

# **COMPUTER ENGINEERING**

## **CURRICULUM GUIDE**

**UNIVERSITY OF MINNESOTA  
2008 - 2009**

## COMPE CURRICULUM GUIDE - TABLE OF CONTENTS

<b>1.0. INTRODUCTION.....</b>	<b>3</b>	8.4.2 Upper Division (8 cr required).....	10
1.1. COMPUTER ENGINEERING CURRICULA.....	3	8.5. ELECTRICAL ENGINEERING CORE COURSES.....	10
1.2. FURTHER INFORMATION.....	3	8.5.1 Lower Division (15 cr required).....	10
<b>2.0. ADMISSIONS .....</b>	<b>4</b>	8.5.2 Upper Division (18 cr required).....	10
<b>3.0 REGISTRATION AND ADVISING .....</b>	<b>4</b>	8.6. COMPE TECHNICAL PROGRAM (28 CR REQUIRED) (26 FOR STUDENTS ENTERING PRIOR TO FALL 2006) .....	10
3.1. ENTERING I.T. ....	4	8.6.1 CompE Senior Technical Electives (22 cr minimum required) (20 for students entering prior to Fall 2006).....	10
3.2. UPPER DIVISION COMPE .....	4	8.6.2. Additional Electives (0-6 credits): .....	10
3.3. GRADUATION PAPERWORK .....	4	8.7. COMPE SENIOR TECHNICAL PROGRAM .....	11
3.4. CLASS RESERVATION AND WAITING LIST .....	5	8.8. FURTHER NOTES .....	11
<b>4.0. ECE PROGRAMS AND ACTIVITIES .....</b>	<b>5</b>	<b>9.0. SEMESTER SCHEDULES.....</b>	<b>12</b>
4.1. ENGINEERING CO-OP PROGRAM.....	5	9.1. COMPE DEGREE PROGRAM .....	12
4.1.1 General Information .....	5	9.2. COMPE ENGINEERING CO-OP PROGRAM SCHEDULE .....	13
4.1.2 Engineering Co-op Program Fall 2006 or Later.....	5	<b>10.0. NEW OR CHANGED COURSES.....</b>	<b>14</b>
4.2. I.T. UPPER DIVISION HONORS PROGRAM .....	5	<b>11.0. APPLICATION FOR DEGREE .....</b>	<b>14</b>
4.3. STUDY ABROAD .....	6	11.1. GENERAL.....	14
<b>5.0. NON-COMPE PROGRAMS .....</b>	<b>7</b>	11.2. APPLICATION FOR DEGREE.....	14
5.1. EARNING A CLASS MAJOR OR MINOR.....	7	11.3. GRADUATION CLEARANCE.....	14
5.2. EARNING AN IT SECOND MAJOR .....	7	11.4. CURRICULUM REQUIREMENTS .....	14
5.3. CARLSON SCHOOL OF MANAGEMENT MINOR.....	7		
<b>6.0. CURRICULUM AND COURSE RESTRICTIONS .....</b>	<b>7</b>		
6.1. DIRECTED STUDY .....	7		
6.2. GENERAL COLLEGE COURSE POLICY .....	7		
6.3. RESIDENCY REQUIREMENT POLICY .....	7		
6.4. COURSES NOT ACCEPTED FOR THE BComPE DEGREE POLICY .....	7		
6.5. TRANSFER CREDIT POLICY .....	7		
6.6. CHANGING DEGREE REQUIREMENTS POLICY.....	8		
6.7. GRADING POLICIES .....	8		
6.7.1. The "D" grade .....	8		
6.7.2. S-N Grading - ECE Policy.....	8		
6.7.3. The "I" grade.....	8		
<b>7. PREREQUISITE FLOW CHART FOR COMPE CORE COURSES.....</b>	<b>9</b>		
<b>8.0. COMPE DEGREE CURRICULUM REQUIREMENTS .....</b>	<b>10</b>		
8.1. LIBERAL EDUCATION (INCLUDING ALL REQUIRED WRITING PRACTICE) .....	10		
8.2. MATHEMATICS (16 CR REQUIRED).....	10		
8.3. PHYSICS (8 CR REQUIRED) .....	10		
8.4. COMPUTER SCIENCE CORE COURSES .....	10		
8.4.1 Lower Division (12 cr required).....	10		

## 1.0. INTRODUCTION

This Curriculum Guide supplements the Institute of Technology Bulletin regarding the Computer Engineering Curricula. It is prepared annually to reflect the department's changing courses and curricula. Students are urged to keep an up-to-date edition on hand and to become familiar with the organization and content of the guide.

### 1.1. Computer Engineering Curricula

This CompE Curriculum Guide reflects the requirements and suggested electives related to the CompE Degree. The actual degree is entitled the Bachelor of Computer Engineering (B.Comp.E.). Section 8 of this guide contains the requirements for the CompE program that applies to those students entering the program Fall 2006 or later, as well as, students entering earlier under semester requirements.

In addition to this Computer Engineering Curriculum Guide, further information about Computer Engineering and the Institute of Technology is contained in

- Institute of Technology Undergraduate Program Information
- Institute of Technology Student Survival Guide and

These are available in hard copy from the IT Student Services Office, 130 Lind Hall. This information is also available on the web.

### 1.2. Further Information

Many other individuals and organizations at the University of Minnesota are available to help you. Foremost is your faculty academic adviser with whom you should have frequent contact. Other offices and individuals are:

ECE Administrative Office: 625-3300 EE/CS 4174

ECE Department Head:  
David Lilja 625-0720 EE/CS 4178D lilja@umn.edu

ECE Associate Department Head:  
William Robbins 626-6722 EE/CS 4178D robbins@umn.edu

ECE Director Undergraduate Studies:  
Larry Kinney 625-4359 EE/CS 6121 kinney@umn.edu

ECE Academic Advisor & Co-op Coordinator:  
Kathleen Propp 625-4327 EE/CS 4178J propp@ece.umn.edu  
Kyle Dukart 624-2285 EE/CS 4174 kdukart@umn.edu

ECE Co-op Committee  
Ted Higma 624-4170 EE/CS 6125 higma001@umn.edu  
Website: <http://www.me.umn.edu/education/coop/about%20co-op.shtml>

ECE Senior Honors Course:  
Ahmