri S&T.

At Missouri S&T, the EEAE I exam will be given in place of the EE 2100/151 final examination. The exam score will be reported separately from the EE 2100/151 grade. However, the exam will impact the course grade just as with any other final exam. Students must pass the advancement exam and earn a grade of C or better in EE 2100/151 before they will be allowed to enroll in EE 2120/153.

This examination is for internal use only. The grade for this examination will not appear on the students' CAPS report or transcript. Students should contact the instructor that administered the exam for their grade results. The grade on the exam will not directly impact the students GPA (The grade may indirectly impact the GPA through the students EE 2100/151 grade.)

Students that enroll in an EE 2100/151 equivalent course at another school have two options:

- The student may take the EEAE I exam off campus. The student will need to find someone to proctor the exam. The proctor should be an instructor or counselor at the school where the student enrolled in the EE 2100/151 equivalent course. Once the student has found a proctor, the student should contact the Missouri S&T Department of Electrical and Computer Engineering for more details. Phone or email the Secretary for Undergraduate Studies.
- The student can take the examination at Missouri S&T immediately before the start of the semester the student plans to enroll in EE 2120/153 or a subsequent EE course. The student should contact the department to find out the exact date and location of the exam.

Students that fail this exam should consider re-taking EE 2100/151 on the Missouri S&T campus. Students are not required to retake EE 2100/151 before trying the examination a second time, but are highly advised to do so. <u>There is no limit on the number of times students can attempt to pass this examination. However, students are only allowed one attempt per semester.</u> If a student fails this exam more than once, the student should seriously reconsider their choice of computer engineering as a major field of study.

3.2.13 Electrical Engineering Advancement Examination II (EEAE II)

After completing EE 2120/153, a computer engineering student must take the EEAE II (Electrical Engineering Advancement Exam II). Students must earn a passing grade on this examination before they will be allowed to enroll in EE courses that use EE 2120/153 as a prerequisite.

<u>At Missouri S&T, the EEAE II is given in the place of the EE 2120/153 final examination</u>. The exam score will be reported separately from the EE 2120/153 grade. However, the exam will impact the course grade just as with any other final exam.   Students must pass the advancement exam and earn a grade of C or better in EE 2120/153 before the student will be allowed to enroll in courses that use EE 2120/153 as a prerequisite. Students should contact the instructor that administered the exam for their grade results.

Aside from the changes outline above, all the rules for the EEAE II are identical to the rules for the EEAE I.

3.2.14 Computer Engineering Advancement Examination (CpEAE)

After completing CpE 2210/111, a computer engineering student must take the CpEAE (Computer Engineering Advancement Exam). Students must earn a passing grade on this examination before they will be allowed to enroll in CpE courses that use CpE 2210/111 as a prerequisite.

<u>At Missouri S&T, the CpEAE is given in the place of the CpE 2210/111 final examination</u>. The exam score will be reported separately from the CpE 2210/111 grade. However, the exam will impact the course grade just as with any other final exam.   Students must pass the advancement exam and earn a grade of C or better in CpE 2210/111 before the student will be allowed to enroll in courses that use CpE 2210/111 as a prerequisite. Students should contact the instructor that administered the exam for their grade results.

The rules for the CpEAE are identical to the rules for the EEAE I.

3.2.15 Fundamentals of Engineering Examination

As a computer engineering student at Missouri S&T you are not required but encouraged to take the fundamentals of engineering (FE) examination prior to graduation. This nationwide exam is the first step in obtaining certification as a registered professional engineer.
Information on the exam will be posted on the undergraduate bulletin board, outside the undergraduate secretary's office and can be found on the web at pr.mo.gov/. Information regarding the FE exam is posted at https://testcenter.mst.edu/testingprograms/ncees/.

3.2.16 Free Elective

In addition to the courses listed above, computer engineering students are required to complete three (3) hours of "Free Electives". The free electives allow one a great deal of flexibility in choosing their coursework. Virtually any course from any discipline may be used to fulfill this elective. The exceptions are deficiency courses (such as algebra and trigonometry), and extra credits in required courses. Any course outside of engineering and science must be at least three credits.

3.3 Minimum Number of Credit Hours

Students must earn a minimum of **128** credit hours before they can graduate. This requirement will not be waived. In some rare cases, students may be able to satisfy all other graduation requirements with less than the minimum number of hours. These students must complete additional electives to increase their total number of credit hours to the minimum given above before they will be allowed to graduate. In many cases, students will enroll in additional elective courses. Remedial courses such as Math 1140/4 and Math 1160/6 will not be used when calculating the total number of credit hours earned.

If a student retakes a course, the total number of credits earned will normally not increase. There are exceptions to this rule. Some courses, such as undergraduate research (CpE 4099/390), some music and physical education courses are "repeatable". Each time a student completes one of these courses, their total number of credits earned will increase. Contact the Registrar's Office to determine which courses are "repeatable".

3.4 Minimum Grade-Point Averages

To graduate, you must satisfy three grade-point average (GPA) requirements. These requirements are known as the cumulative, Missouri S&T, and CpE GPA, which are described in the following subsections. GPA requirements can not be waived. If you satisfy all other graduation requirements, but have one or more GPAs below 2.000, you must enroll in additional courses and receive sufficiently high grades to meet these GPA requirements. You can accomplish this by enrolling in new courses or by retaking courses in which you have received a grade of D or F. Contact the registrar's if you have questions about your GPA calculations.

3.4.1 Cumulative GPA

A student must have a cumulative GPA greater than or equal to 2.000 on a 4.000 scale. This GPA includes all undergraduate courses the student has taken at all post-secondary schools (including Community Colleges and other Universities). Note that all courses taken at all schools must be transferred to Missouri S&T prior to graduation. Even if courses do not satisfy any other degree

requirements, they must be transferred and may impact the student's cumulative GPA. Courses taken for graduate credit will not affect this GPA.

3.4.2 Missouri S&T GPA

A student must have a Missouri S&T GPA greater or equal to 2.000 on a 4.000 scale. This GPA includes all courses taken at Missouri S&T, but it does not include courses transferred to Missouri S&T. Some, but not all, of the courses offered by the University of Missouri Center for Independent Study affect the Missouri S&T GPA. <u>Contact the registrar's office to determine which independent study courses will affect your Missouri S&T GPA</u>. Courses taken for graduate credit do not affect this GPA.

3.4.3 Computer Engineering GPA

A student must have a computer engineering GPA greater or equal to 2.000 on a 4.000 scale. This GPA is based on courses that have a course number beginning with CpE. This GPA includes both computer engineering courses taken at Missouri S&T and those transferred to Missouri S&T as CpE Credit. The calculation does not include non-CpE courses, even if the classes are required for a CpE degree (such as Calculus, Basic Sciences, Humanities and Social Sciences courses). Courses taken for graduate credit will not affect this GPA.

3.4.4 University of Missouri GPA

This GPA includes all courses you take at a University of Missouri school including Rolla, Columbia, St. Louis and Kansas City campuses and extension courses. This calculation does not include courses transferred from other schools, including Missouri schools not part of the University of Missouri such as Missouri State Schools and Community Colleges). The student is not required to attain any minimum UM GPA. Graduation honors are based on the UM GPA. Courses taken for graduate credit do not affect this GPA.

3.5 Minimum Acceptable Grades

Unless otherwise specified, a student must earn a letter grade of D or higher in every course that they wish to use to satisfy a graduation requirement. If a student takes a course more than once, their last grade must be D or better. A student's academic advisor and the associate or department Chair may require a student to re-take a course in which they have earned a grade of D or lower.

3.5.1 Basic Science, Mathematics and CpE Courses

Some courses are particularly important to computer engineering majors. Students must earn a grade of C or better in these courses. This rule applies to the courses listed below. Note that students will enroll in some, but not all, of the courses listed below. See the section on required courses to determine which of the following courses that must have a grade of C or better.

- Phys 1135/23 - Engineering Physics I or equivalent
- Phys 2135/24 - Engineering Physics II or equivalent
- Math 1214/14 - Calculus with Analytic Geometry I
- Math 1215/15 - Calculus with Analytic Geometry II
- Math 2222/22 - Calculus with Analytic Geometry III
- Math 3304/204 - Elementary Differential Equations
- CpE 2210/111 - Introduction to Digital Logic
- CpE 2211/112 - Computer Engineering Lab I

- CpE 3150/213 – Introduction to Microcontrollers and Embedded System Design
- CpE 3151/214 – Computer Engineering Lab II
- CpE 3110/215 – Computer Organization and Design
- CpE 5410/319 – Introduction to Computer Communication Networks
- CpE 4096/391 – Computer Engineering Senior Project I
- CpE 4097/392 – Computer Engineering Senior Project II
- CS 1570/53 – Introduction to Programming
- CS 1580/54 – Introduction to Programming Lab
- CS 1200/128 – Discrete Mathematics
- CS 1575/153 – Data Structures
- CS 3800/284 – Introduction to Operating Systems
- EE 2100/151 - Circuits I
- EE 2101/152 - Circuit Analysis Lab I
- EE 2120/153 - Circuits II
- EE 2200/121 – Introduction to Electronic Devices
- EE 2201/122 – Electronics Devices Lab
- EE 3410/215 – Digital Signal Processing
- Computer Engineering ABCDE electives

Up to two exceptions can be made for Ds in Computer Engineering ABCDE electives at the discretion of the student's advisor and with agreement of the Associate Chair for Computer Engineering Undergraduate Studies.

3.6 Residency Requirement (Last 60 Hours at Missouri S&T)

A student receives a Missouri S&T degree, because the student completed the requirements of the degree while attending Missouri S&T. To protect the integrity of this seemingly obvious statement, all students are required to take their last 60 credit hours of instruction at Missouri S&T.

Up to 15 credit hours of this 60-hour requirement may be waived with the prior permission of the student's advisor and the Associate Chair for Computer Engineering. Waiving more than 15 credit hours requires obtaining prior permission from the student's advisor, the Associate Chair for Computer Engineering Undergraduate Studies and the Vice Provost for Academic Affairs. Requests to waive this requirement are handled on a case-by-case basis. The Associate Chair for Computer Engineering will typically approve requests only when the student has taken well over 60 credit hours at Missouri S&T and can show good reason for the need to take courses at another school late in their program of study.

If the student wishes to have this requirement waived, the student must submit a REQUEST TO TRANSFER PART OF LAST 60 HOURS FOR A DEGREE form and have the form approved before enrolling in the course(s) off campus. The form can be obtained from the Registrar's Office, the ECE Undergraduate Secretary in 140 EECH, or on the web at http://registrar.mst.edu/forms/.

If a student fails to complete this form prior to enrolling in the course, the department may refuse to allow the student to use the course to satisfy ANY graduation requirements. Students in their last 60 hours should never take a course off campus until checking with their advisor, completing the appropriate form, and obtaining signatures.

Students will not normally be allowed to transfer 3xxx or 4xxx or 5xxx/200 or 300 level CpE courses to Missouri S&T unless the courses were taken at an ABET accredited program or a program with an international reputation for excellence in engineering education.

3.7 Substitutions and Waivers

There are many specific courses that must be completed before graduation. The student has four (4) options for each of these courses:

- Complete the specified course at Missouri S&T. In some cases, the student is allowed to select a course from an approved list.
- Complete an equivalent course at another institution and transfer credit to Missouri S&T.
- Complete a related course at Missouri S&T or another institution and request to substitute the related course for the required course.
- Petition to have the requirement waived.
- Obtain credit by examination for the course.

Students who wish to transfer credit to Missouri S&T should read the appropriate section in Chapter 2 of this handbook. There are many restrictions placed on transfer credit. Students unfamiliar with these requirements risk losing credit for the transferred courses.

Students wishing to substitute or waive course requirements should read Section 3.18 "Waiving and/or Changing Graduation Requirements" in this chapter.

A detailed explanation of each requirement is presented in Section 3.2 along with typically approved course substitutions. Unless otherwise noted, students must complete a COURSE SUBSTITUTIONS AND WAIVER form available from the Registrar's Office, the ECE Undergraduate Secretary in room 140 EECH, or on the web at http://registrar.mst.edu/forms/.

3.8 Emphasis Areas within Computer Engineering

The following emphasis areas identify courses from which a student may opt to develop a specific emphasis. It is not required that students obtain an emphasis specialty within computer engineering.

- **Computational Intelligence** topics include **machine vision, neural ne**tworks, and fuzzy logic control.
- **Computer Architecture and Embedded Systems** topics include computer organization, computer architecture, microprocessor system design, hardware/software co-design, microprocessor systems, and real-time systems.
- **Integrated Circuits and Logic Design** includes chip (VLSI) design, digital systems modeling, electronic circuits, and fault tolerant systems design.
- **Networking, Security and Reliability** topics include design of digital networks, reliable and secure computing, fault tolerance, development of secure networks, secure and reliable computing infrastructure, and design of fault-tolerant digital systems.

Skills in the above emphasis areas can be improved with the following classes. Choosing a specialty is at the discretion of the student and is not required.

Computational Intelligence

Highly Recommended
COMP ENG 5310	Computational Intelligence	3
ELEC ENG 5370	Introduction to Neural Networks and Applications	3

COMP ENG 6310	Markov Decision Processes	3
Suggested		
ELEC ENG 5330	Fuzzy Logic Control	3
COMP ENG 5450	Digital Image Processing	3
COMP ENG 5460	Machine Vision	3

Computer Architecture and Embedded Systems

Highly Recommended		
COMP ENG 5110	Principles of Computer Architecture	3
COMP ENG 5120	Digital Computer Design	3
COMP ENG 5151	Digital Systems Design Laboratory	3
COMP ENG 5160	Embedded Processor System Design	3
COMP ENG 5170	Real-Time Systems	3
Suggested		
COMP ENG 5610	Real-Time Digital Signal Processing	3
COMP ENG 5130	Advanced Microcomputer System Design	3
ELEC ENG 3100	Electronics I	3
COMP SCI 3100	Software Engineering I	3

Integrated Circuits and Logic Design

Highly Recommended		
COMP ENG 2210	Introduction to Digital Logic	3
COMP ENG 5210	Introduction To VLSI Design	3
COMP ENG 5220	Digital System Modeling	3
COMP ENG 6210	Digital Logic	3
Suggested		
ELEC ENG 3100	Electronics I	3
COMP ENG 5110	Principles of Computer Architecture	3
COMP ENG 5151	Digital Systems Design Laboratory	3
COMP ENG 5120	Digital Computer Design	3
COMP ENG 5130	Advanced Microcomputer System Design	3
COMP ENG 5510	Fault-Tolerant Digital Systems	3

Networking, Security, and Dependability

Highly Recommended		
COMP ENG 5420	Introduction to Network Security	3
COMP ENG 5430	Wireless Networks	3
COMP ENG 6440	Network Performance Analysis	3
COMP ENG 6510	Resilient Networks	3
Suggested		
COMP ENG 5510	Fault-Tolerant Digital Systems	3

3.9   Multidisciplinary Programs

The Bachelor of Science in Computer Engineering is an excellent degree for multidisciplinary opportunities. A careful selection of electives can prepare a student for a unique career at the bachelor's level as well as an advanced degree in a field like business, computer science, electrical engineering, law or medicine.

As an example, a student interested in Computer Engineering and Medical Science should consult with a Biological Sciences advisor early in their program. A careful selection of science electives and technical electives along with additional classes in Chemistry and Biological Sciences can prepare a student for medical careers along with the Computer Engineering Degree.

Computer engineering is particularly well suited for combination with degrees in Electrical Engineering or Computer Science, as discussed in section 3.15.

3.10   Minor Programs

Students are allowed to minor in computer engineering and in an area outside of computer engineering. Several departments offer minors, as can be seen at http://explore.mst.edu/undergrad_departmental_list.html. By carefully selecting elective courses, students can often complete a minor with only a small increase in the number of credit hours required to graduate. The minor will appear on the student's transcript upon graduation.

EE Minor Advisor
Dr. Mehdi Ferdowsi, 234 EECH, 341-4552, ferdowsi@mst.edu

CpE Minor Advisor
Dr. R. Joe Stanley, 127 EECH, 341-6896, stanleyj@mst.edu

The Electrical and Computer Engineering Department offers minor programs in both Electrical Engineering and in Computer Engineering. If you complete a minor program, the designation Minor in Electrical Engineering or Minor in Computer Engineering will be placed on your transcript, in addition to any academic honors based upon your Missouri S&T GPA. Minor elective courses may be in one or more of the available emphasis areas.

3.10.1 Minor in Computer Engineering
A minor in Computer Engineering will require the following:
- Pass the El Eng Advancement Exam I (El Eng 2100/151 Final) with a C or better*
- Pass the Cp Eng Advancement Exam (Cp Eng 2210/111) with a C or better**
- Pass Cp Eng 3150/213 with a C or better
- Pass El Eng 2200/153 or Cp Eng 3110/215 with a C or better
- Pass Cp Eng 5410/319 or Cmp Sc 5600/365 with a C or better
- Pass 3 hours of 4XXX-level or above Cp Eng or El Eng or Cmp Sc coursework with a C or better, excluding special problems and undergraduate research. Transfer courses cannot be used to satisfy this requirement. The course choice for this requirement is subject to the approval of the minor advisor.

*One opportunity will be given to pass the El Eng Advancement Exam I if a student has prior course or experience in circuits. Otherwise, the student must pass El Eng 2100/151.
**One opportunity will be given to pass the Cp Eng Advancement Exam if a student has prior course or experience in digital circuits. Otherwise, the student must pass Cp Eng 2210/111.

3.10.2 Minor in Electrical Engineering
A minor in Electrical Engineering will require the following:
- Pass the El Eng Advancement Exam I (EEAE-I: El Eng 2100/151 Final) with a C or better*
- Pass El Eng 2120/153 and El Eng Advancement Exam II (EEAE-II) with a C or better
- Pass 12 additional hours of El Eng coursework excluding El Eng 28XX, 38XX, 4096/391, 4097/392, and 4099/202. At least 3 lecture hours at the 4XXX-level or above are required. A C or better is required for the all 12 hours. No transfer courses and no more than 3 hours of El Eng 3000/200, El Eng 4000/300, or El Eng 5000 may be used to meet the requirements. The course choice for the 12 additional hours is subject to the approval of the minor advisor.

*One opportunity will be given to pass the El Eng Advancement Exam I if a student has prior circuits coursework or experience. Otherwise, the student must pass El Eng 2100/151.

An Admission Form is needed to start the program and the Registrar's Undergraduate Minor Form is required upon completion. The Admission form should be submitted to the EE or CpE Minor Advisor. See
http://ece.mst.edu/undergraduateprograms/electricalengineering/   or
http://ece.mst.edu/undergraduateprograms/computerengineering/

3.10.3 Procedure for obtaining a Minor in Electrical or Computer Engineering
- Meet with the EE or CpE Minor Advisor for course selection and approval signature
- Complete and submit a signed *Application for Admission to the EE or CpE Minor Program** to the ECE Undergraduate Secretary
- Complete the courses for the minor (If alternate courses are desired, meet again with the minor advisor to seek approval for the minor program changes.)
- Upon completion of an approved minor program, complete and submit a signed Registrar's *Undergraduate Minor Form.**
  *The student is responsible for completing and submitting the required forms.

A minor will take multiple semesters to complete. Make plans to meet the introductory requirements in each minor as soon as possible, e.g. the El Eng Advancement Exam I or El Eng 2100/151 and the Cp Eng Advancement Exam or Cp Eng 2210/111 are basic prerequisite for courses in El Eng and Cp Eng, respectively. The use of minor courses to meet in-major course requirements is subject to the major department's approval. Note that the C or better requirement for all courses is a requirement that cannot be waived.

3.11   Combining and Splitting Courses

With a few exceptions, students are allowed to combine courses to satisfy degree requirements. For example, a student who has taken three (3) separate one (1) credit hour courses can combine them to satisfy a three (3) credit hour elective requirement. Also, a student who has taken a semester of Statics (3 credit hours) and a semester of dynamics (2 credit hours) could use them to satisfy the IDE 140 (3 credit hours) requirement. Students need to complete a SUBSTITUTION AND WAIVER form to update their CAPS report when combining courses. On exception is the Free Elective, which must be at least three credit hours if the course is outside of engineering and science.

Students are not allowed to "split" courses and count some of the credit toward one requirement and the rest toward a second requirement. For example, a four (4) credit hour course can be used to satisfy a three (3) hour course requirement. However, the "extra" or "dangling" credit hour may not be used to help satisfy some other requirement other than the total hour requirement. All four (4) credit hours will be counted toward the three (3) hour requirement.

3.12   Retaking Courses

On occasion, students may wish to, or be required to, retake a course. Before retaking a course, students should consider how this action will affect their total number of credits toward a degree, their grade-point average and how it may fulfill or nullify specific graduation requirements.

3.12.1 Retaking Courses and Grade-Point Averages

Normally, every course a student takes is treated the same way when calculating the UM Cumulative GPA (grade point average) for graduation honors. If a student enrolls in EE 2100/151 a total of four times and receives grades of D, F, D and A, the student's Missouri S&T Cumulative GPA will record this as four (4) separate 3 credit hour EE courses with the grades listed above. A student must submit a REPEAT COURSE GPA ADJUSTMENT form from the Registrar's Office (http://registrar.mst.edu/forms/) to request an exception to this rule. If the students request a repeat course GPA adjustment, only one course will count toward the GPA calculation (for example, only the A might be used to calculate the students GPA). All course grades will still appear on the student's transcript.

Computer engineering students are not allowed to retake a course if they have already earned a grade of C or better in the course (with the exception of "retakable" courses such as CpE 4000/300, CpE 5001/301, CpE 4099/390, music, performance and other selected classes).

The grade adjustment policy only applies to courses taken at Missouri S&T that have a D or F grade. A maximum of 15 semester hours may be adjusted and the course must be repeated at Missouri S&T. The grade adjustment policy does not affect the UM Cumulative GPA which is used for graduation honors.

3.12.2 Retaking a Course, Fulfilling and Nullifying Graduation Requirements

If a course is failed that the student must complete to fulfill a specific graduation requirement (such as EE 2100/151), the student must retake the course and earn a passing grade. However, if a student passes a course with a D or better, then retakes the course and fails the course, the credit for having passed the course the first time will be lost. This means the student has to take the course yet a third time and earn a passing grade. To satisfy a graduation requirement, the student must earn a passing grade in the course the last time the student was enrolled in that course.

3.13   Taking Graduate-Level Courses for Undergraduate Credit

The department offers graduate-level courses (numbered CpE 6xxx/400 or higher) for students who have already obtained a B.S. degree, and who are pursing M.S. and Ph.D. degrees. Under normal circumstances, an undergraduate student may not enroll in these courses. In some special cases, students may use a graduate course as their Computer Engineering ABCDE elective. To use a graduate course for this purpose, an undergraduate student must meeting the following requirements

- Have a cumulative GPA above 3.50.
- Have completed all prerequisite courses.
- Obtain permission from the instructor teaching the graduate course.
- Obtain permission from the student's faculty advisor.
- Complete a COURSE SUBSTITUTION AND WAIVER form and have the form signed by the student's advisor, the Associate Chair for Computer Engineering Undergraduate Studies and the Vice Provost for Academic Affairs.

*When enrolling in a graduate level course for undergraduate credit, enter the letter "U" in the box marked "Type" on the ENROLLMENT, ADD/DROP OR SECTION CHANGE form.

3.14   Taking Graduate-Level Courses for Graduate Credit

If a student plans to attend graduate school, the student may wish to consider "dual enrollment" in their last semester as an undergraduate student. This allows the student to complete the undergraduate coursework and start the graduate studies in the same semester. This is particularly helpful, when the student would normally carry a very light course load in his/her final semester. To "dual enroll" a student must do the following:

- Receive permission from their faculty advisor.
- Apply and be admitted as a "dual enrolled" student. Application forms are available from the Registrar's Office (http://registrar.mst.edu/forms/). The Associate Chair for Graduate Studies will decide if a student will be allowed to dually enroll. The entrance requirements for the dual enrollment program are slightly more stringent than the entrance requirements for the graduate program.
- On the registration form, indicate which of the courses will be counted for undergraduate credit and which for graduate credit. (This decision may be changed during the normal add/drop period for classes. However, it may not be changed after the last day to drop a course, and it may not be changed, after the final grade has been assigned.)

Normally, students are eligible for dual enrollment during their last semester as an undergraduate. Students participating in the honors program are eligible for dual enrollment during their last two semesters as an undergraduate.

Any courses taken for graduate credit will not affect the student's undergraduate GPA, total number of credits earned toward a B.S. degree or is used to satisfy any other B.S. graduation requirement. Likewise, a course taken for undergraduate credit can not be used to satisfy any M.S. or Ph.D. graduation requirement.

3.15   Dual B.S. Degrees

A student may wish to earn a B.S. degree in more than one area at a time (such as a B.S. in Computer Engineering and a B.S. in Electrical Engineering or Computer Science). This usually involves a substantial amount of effort beyond earning a single degree. Careful selection of electives, however, will let a student earn a dual B.S. degree in Electrical Engineering and in Computer Engineering with about one (1) semester of extra work. (See "To receive a B.S. degree in both Electrical and Computer Engineering" below). Similarly, a student can earn a dual B.S. degree in Computer Engineering and Computer Science with about one (1) semester of extra work. Students should discuss a dual B.S. plan with their advisor(s). Students who are working to earn a dual B.S. degree should have an advisor in CpE and an advisor in the other degree area. Both advisors should approve all course selections, Add/Drops and all other academic decisions. Additional information is given below about dual degrees in Computer Engineering and either Electrical Engineering or Computer Science.

3.16   Second B.S. Degree

A student that has already received a B.S. degree in a field other than CpE may wish to obtain a B.S. degree in CpE from Missouri S&T. The student should apply for admission to Missouri S&T and apply for admission to CpE. Once admitted to the CpE program, the student will be assigned a faculty advisor. The student should contact the faculty advisor and complete a SECOND BACHELOR OF

SCIENCE DEGREE PROGRAM form (available at http://registrar.mst.edu/forms/). This form will explicitly list every course the student must complete to obtain a B.S. degree in CpE.

3.17   To Receive a BS Degree in Both Electrical and Computer Engineering

A dual degree in Electrical and Computer Engineering can be received by taking 17 credit-hours of additional coursework, provided one carefully plans their course schedule. While the plan will vary for each student, one possibility is given beginning on the next page. In any case, students should discuss their plans with their advisor and carefully monitor their CAPS reports to ensure they are consistently meeting the requirements of both programs.

Example course-plan for a dual degree in CpE and EE:

Semester	Courses to be taken	Credits	Requirement(s) satisfied in Cp Eng	Requirement(s) satisfied in El Eng
1	FE 1100/10-Study & Careers in Eng	1	FE 1100	FE 1100
	Math 1214/14-Calculus I for Engineers	4	Math 1214	Math 1214
	Chem 1310/1-General Chemistry	1	Chem 1310	Chem 1310
	Chem 1319/2-General Chemistry Lab	4	Chem 1319	Chem 1319
	Hist 1200/112, 1300/175, 1310/176 or Pol Sc 1200/90	3	US History elective	US History elective
	English 1120/20-Exposition & Argumentation	3	Eng 1120	Eng 1120
		16		
2	Cmp Sc 1500-Computational Problem Solving	3	Cmp Sc 1500	None
	Math 1215/15-Calculus II for Engineers	4	Math 1215	Math 1215
	Physics 1135/23-Engineering Physics I	4	Phys 1135	Phys 1135
	Mc Eng 1720-Intro to Eng Design	3	Mc Eng 1720	Mc Eng 1720
	Econ 1100/121 or Econ 1200/122	3	Soc Sci Elective	Soc Sci Elective
		17		
3	El Eng 2100/151-Circuits I	3	El Eng 2100	El Eng 2100
	El Eng 2101/152-Circuits I Lab	1	El Eng 2101	El Eng 2101
	Cmp Sc 1570/53–Intro to Programming	3	Cmp Sc 1570	Cmp Sc 1570
	Cmp Sc 1580/54 – Intro to Programming Lab	1	Cmp Sc 1580	Cmp Sc 1580

	Math 2222/22-Calculus with Analytic Geometry III	4	Math 2222	Math 2222
	Physics 2135/24 – Engineering Physics II	4	Phys 2135	Phys 2135
		16		
4	El Eng 2120/153-Circuits II	3	El Eng 2120	El Eng 2120
	Cp Eng 2210/111-Introduction to Digital Logic	3	Cp Eng 2210	Cp Eng 2210
	Cp Eng 2211/112-Computer Engineering Lab	1	Cp Eng 2211	Cp Eng 2211
	El Eng 2200/121-Introduction to Electronic Devices	3	El Eng 2200	El Eng 2200
	El Eng 2201/122-Electronic Devices Lab	1	El Eng 2201	El Eng 2201
	Sp&M 1185/85-Principles of Speech	3	Sp&M 1185	Sp&M 1185
	Math 3304/204-Elementary Differential Equations	3	Math 3304	Math 3304
		17		
5	El Eng 3410/215-Digital Signal Processing	3	El Eng 3410	El Eng Elective D
	El Eng 3100/253-Electronics I	3	Cp Eng Elective A	El Eng 3100
	El Eng 3101/255-Electronics I Lab	1	Cp Eng Elective A	El Eng 3101
	Cmp Sc 1575/153-Data Structures	3	Cmp Sc 1575	Free elective
	Cmp Sc 1200/128-Discrete Math	3	Cmp Sc 1200	<none>*
	English 3560/160-Technical Writing	3	English 3560	English 3560
		16		
6	Cp Eng 3150/213-Intro to Micro and Embedded Sys Design	3	Cp Eng 3150	El Eng Elective A
	Cp Eng 3151/214-Digital Engineering Lab II	1	Cp Eng 3151	<none>*
	El Eng 3320/3321- Control Systems (+Lab)	4	Stat 3117	El Eng 3320/3321
	El Eng 3600/271-Electromagnetics	4	<none>*	El Eng 3600
	El Eng 3430-Digital Communication	3	Cp Eng Elective D	El Eng 3430
	El Eng 3431-Digital Communications Lab	1	<none>*	El Eng 3431
		16		
7	Comp Eng Elective B	3	Comp Eng Elective B	

	Comp Eng 5410/319-Intro to Communication Networks	3	CpE 5410	
	Engineering Science Elective	3	Engineering Science Elective	Engineering Science Elective
	Comp Eng 3110/215-Computer Architecture	3	Cp Eng 3110	El Eng Elective E
	Cmp Sc 3800/284-Introduction to Operating Systems or CmpSc 2500-Algorithms	3	Cmp Sc 3800 or Cmp Sc 2500	<none>
		15		
8	Elective-Hum or Soc (any level)	3	Hum/SS req.	Hum/SS req.
	El/Cp Eng 4096/391-Senior Project I	1	Cp Eng 4096	El Eng 4096
	Math 3108/208-Linear Algebra	3	Math elective	Math 3108
	El Eng Elective C	3	Cp Eng Elective D	El Eng Elective C
	El Eng Elective B	3	Cp Eng Elective C	El Eng Elective B
	Stat 3117/217-Intro to Prob/Stat	3	Stat 3117	Stat 3117
		16		
9	El/Cp Eng 4097/392-Senior Project II	3	Cp Eng 4097	El Eng 4097
	Elective-Hum or Soc (any level)	3	Hum/SS req.	Hum/SS req.
	Professional Dev Elective	3	Prof Dev Elective	Pro Dev Elective
	El Eng Power Elective	3	Cp Eng Elective E	El Eng Power Elective
	El Eng Power Elective Lab	1	<none>*	El Eng Power Elective lab
	Free Elective	3	Free Elective	Free Elective
		16		

*Laboratories are required to be taken as a co-requisite.

3.18   To Receive a BS Degree in Both Computer Engineering and Computer Science

A dual degree in Computer Engineering and Computer Science can be received by taking 28 credit-hours of additional coursework, provided one carefully plans their course schedule. While the plan will vary for each student, one possibility is given on the following pages. In any case, students should discuss their plans with their advisor and carefully monitor their CAPS reports to ensure they are consistently meeting the requirements of both programs.

Example course-plan for a dual degree in CpE and CS:

Semester	Courses to be taken	Credits	Requirement(s) satisfied in Cmp Sc	Requirement(s) satisfied in Cp Eng
1	Either Fr Eng 1100 – Study and Careers in Engineering	1	Fr Eng 1100	Fr Eng 1100
	Cmp Sc 1500-Comput Problem Solving	3	Cmp Sc 1500	Substitution for Cmp Sc 1500
	Either Math 1214 – Calculus I for Engineers	4	Math 1208 (Note: waiver may be required)	Math 1214
	Econ 1100 or 1200	3	Social science Elective	Econ 1100 or 1200
	English 1120-Exposition & Argumentation	3	English 1120	English 1120
	Mc Eng 1720 – Eng. Design with Comp. Appl.	3	Free elective or Sci/Eng elective	Mc Eng 1720
		17		
2	Cp Eng 2210-Intro to Dig Log	3	Cp Eng 2210	Cp Eng 2210
	Cp Eng 2211 – Computer Engineering Lab I	1	Sci/Eng elective or Free elective	Cp Eng 2211
	Cmp Sc 1570-Intro to Programming	3	Cmp Sc 1570	Cmp Sc 1570
	Cmp Sc 1580-Intro to Prog Lab	1	Cmp Sc 1580	Cmp Sc 1580
	Math 1215 – Calculus II for Engineers	4	Math 1221 (Note: waiver may be required)	Math 1215
	Humanity Elective	3	Humanity Elective	Hum/SS Elective
	Hist 1200, 1300, 1310, or Pol Sc 1200	3	History/political science/constitution requirement	Hist 1200, 1300, 1310, or Pol Sc 1200
		18		
3	Cmp Sc 1200-Discrete Math for Cmp Sc	3	Cmp Sc 1200	Cmp Sc 1200
	Math 2222-Calculus with Analytic Geometry III	4	Sci/Eng elective or Free elective	Math 2222
	Cmp Sc 1575-Data Structures/Cmp Sc 1585-Data Structures Lab	4	Cmp Sc 1575/Cmp Sc 1585	Cmp Sc 1575

	Literature elective	3	Literature elective	
	Physics 1135 – Engineering Physics I	4	Physics elective	Physics 1135
		18		
4	Cmp Sc 2500-Algorithms	3	Cmp Sc 2500	Free elective
	El Eng 2100-Circuits I	3	Free elective	El Eng 2100
	El Eng 2101-Circuit Analysis Lab	1		El Eng 2101
	Physics 2135 – Engineering Physics II	4	Physics elective	Physics 2135
	Social Science Elective	3	Social Science Elective	Hum/SS Elective
	Cp Eng 3150-Digital Systems Design	3	Cp Eng 3150	Cp Eng 3150
	Cp Eng 3151 – Computer Engineering Lab II	1		Cp Eng 3151
		18		
5	Math 3304-Elementary Differential Equations	3	Free elective	Math 3304
	Sp&MS 1185-Principles of Speech	3	Sp&MS 1185	Sp&MS 1185
	Social Science Elective	3	Social Science Elective	Elective-Hum or Soc Sc
	El Eng 2120-Circuits II	3		El Eng 2120
	Cmp Sc 2200 – Theory of Computer Science	3	Cmp Sc 2200	
	Cmp Sc 2300-File Struct & Intro Database Sys	3	Cmp Sc 2300	
		18		
6	Math 3108-Linear Algebra I	3	Math 3108	Math elective
	Cmp Sc 3800-Intro Operating Systems	3	Cmp Sc 3800	Cmp Sc 3800
	Chem 1310 – General Chemistry	4	Laboratory science course	Chem 1310
	Chem 1319 – General Chemistry Laboratory	1	Laboratory science course	Chem 1319
	Cp Eng 3110 – Computer Architecture	3	Eng/Science Electives	Cp Eng 3110
	El Eng 2200-Introduction to Electronic Devices	3		El Eng 2200
	El Eng 2201-Electronic Devices Lab	1		El Eng 2201
		18		
7	Cmp Sc 3500-Prog Languages & Translators	3	Cmp Sc 3500	

El Eng 3410-Digital Signal Processing	3	Eng/Science Electives	El Eng 3410
Cp Eng 5410-Intro to Communication Networks	3	Cmp Sci 3610	Cp Eng 5410
3 hours selected from Mc Eng 2340, Mc Eng 2519, Mc Eng 2527, Physics 2311, Physics 2401, Chem 2210, Biology 2213, or Biology 2223	3	Eng/Science Electives	Cp Eng Science Elective
Cmp Sc 4610-Intro to Security	3	Cmp Sc 4610	Cp Eng Senior Elective E
English 1160-Writing and Research or English 3560 – Technical Writing	3	English 1160	English 3560
	18		

8				
	Cmp Sc Electives (5xxx level)	3	Cmp Sc Electives	Cp Eng Senior Elective A (4xxx or 5xxx level)
	Stat 3117-Intro to Prob and Stat	3	Stat Elective	Stat 3117
	Phil 3225-Engineering Ethics	3	Ethics Elective	Pro Dev Elective
	Cmp Sci 4090-Software Eng Capstone I	3	Cmp Sci 4090	
	Cp Eng 4096-Senior Project I	1	Sci/Eng elective or Free elective	Cp Eng 4096
	Cmp Sc 3100 – Software Engineering I	3	Cmp Sc 3100	
		16		

9	Cp Eng Senior Elective B (4xxx or 5xxx/2xx or 3xx level course, excludes 4096, 4097, 5410)	3	Free Elective	Cp Eng Senior Elective B
	Cmp Sc Electives (5xxx level)	3	Cmp Sc Electives	Cp Eng Senior Elective C
	Cmp Sc Electives (5xxx level)	3	Cmp Sc Electives	Cp Eng Senior Elective D
	Cmp Sc 4091-Software Systems Development I	3	Cmp Sc 4091	
	Cp Eng 4097-Senior Project II*	3	Free elective	Cp Eng 4097
	Assessment	0		FE requirement
	Experiential Learning Requirement*	0		Experiential Learning Requirement
		15		

3.19   Accelerated BS/MS ECE Degree Program

Electrical engineering or computer engineering undergraduates in ECE at Missouri S&T may opt to apply for an accelerated BS/MS ECE program where a student can achieve both degrees faster than if pursuing the degrees separately. The degrees may be BS EE and MS EE, BS CpE and MS CpE, BS EE and MS CpE, or BS CpE and MS EE. The benefits of the program for admitted students are:

- Undergraduate and graduate courses may be chosen with greater flexibility,
- Up to six hours of 5000-level or above ECE coursework may apply to both the BS and MS requirements,
- The classes taken for shared BS/MS credit may be taken at the lower undergraduate tuition rate,
- The GRE is not required for admission,
- Other graduate credit courses may be taken any time after entering the program, and
- Work on a thesis project may begin before the BS requirements are completed.

The BS-degree requirements are modified for admitted students such that EE Electives D and E or CpE Electives B and C will be satisfied by six-credit-hours of 5000-level or above ECE coursework. To be eligible for the accelerated BS/MS ECE program, an EE or CpE undergraduate must be at or beyond the junior level with a minimum of 60 credit hours and must have completed 18 credit hours of EE and/or CpE courses at Missouri S&T with at least a 3.50 GPA in the ECE courses. To be admitted, the student must complete the program application and must have the recommendation of an ECE faculty member who agrees to serve as the graduate thesis advisor. All other MS degree requirements are not changed and the MS degree must be for the thesis option. The program may be combined with existing honors research and emphasis area options. Admitted students will have both undergraduate and graduate records in the Registrar's Office.

The Accelerated Program application must be completed within one semester after shared-credit courses are completed. Courses taken for shared credit will be identified on this form and on Graduate Form 1, which is submitted after the student enters the graduate program. The six hours of shared-credit coursework will be taken as undergraduate credit, must be approved by the academic advisor, and may not be undergraduate research, special problems, or transfer courses (a co-listed course can only apply for these undergraduate requirements if it is under an EE or CpE registration. Note that the choice of EE or CpE registration may affect how a course can apply within an MS program.)   An additional six credit hours of coursework for graduate credit (beyond the shared BS/MS credits) can be taken while in the undergraduate program by applying for dual undergraduate/graduate enrollment. Taking additional courses for graduate credit will require formal application to the graduate program. Acceptance to the MS degree from the Accelerated Program is automatic so long as the student remains in good standing within the program. To remain in the Accelerated Program, the student must maintain good standing within the undergraduate EE or CpE program and must maintain continuous enrollment at Missouri S&T. If the student exits the program before completion of the MS degree requirements or fails to maintain continuous enrollment at Missouri S&T, the shared-credit courses may not apply toward graduate requirements in the event of future readmission.

The student is responsible for checking on how dual-enrollment status and graduate coursework will affect scholarships and other financial aid. Applicants should check how dual-enrollment status and graduate coursework will affect scholarships and other financial aid. Once you become a graduate student, you **are not** eligible for Federal Pell Grants, though are still eligible for Federal Financial Aid and will be eligible for fellowships and teaching/research assistantships. International students should check with international affairs during completion of an accelerated BS/MS to ensure immigration status will be maintained throughout the program.

If you are interested in applying for this program, please see Erin Karr in room 140 ECE for an application.

3.19   Credit by Examination

Students may receive credit for a course by taking an examination. The official examination policy for the Department of Electrical and Computer Engineering is as follows:

To receive credit by examination, the student must request **in writing** to take the examination. This request should normally be made during fall semester. The request must be turned into the Associate Chair for Computer Engineering Undergraduate Studies. There is no standard form for this request. The student does not need to officially enroll in the course. There is currently no fee charged for taking the exam and a failing grade will not appear on the student's transcript.

Upon receipt of the student's request for an examination to earn course credit, the Associate Chair for Computer Engineering Undergraduate Studies will appoint an examiner from among the faculty. The examiner will prepare, administer and grade the examination. This examination will require no less than one hour but no more than two hours of scheduled examination time for each unit of credit sought. The examination will be a substantial effort. (For a three credit hour course, the examination will last between three (3) and six (6) hours.) In laboratory courses, this examination could include a demonstration of proficiency with the appropriate equipment.

The examination will be completed within two weeks of the student's request as long as the request is made more than two weeks before the beginning of the "Spring Semester Final Examination Period" of any academic year. No examination for course credit will be administered on dates other than those designated as "class days" for the fall and spring semesters of a given academic year.

The examiner's grade will be final. No repeat examination will be allowed. No Computer Engineering course credit earned by examination will count toward satisfaction of the residency requirement for any degree.

3.20   Waiving and/or Changing Graduation Requirements

Occasionally, a student will have a valid reason to petition to waive or change a degree requirement. The general guideline that the Electrical and Computer Engineering department will follow when reviewing these requests is that any waiver or substitution should result in an equally, if not more, demanding program of study. Some requests are routinely approved, while some requirements are very firm and can never be waived. If it appears that the requirement is flexible, the student should obtain a COURSE SUBSTITUTION AND WAIVER FORM from the Registrar's Office or the ECE Secretary for Undergraduate Studies in room 140 EECH. These forms can also be found at http://registrar.mst.edu/forms/.

The student should complete the form with the help of the student's academic advisor, provide justification for the request, and have the advisor sign in the appropriate location. Most forms require the signature of the Associate Chair for Computer Engineering and other administrators. The ECE Secretary for Undergraduate Studies will route the form to the appropriate party. The student will be notified by mail after the request has been officially approved or denied. If the request is approved, the student should keep a copy of the approval until their graduation.

3.21   Accreditation Board for Engineering and Technology (ABET)

The B.S.CpE degree that students receive from Missouri S&T is valuable, in part, because the Accreditation Board of Engineering and Technology (ABET) has accredited the degree. This board of university faculty and other engineering professionals periodically reviews the curriculum and policies of

the department to insure they are both relevant and sufficiently advanced to warrant accreditation. This board also reviews representative student work, to insure tests and homework problems are reasonable, and grades are being assigned in a reasonable manner. If the faculty were to change the program or alter graduation requirements in a way that ABET did not approve, the board could remove this accreditation. This would be a serious disservice to all ECE students, and significantly reduce the value of the degree. While students will rarely, if ever, contact ABET, their presence on campus is very real and significant. Often course substitution and waiver requests will be denied because they would violate ABET rules.

Chapter 4

The Mechanics of Taking Courses

4.1   Registering

Registrar
Deanne Jackson, 103 Parker Hall, 341-4181, registrar@mst.edu

The registrar's office publishes numerous documents, including the schedule of classes and the undergraduate catalog. The registrar also maintains class rolls, records grades, and checks graduation requirements. This office does not make any graduation requirements, but is charged with enforcing the requirements. If you believe that you have satisfied a requirement, but your CAPS report does not indicate that the requirement is satisfied, check with your advisor. If you believe that a requirement is inappropriate, and wish to change or waive the requirement, or wish to substitute one course for another, you should contact your advisor. The registrar will not, and should not, answer these types of questions.

The registrar's office maintains a website located at http://registrar.mst.edu/ that contains the following:

- People Soft student records: assign/change PIN #, registration, fee payment, class schedule, CAPS report, grades, financial-aid information, biographic update, and address update
- Course information: schedule of classes, final-exam schedule, course equivalencies
- Dates and deadlines: semester calendar
- Student academic regulations: quick reference, confidentiality policy, student conduct, etc.
- Graduation information: commencement, deadlines, graduation list
- Catalog information: undergraduate & graduate catalogs and admission Information
- Faculty information: deadlines
- Official documents: transcripts, certification letters, diplomas
- Enrollment: enrollment statistics

4.1.1   Priority Registration

Just after you receive mid-semester grades, you should register for the following semester during priority-registration week. Faculty members set aside additional office hours to meet with their advisees during this week. The exact dates for priority registration are listed in the schedule of classes each semester (see http://registrar.mst.edu/classofferings/). The week prior to priority registration, you should

1. Sign up for a meeting time on the schedule posted outside your advisors office
2. Review your most recent CAPS report for progress toward your degree
3. Decide which classes you should take

Meet with your advisor during priority-registration week. Your advisor should review your progress toward an CpE degree, mid-semester grades, and give you a new CAPS report. Once you and your advisor have agreed upon a schedule, your advisor will sign the registration form and use Joe'SS to release the advisor hold on your registration. You should then register using the Joe Miner's Student Self Service (Joe'SS) by phone or computer. See the schedule of classes to see how to register using Joe'SS, and the dates that registration is open to you. Appropriate forms can be found at http://registrar.mst.edu/forms/.

It is important that you register during priority-registration week. Insufficient numbers can cause class cancellations before regular registration, and other classes may be full by regular registration.

4.1.2   Regular Registration

If you miss priority registration, you must attend regular registration. This is usually two school days before classes start. See the schedule of classes at http://registrar.mst.edu/classofferings/ for the exact date.

4.1.3   Adding a Course

During the first-two weeks of the fall semester or winter semester, you may add a course, assuming there is sufficient space. Use the following procedure:

1. Pick up an ADD/DROP form from the registrar's office or the ECE secretary for undergraduate studies in room 140 EECH or from http://registrar.mst.edu/forms/.
2. Complete the student-information portion on the top of the form, and fill in all requested information for the add section.
3. Obtain the signatures from both your academic advisor and the instructor teaching the course you wish to add.
   Your academic advisor is not required to sign the form if you can not justify taking the class. The instructor of the class is not obligated to sign this form if the class has reached capacity, or if enrollment between sections is uneven.
4. Deliver the completed form to the registrar's office before the end of the second week of class.

After the first-two weeks of the semester, you can only add a course if you follow the procedure listed above **and** obtain the signature of the CpE associate chair of undergraduate studies. Normally, you are only allowed to add a class after the first-two weeks if a registration error has been made.

The deadlines for adding courses during a summer session are listed in the summer class schedule.

4.1.4   Changing Sections of a Course

During the first-two weeks of the semester, you may change sections of a course, if there is sufficient room. In the ECE department, section changes are not allowed after the first-two weeks of the semester. To change sections of a course, you should

1. Pick up a SECTION CHANGE form from the registrar's office, the ECE secretary for undergraduate studies, or from http://registrar.mst.edu/forms/.
2. Complete the student-information portion on the top of the form and fill in all requested information for the section-change portion of the form.
3. Obtain the signatures from the following:
   a) The instructor teaching the section you are adding. The instructor teaching the section you wish to add may refuse to sign the form if the section has reached capacity, or if enrollment between sections is uneven.
   b) The instructor teaching the section you are dropping.
   c) There is no need to obtain your academic advisor's signature for section changes. The space for the advisor's signature only applies to credit-hour and grading-option changes.
4. Deliver the completed form to the registrar's office.

4.1.5   Dropping a Course

During the first six-weeks of the semester, you may drop a course for any reason. No record that you ever enrolled in the class will be kept. A dropped course in the first six-weeks will not affect your GPA, and it will not appear on your transcript or CAPS reports. One should be careful when dropping a course, however, that they do not drop below the 12 credit-hour load required to be considered a full-time student. Losing your full-time status may impact student loans, scholarships, insurance rates or coverage, or other items. Carefully consider your options – like changing to hearer status – before dropping below a 12 credit-hour load.

To drop a course, you must

1. Pick up an ADD/DROP form from the registrar's office, the ECE secretary for undergraduate studies, or http://registrar.mst.edu/forms/.
2. Complete the student-information portion on the top of the form and fill in all requested information for the drop portion of the form.
3. Obtain signatures from both your academic advisor and the instructor teaching the course you wish to drop.
4. Deliver the completed form to the registrar's office.

You may still drop any course for any reason from the seventh-through–the-twelfth week of the semester; however, a grade of WD will appear on your permanent transcript. This is not a passing or failing grade, but merely indicates that you withdrew from the class. The class will not affect your GPA. Reviewers of your transcript may, however, be unfavorably impressed by withdrawals.

After the twelfth week of the semester, you may not drop a course for any reason. You also may not withdraw from school after the twelfth week. If you are unable to attend a class, due to illness or other unavoidable circumstances, you may ask the instructor to assign a grade of I for Incomplete. This is a temporary grade that will eventually be changed into a normal letter grade. See the following section on grading options for a more-complete description of incomplete grades.

4.2   Grading Options

4.2.1   Taking a Class as a Hearer

Every student who attends a class must be registered for that class. If you wish to attend the lectures for a course, but not receive a grade, you must register as a hearer. You may register as a hearer, or may change to hearer status during the first-six weeks of the fall or winter semesters. To register as a hearer, you should use one of the two following procedures:

1. Prior to the start of classes, pick up an AUTHORIZATION FOR PASS/FAIL OR HEARER (AUDIT) GRADING form at the registrar's office or at http://registrar.mst.edu/forms/. Fill out and submit the form.
2. After classes have started: Pick up a SECTION CHANGE form from the registrar's office or the ECE secretary for undergraduate studies.
   a) Complete the student-information portion on the top of the form, and the fill in all requested information at the bottom of the form under Credit Hour–Grading Option Only.
   b) Obtain the signatures from both your academic advisor, and the instructor teaching the course.
   c) Deliver the completed form to the registrar's office.

4.2.2   Incomplete Grades

If you are unable to complete a class due to sickness or other unavoidable reasons in the last-four weeks of the fall or winter semesters, you may request the instructor to assign a grade of I (Incomplete). This is not a passing or failing grade; in fact, it is a temporary grade. It states that you will be allowed to complete the course work after the end of the semester. To be assigned a grade of I, you must

1.   Regularly attend class during the first-twelve weeks of the semester.
2.   Be earning a passing grade at the time the unavoidable absence started.
3.   Be sick or forced to miss class due to unavoidable circumstances during the last-three weeks of regularly scheduled class or finals week.
4.   Receive permission from the instructor. Instructors are in no way required to assign a grade of I. They may assign a normal letter grade if they prefer.
5.   Receive permission from the department chair of the teaching department. In the case of CpE courses, receive permission from the Associate Chair for Computer Engineering Undergraduate Studies. In the case of EE courses, receive permission from the Associate Chair for Electrical Engineering Undergraduate Studies. The chair is not required to approve requests for I grades, and may force instructors to assign normal letter grades.

If, and only if, you satisfy the conditions listed above, will you be assigned an I grade for the course.

If you receive a grade of I, your instructor will file an INCOMPLETE GRADE form at the end of the semester stating what work you must complete to finish the course and when it is due. This form must be approved by the department chair, and will be kept on file by the department. You should obtain a copy of this form and study it carefully. Your I grade will be translated into a conventional letter grade within one year. If not update is made to the grade, it automatically becomes a failing grade. There is no way for you, the instructor, or the department chair to prevent this. Withdrawing from school will not prevent it, and you can not withdraw from the course. If your instructor leaves Missouri S&T before he assigns a normal letter grade, another faculty member will be given the responsibility of evaluating your work. If you do not satisfactorily perform the specified work in the allowed time, you will fail the course. Your work must be completed within one calendar year from the close of the semester in which you received the incomplete grade.

Once your work is complete, or the time to complete it has expired, your I grade will be replaced by a normal letter grade.

Note: You must meet all prerequisites before enrolling in a course. For example, if you receive an I grade in EE 2100/151, you can not enroll in EE 2120/153 until this I has been replaced with a C or better grade.

4.2.3   Delayed Grades

If you enroll in CpE or EE 4099/390 for more than one semester, you may be assigned a grade of DEL (Delayed) in your first semester. This means that the instructor has chosen to wait until the next semester when you complete the project to assign a grade. Your DEL grade will be changed to a normal letter grade before you graduate. Your instructor must complete a GRADE CHANGE form to change your DEL grade to a letter grade. You are not allowed to drop a course in which you received a grade of DEL, and you and are not allowed to change the grading option to pass/fail or hearer.

4.2.4   Pass/Fail Grades

If you take a course pass/fail you will receive a grade of S (satisfactory or pass) or a grade of U (unsatisfactory or fail). If a grade of S is received, courses taken pass/fail can be used to satisfy the free-elective requirement (CAPS requirement 17), the cumulative-hours requirement (CAPS requirement 2) and the last-60-hours-on-campus requirement (CAPS requirement 7). Courses taken pass/fail do not satisfy any-other degree requirements.

In order to take a course pass/fail, you must submit a completed PASS/FAIL or HEARER form, available at http://registrar.mst.edu/forms/, to the registrar's office prior to the start of the semester or complete the lower portion of a SECTION CHANGE FORM during the first two weeks of class.

4.2.5   Graduate vs. Undergraduate Credit

To dually enroll as both an undergraduate and a graduate student, submit a DUALLY ENROLLED UNDERGRADUATE – GRADUATE CREDIT INDICATION form available at http://registrar.mst.edu/forms/ within the first two weeks of classes.

If you are dually enrolled, you must specify which courses are for undergraduate credit and which courses are for graduate credit. You may change this designation during the semester by completing the grading-option section of a SECTION CHANGE form available at http://registrar.mst.edu/forms/. Your advisor must sign this form. You are allowed to change the graduate/undergraduate designation after the cut-off date for changing grading options. Courses taken for graduate credit do not satisfy any undergraduate graduation requirements.

4.3   Prerequisites and Corequisites

Instructors have the right to drop you if they believe you are not prepared to take the course. Many of the courses offered at this university build on material introduced in other courses. You are required to complete all prerequisites before enrolling in a course. Corequisite courses may be taken prior to, or concurrent with, the specified course. The prerequisites and corequisites are listed in both the undergraduate catalog and the schedule of classes. Known errors in these listings will be posted on the ECE undergraduate bulletin board located in the first-floor lobby near the north entrance of EECH.

You may wish to take a course before completing all of the prerequisite courses. If your faculty advisor agrees, you can enroll in the class. Since the instructor teaching the course has the right to drop you, you should contact the instructor before enrolling, or, at the latest, the first day of class.

In the case of laboratory courses, you should contact the ECE Associate Chair for Laboratory Development for permission to take the lab without the prerequisites. You will be allowed to enroll in, or complete, the course if this assistant chair decides that you are properly prepared. If you are not prepared, you will be forced to drop the course. This means that you can lose both credit for any completed work in the course and some or all of the fees paid.

4.4 Special CpE Courses

4.4.1   Special Problems (CpE 3000/200 & CpE 4000/300)

The CpE 3000/200 and CpE 4000/300 courses are individual-study courses referred to as special-problems courses. You might study a topic that is not regularly taught in the department. CpE 3000/200 is considered a junior level course, and CpE 4000/300 is at the senior level. If you are interested in enrolling in CpE 3000/200 or CpE 4000/300, contact a faculty member in your area of

interest and request to take a special-problems course. Faculty are often eager to work with students in this way, but a faculty member is under no obligation to do so. CpE students may take a maximum of six credit hours of CpE 3000/200 or CpE 4000/300. These courses may be taken for a letter grade and used for CpE Elective CDE or as free electives, or under the pass/fail option and used as free electives. These courses may not be used as CpE Elective A or B and no more than 3-hours may be used as CDE electives. You must have a cumulative Missouri S&T and CpE GPA above 2.000 before you can enroll in CpE 4000/300. There will be no mention on your transcript of the topics covered.

4.4.2   Special Topics (CpE 3001/201 & CpE 5001/301)

In developing and modifying the curriculum, the department frequently offers experimental courses known as special-topics courses. These are conventional lecture courses that are given the temporary course numbers of CpE 3001/201 (junior level coursework) or CpE 5001/301 (senior level coursework). After the experimental course is taught once or twice, it is given a permanent course number or dropped from the curriculum. You may use CpE 3001/201 as an CpE elective CDE or as a free elective. CpE 5001/301 may be used as CpE elective ABCDE or as a free elective. You will normally receive a letter grade in these courses, but may request to take them with the pass/fail grading option for use only as free electives. You may re-take CpE 3001/201 and CpE 5001/301 for additional credit as long as each identically numbered course covers a different topic. The subtitle of the course will appear on your permanent transcript.

4.4.3   Undergraduate Research (CpE 4099/390)

The course CpE 4099/390 is an individual-study course, similar to CpE 4000/300. The primary difference between these two courses is in the scope of the material covered. A CpE 4000/300 course should cover a range of topics similar to a conventional lecture courses. CpE 4099/390 courses have a much more limited scope. This course allows you to study a research-specific problem in great depth. CpE 4099/390 is an integral part of both the CpE honors program and the OURE program; however, any student may enroll in CpE 4099/390.

You should contact faculty members individually to discuss potential research topics. CpE students may take a maximum of six credit hours of CpE 4099/390. If CpE 4099/390 is taken for a letter grade, the course may be used for CpE elective CDE or as a free elective. If taken under the pass/fail option, the course can only be used as a free elective. This course will appear with the title Undergraduate Research on the student's transcript, but the area of research will not be documented.

4.4.4   Cooperative Engineering Training (CpE 3002/202)

Computer Engineering 202 Advisor
Dr. R. Joe Stanley, 127 EECH, 341-6896, stanleyj@mst.edu

Electrical Engineering 202 Advisor
Dr. Mehdi Ferdowsi, 234 EECH, 341-4552, ferdowsi@mst.edu

Cooperative Education (Co-op) is a structured educational strategy integrating classroom studies with learning through productive work experiences in a field related to your academic or career goals. If you wish to have academic credit for a co-op experience, the department has one-credit-hour courses CpE 3002/202 and EE 3002/202 that can apply toward your free-elective requirements.

You should register your co-op experience with the campus Career Opportunities & Employer Relations (COER) office (http://career.mst.edu/) to maintain continuing student status. Upon registering, you will

be enrolled in "Co-op Work Program" for zero (0)-credit hours (this item does not appear on your transcript). It is possible to earn one (1)-credit hour to receive academic credit for your co-op experience and to have CpE 3002/202 and EE 3002/202 appear on your transcript. *Consent of the Associate Chair of EE Undergraduate Studies, Associate Chair of CpE Undergraduate Studies, or the Department Chair is required to enroll in the course.* This one (1)-hour course may be taken only once, has a pass-fail grading option only, and may be used only for the free-elective degree requirements. You will be required to prepare a report related to your co-op assignments. The report and any work evaluations from your supervisors on the co-op work assignment will be used for pass-fail grading by an ECE faculty instructor as assigned by the department.

> *You are responsible for obtaining department approval and for understanding grading criteria prior to enrolling in the course.*

The assignment details regarding report topic, general format, and grading criteria will be available from the course instructor (typically the Associate Chair for EE Undergraduate Studies or the Associate Chair of CpE Undergraduate Studies). The ECE Department Chair has the authority to approve a CpE 3002/202 and EE 3002/202 course for students who can document they have had appropriate employment experience, even when the employment was not part of a university-approved cooperative education assignment. (Refer to section 5.4 of the EE or CpE Undergraduate Handbook for more information on the co-op program.)

Minimum Report Requirements
(The Course Instructor may specify other requirements, formatting, and grading criteria):
Page 1 (Cover Page)
> Student Name, Co-op Dates, Co-op Company, Location, Supervisor (w/Contact Information)

Page 2-3
> Summary of Tasks, Lessons Learned with emphasis on project management, teamwork, economics, salesmanship, company culture, ethics, etc.

Evaluations from the student's co-op work supervisor may be required.

It is possible to earn up to 3 credit hours for co-op related experience. To earn this credit, you must first complete a minimum of twelve months of co-op experience (typically three assignments). The number of credit hours should depend on the level of the work performed while on co-op. If significant technical learning took place, equivalent to a 5xxx/300-level 3-hour CpE lecture course, then it may be appropriate to register for up to 3 credit hours of CpE 4099/390. Note that you *cannot* apply your co-op experience to receive credit for both CpE 3002/202 and CpE 4099/390. You should discuss the number of hours with your advisor before signing up, as signing up for more hours than are appropriate for the work performed could result in a poor grade for the course. This course must be taken for a letter grade if used to satisfy CpE elective CDE. Your advisor will be your instructor for this course. You will be required to write a technical report on your co-op assignments. Your advisor will define the exact topic, format and level of detail for this report. Your grade in the course will be determined by the quality of the report, the level of the tasks performed on co-op, and the evaluations completed by your supervisors of the co-op work assignments. These evaluations are automatically forwarded to your advisor each time you complete a work assignment. Refer to section 5.4 for more information on the co-op program.

Chapter 5

Programs

5.1   Opportunities for Undergraduate Research (OURE) Program

Coordinator
Dr. Daryl Beetner, 126 EECH, 341-6203, daryl@mst.edu

Traditionally, research has been reserved for faculty and graduate students. In an attempt to extend this privilege to undergraduate students, the OURE program was initiated. This program allows you to receive credit, and in some cases financial assistance, for working on research projects with an ECE faculty member. An OURE program may be combined with the departmental honors programs. Additional information about this program can be found at http://ugs.mst.edu/oure.html or 341-7276.

Any student can apply for an OURE grant. Your best bet is typically to contact faculty your might like to work with and let them know your interest in this program. They may have research that is appropriate for an undergraduate. The Department of Undergraduate Studies or the department OURE coordinator may also know of other research projects that are looking for undergraduate assistance.

5.2   Departmental Honors Program

Coordinator
Dr. Steve E. Watkins, 121 EECH, 341-6321, watkins@mst.edu

If you are performing exceptionally well in your undergraduate studies, you may wish to join the honors program. This allows you to perform research in your area of interest with a faculty member. If you complete the program, the designation Honors Scholar in Computer Engineering will be placed on your diploma, in addition to any academic honors based upon your UM GPA. As an honors-program student, you may dually enroll for the last-two semesters.

To be admitted to the ECE-department honors program, you must be at the junior level, have a minimum of 60 credit hours with at least a 3.50 Missouri S&T GPA. If you are a transfer student, you must have a minimum of 60 credit hours with 15 hours at Missouri S&T and a 3.50 Missouri S&T GPA.

Participation in the honors program provides an opportunity for individual learning and creativity through your honors project. Your honors project is an independent project under the supervision of a faculty advisor of your choice. Your project will constitute a minimum of 2 credit hours and a maximum of 6 hours of CpE 4099/390 course work. Typically, projects are a total of 3 credit hours, with 2 credits earned in one semester and 1 credit earned in the other. Your project will culminate in a formal report approved by the supervising faculty advisor and an additional ECE faculty member appointed by either the EE or the CpE associate chair for undergraduate studies. Your research advisor will assign a letter grade to both your final report and CpE 4099/390 courses. If you take CpE 4099/390 for a letter grade, you can use it as CpE elective CDE. If graded pass/fail, it can only be used only as a free elective.

You can combine your departmental honors program with the MSF and OURE programs.

5.3   Master Student Fellow (MSF) Program

Coordinator
Dr. Steve E. Watkins, 121 EECH, 341-6321, watkins@mst.edu

The MSF program is an integrated, research-oriented program of study leading to an undergraduate degree followed by an M.S. degree. The program facilitates the involvement of sophomores and juniors in ECE faculty research. The recommended curriculum includes 6 credit hours of CpE 4099/390 coursework which meets degree requirements. The undergraduate-research experience is designed to prepare you for your graduate thesis work. The MSF curricula plan facilitates the rapid achievement of a master's degree. Participating students are automatically dually enrolled after completing ninety credit hours. Upon completion of an undergraduate degree, students in the MSF program are automatically accepted for graduate school and are guaranteed to receive at least two semesters of half-time graduate support. The graduate support may require teaching or research duties.

To be admitted to the MSF program on admission as a freshman you must have a minimum ACT score of 32 and be in the top-ten percent of your high-school graduating class. Upon leaving the FEP you are guaranteed continuing MSF status in your new department. Students already on campus may also enter the MSF program. You must have completed at least 30 credit hours of Missouri S&T work with a Missouri S&T GPA of 3.5 or higher, and you must be approved for MSF status by your major department. If you change majors, you must also be approved for MSF status by your new department.

To remain in the MSF program, you must maintain a 3.5 or greater Missouri S&T GPA, and you must be making reasonable progress toward your undergraduate and master's degrees. You can combine an MSF program with departmental honors and OURE programs. For departmental specifics, contact your MSF program coordinator.

5.4   Cooperative Education Program

Third Floor Norwood Hall, 341-4343, career@mst.edu

Missouri S&T has an excellent co-op program. This program allows you to attend school and work for a company of your choice in alternating semesters. While this increases the time required to earn your degree, it is often well worth the extra effort. Co-op assignments give you a break from school, let you see how course work can be applied to real-world problems, and can help you more easily make the transition from school to full-time employment after graduation. Many employers recognize the benefit of co-op, and often ask graduating seniors if they have any CpE experience outside of their course work.

You should consider applying for a co-op position after one-to-two years of study. You typically do not receive academic credit for your co-op experience. However, it is possible to earn 1 credit for co-op by signing up for CpE 3002/202 (refer to section 4.4.4). It is possible to seek up to 3 credits for extended co-op assignments (refer to section 4.4.4).   The co-op office can also arrange internships, a slightly less formal form of co-op. For more information on co-op opportunities available at Missouri S&T, contact the co-op office or check out their website at http://career.mst.edu/cooperativeeducation/description.html.

5.5   Career Opportunities and Employer Relations (COER)

Director of Career Opportunities and Employer Relations
Dr. Edna Grover-Bisker 303C Norwood Hall, 341-6170, egroverb@mst.edu
It is not always easy to find your first engineering position. The career opportunities and employer relations center will help you locate potential employers. They can also help you develop an effective resume and interviewing skills. Many employers send representatives to campus to interview students. The career opportunities center coordinates these interviews. You should contact this center approximately one year before you plan to graduate. Check out their website at http://career.mst.edu/.

Chapter 6

Financial Assistance

6.1   Financial-Aid Office
G1 Parker Hall, 341-4282, sfa@mst.edu

You may apply for a variety of financial aid. The student-financial-aid office will assist you in determining programs for which you may qualify and supply the appropriate application forms. You may wish to visit their website at http://sfa.mst.edu/ before contacting the office directly. You are also urged to contact the ECE scholarship coordinator.

6.2   Department Scholarships
Dr. Kurt Kosbar, Coordinator, 227 EECH, 341-4894, kosbar@mst.edu

The ECE department awards a number of scholarships to undergraduate students. You are eligible for departmental scholarships once you officially enter the CpE program from Freshman Engineering. Departmental scholarships are currently given out by the recommendation of the ECE faculty. If you are interested in these scholarships, please contact the ECE scholarship coordinator.

There are also a number of scholarships that are available to all Missouri S&T students. More information about these scholarships is available from the Student Financial Assistance Office at http://sfa.mst.edu/.

6.3   Financial Aid for Graduate Study

Although the focus in this chapter is on undergraduate financial aid, several scholarships, like the Rhodes scholarship, apply only to students pursuing advanced degrees, such as an M.S. or Ph.D. degree. Please be aware that there are numerous opportunities for financial aid in an engineering graduate school. The opportunities include various assistantships (both teaching and research), fellowships and grants from a variety of state, federal and private sources. Please see the graduate coordinator or the graduate handbook for details.

Chapter 7
Professional Societies and Organizations

Information about professional societies and organizations for student participation can be found at http://ece.mst.edu/currentstudents/prohonsocieties/.

7.1 Institute of Electrical and Electronics Engineers Inc. (IEEE)

Dr. Minsu Choi, Faculty Advisor, 341-6775, 134 EECH, choim@mst.edu

All ECE students are welcome to join the student branch of IEEE. This is the largest professional society in the world. Joining this organization gives you access to the technical publications and opportunities that IEEE offers at a fraction of the full membership rate. For more information contact the faculty advisor or get a student-membership application at http://www.ieee.org/.

7.2 Association for Computing Machinery (ACM)

Dr. Daniel Tauritz, Faculty Advisor, 341-7218, 324 Computer Science Bldg, tauritz@mst.edu

ACM is the oldest professional society that services the computer industry, and the Missouri S&T student chapter, organized in 1962, is the second oldest in the USA. Its focus is much more software oriented than the IEEE computer society. Many computer engineers belong to both organizations. See http://acm.mst.edu/ for additional information.

7.3 Eta Kappa Nu (HKN)

Dr. Sahra Sedighsarvestani, Faculty Advisor, 341-7505, 135 EECH, sedighs@mst.edu
Dr. Theresa Swift, Faculty Advisor, 341-4540, 217 EECH, thswift@mst.edu
Dr. Steve Watkins, Faculty Advisor, 341-6321, 121 EECH, watkins@mst.edu

HKN is an international honorary society for electrical engineers and admission is primarily based on scholastic performance. Visit their website at http://ece.mst.edu/currentstudents/prohonsocieties/ or contact the faculty advisors. This society can often help supply tutors for CpE students.

7.4 Tau Beta Pi
Dr. Ralph Flori, Faculty Advisor, 341-7583, 129 McNutt Hall, reflori@mst.edu

Tau Beta Pi is an honorary society for all engineering. Questions concerning this society may be directed to the local Tau Beta Pi faculty advisor, *or v*isit the web site at http://ece.mst.edu/currentstudents/prohonsocieties/.

A complete listing of campus societies and organizations can be found at the website http://studentlife.mst.edu/volunteer/student_organizations.html.

Chapter 8

Miscellaneous

8.1   Required Calculators

Electrical engineering and math instructors may require you to have a Hewlett Packard Model 48G (HP-48G) calculator, or equivalent, during an examination. The instructor will determine if another computing device is a reasonable equivalent to a HP-48G. Instructors can not insist that students have access to any other computing device unless provided by the university.

8.2   Student Paper and Presentation Competitions

A number of technical societies organize paper and presentation competitions that are open to undergraduate students. You are encouraged to participate in these competitions. If in the honors or OURE program, you may wish to use your project as a basis for your papers and presentations. In addition to the recognition associated with winning a competition, many have significant cash awards.

Competitions are currently conducted by the OURE program, Sigma Xi (a scientific honor society), the Missouri Academy of Science, and IEEE to name a few. Be sure to check with the ECE departmental OURE coordinator, the IEEE faculty advisor or the CpE associate chair for undergraduate studies.

Chapter 9

When Things Are Not Going Well

9.1   Problems in Several Courses

If you are having difficulty in several courses, contact your faculty advisor. Your advisor can discuss ways to lighten your academic load and how this will impact the time required to earn your degree.

You may also wish to visit:

Counseling and Academic Support Programs
105 Norwood Hall, 573-341-7276, learn@mst.edu .

This center offers seminars to help you study more efficiently and manage time, stress, test anxiety, and other problems. The center can also direct you to a number of support groups in these areas. Information about these programs can be found at http://learn.mst.edu/.

The university has many resources to help you overcome difficulty in your courses. These include learning communities, tutoring through the LEAD program (http://lead.mst.edu/), and many others. Your advisor and the Counseling and Academic Support Center can help you find the program that is best for you.

9.2   Problems with One Particular Course or Instructor

Do not hesitate to contact your instructor for the course to discuss your problems with the course.

Make sure enough time is allowed to study for the course. The rule of thumb for undergraduate courses is that approximately 2-to-3 hours a week is spent studying course material for every hour spent in class. A 3 credit-hour course should require 6-to-9 hours of study time a week outside of class and all prerequisite courses need to be completed.

If you believe an instructor is behaving in an unreasonable or unprofessional manner, contact the instructor's supervisor. If the instructor is a laboratory GTA, contact the ECE Associate Chair for Laboratory Development. If the instructor is a faculty member, contact the ECE Department Chair.

Please make every attempt to resolve problems with the instructor before going to their supervisor. If the problems seem significant, it may still be necessary to contact the instructor's superior.

9.3   In Danger of Failing a Course

If you are in danger of failing a course, discuss the following options with your advisor and instructor:

- Reducing extracurricular activities
- Dropping the course
- Dropping other courses to free up additional study time
- Changing to hearer status

Each of the last three actions listed have significant restrictions and consequences associated with them. Thoroughly review the appropriate sections in Chapter 4 before selecting any of these options and discuss any plans with your advisor.

9.4   Scholastic Probation

If a student's semester GPA is below 2.00, the student is placed on scholastic probation. A NOTIFICATION OF SCHOLASTIC ACTION form will be mailed directly to the student indicating what action will be taken to continue enrollment. If placed on scholastic probation, the student should contact their faculty advisor and re-examine the student's schedule for the next semester.

In addition, the student should review the university policies for being placed on and to be removed from probation. See the student academic regulations at http://registrar.mst.edu/academicregs/index.html. In general, students may not hold an office in any student organization and may not take more than 13 credit hours of classes. It is important that students on probation make every attempt to raise their GPA in subsequent semesters. Students that do not take academic probation seriously often fail to graduate.

9.5   Scholastic Deficiency

If placed on academic probation a second time, the student is considered scholastically deficient. This is a very serious problem, since the student is dropped from the CpE program. The student will have to apply to be readmitted into CpE. There is no guarantee that this application will be accepted. If the student is scholastically deficient, contact their faculty advisor immediately and review the rules for scholastic deficiency. These are available at http://registrar.mst.edu/academicregs/index.html/. If denied admission to the CpE program, the student may also appeal to the provost for admission to the school through other means.

9.6   Withdrawing from School

A student who is unable to continue studies needs to withdraw from school. Use the following procedures as stated in the student academic regulations. Review this information online by accessing http://registrar.mst.edu/academicregs/index.html .

- **Do Not Just Walk Away From School:** The student will still be enrolled in the courses and receive an "F" grade unless officially withdrawing from school.

- Permission Required**:** To withdraw from school fill out a REQUEST TO WITHDRAW FROM SCHOOL form available from the registrar's office or at http://registrar.mst.edu/forms/. Withdrawals from school must be completed 3 weeks (15 class days) prior to the last day of class.

- Before Two 2 Weeks Past Mid-Semester: If a student withdraws from school with permission prior to 2 weeks past mid-semester (1 week during summer session), they shall receive no grade in any class scheduled for that semester.

- After Two 2 Weeks Past Mid-Semester but Prior to 3 Weeks Before the End of Classes: If a student withdraws during this interval, they may receive credit for courses that they have actually completed at the time of withdrawal. In other courses, no grades shall be recorded.

- Academic Status: Academic status if a student withdraws will be the same as their status at the beginning of the semester in which they withdrew. **Reapply for admission if placed on academic deficiency**.

9.7   ECE Department Academic Dishonesty Policy

As a faculty, we believe that membership in the engineering profession requires the utmost in honesty and ethical conduct. For this reason, we have established the following departmental guideline on academic dishonesty by students:

- **First Offense**: Cheating in a course will be punished by a grade of F for the corresponding work. The student will be notified in writing that a second incidence of cheating will result not only in an F grade in the course, but in automatic expulsion from the department. In addition, a copy of this reprimand will be placed in the student's file at the department level. This letter will be destroyed upon graduation if no further infractions occur.
- **Second Offense**: A second incidence of academic dishonesty is cause for automatic expulsion from the department. Students so expelled will be readmitted to the department only with a vote of two-thirds of the active tenured faculty.

These guidelines do not preclude further disciplinary action at the school of engineering, campus or university level.

9.8   Personal Problems and Emergencies

CpE students who experience serious health or personal problems should contact the CpE Associate Chair for Undergraduate Studies and the Vice Provost for Academic Affairs, 110 ERL, 341-7887, rschwartz@mst.edu. **Never simply walk away from school**. Discuss the details of the situation and investigate all of the options before terminating studies.

Chapter 10

Student Check Lists

This chapter includes checklists of milestones and decisions you will encounter while studying at Missouri S&T. In making these lists, we assume that you have already been admitted to Missouri S&T and completed the Freshman Engineering program or a pre-engineering program at another school. For information on applying to Missouri S&T contact admissions located at 106 Parker Hall or visit their web site http://admissions.mst.edu/.

10.1   Entering Computer Engineering

- **Entering CpE from the Freshman Engineering Program:** During your last semester in the FEP, you will need to obtain a UNDERGRADUATE REQUEST TO CHANGE MAJORS form from your advisor, the administrative assistant in the FEP or from http://registrar.mst.edu/forms/. You need to fill out the form and return it to administrative assistant in the FEP. The form will be forwarded to the CpE secretary for undergraduate studies for approval by the Associate Chair for Computer Engineering. If you are approved for admission into the CpE program, this secretary will assign you an advisor in CpE and notify you at your Missouri S&T email address.
- **Entering CpE as Part of a Dual Degree Program:** If you seek to pursue dual degrees, you must complete an UNDERGRADUATE REQUEST TO CHANGE MAJORS form, which can be obtained from http://registrar.mst.edu/forms/. You need to complete this form and return it to the CpE secretary for undergraduate studies for approval by the Associate Chair for Computer Engineering. This form requires approval from both departments that you are seeking degrees. If you are approved for admission into the CpE program, this secretary will assign you an advisor in CpE and notify you at your Missouri S&T email address.
- **Entering CpE from Another School (Transfer Student):** The transfer admission office is the expert to contact in transferring to CpE from another school. This office is located in room 102 of Parker Hall, or you can visit their website http://admissions.mst.edu/transfer/. The CpE secretary for undergraduate studies will notify you of your faculty advisor's contact information at your Missouri S&T email address.
- **Entering CpE from Another Department (Discipline):** If you decide to change your major from another department to CpE, you need to fill out an UNDERGRADUATE REQUEST TO CHANGE MAJORS form, obtainable from the registrar's office or their website http://registrar.mst.edu/forms/. The CpE secretary for undergraduate studies will notify you of your advisor at your Missouri S&T email address.
- **Contact Your Faculty Advisor:** Once you have been admitted into the CpE program, you should contact your new advisor for questions and help.
- **Minor Programs:** There are many minor degrees available, and many do not require you to take more credit hours than the minimum required for an CpE degree, but all minors require advance planning. You should speak with your faculty advisor regarding all minor degrees. You will need to fill out an APPLICATION FOR MINOR form which you can obtain from the registrar's office or their website http://registrar.mst.edu/forms/. For a list of all degrees, including those that allow minors, see http://futurestudents.mst.edu/degrees/undergraduate/index.html.

10.2   A Typical Semester

Please access the website http://registrar.mst.edu/calendars/ to view the semester schedule for deadlines. Here you will find the dates for registration; add/drop slip submission, final-exam schedule, etc.

- **Advising Week:** One week during fall and winter semester is advising week. This is the most efficient time for you to meet with your advisor to make a new schedule   Check the website http://registrar.mst.edu/calendars/ for the precise dates for this week. During advising week, you should meet with your advisor to set up your next-semester class schedule. You should be sure to sign up for an appointment on the schedule that will be posted beside your advisor's office door. Your advisor must remove the advising hold in order for you to register. After your advising session, you should check Joe'SS to find out the first date and time that you can register. You should register as soon as possible to improve your chance of getting the course sections you prefer
- **Open Registration:** Open registration dates are also listed in the semester class schedule. Use the link http://registrar.mst.edu/calendars/ to find these dates.

10.3   Co-Op

If you wish to consider applying for a co-op position, you should contact the career opportunities center located at 301B Norwood Hall (341-4301, career@mst.edu). The career opportunities center website is http://career.mst.edu/cooperativeeducation/description.html. See section 5.4 for more details.

10.4   The Semester Prior To Your Graduating Semester

- Make sure to register for the Fundamentals of Engineering Exam. See section 10.5.

10.5   Your Graduating Semester

The following checklist, paraphrased from the registrar's website, lists the steps for students to follow in preparation for graduation:

- You must submit to the registrar's office a completed APPLICATION FOR GRADUATION form, available at http://registrar.mst.edu/forms/ **within the first-four weeks** of your graduating semester. Submitting this form a few weeks after pre-registering for the final semester is even better.

- After the fifth-or-sixth week of classes, you will receive a preliminary degree check with the analysis mailed to your local address. This analysis consists of a CAPS report and a cover letter stating any deficiencies or if all of your degree requirements will have been met with in-progress course work. Your CAPS report may be obtained from Joe'SS (http://joess.mst.edu) at any time.

  NOTE: It is your responsibility to make sure all discrepancies have been resolved before commencement.   If you have any problems, you need to see your advisor.

- You can check the Assessment Office link (http://ira.mst.edu/assessment.html) to see what your senior assessment requirement is. If you have a questions concerning your senior assessment requirements and why the senior assessment does not show up on your CAPS, please see the ECE Undergraduate Secretary.

- You must complete all transfer credit and correspondence course work prior to commencement. Transcripts for correspondence-and-transfer credit must be received within 30 days after commencement. In addition, grade changes or incomplete-grade replacements must be submitted to the registrar's office within 30 days after commencement in order to meet graduation requirements.

- **ALL STUDENTS:** If you fail to meet graduation requirements in the term you specified, you must **reapply** for the term in which you next expect to complete all requirements. Final degree audits are only provided for the terms specified.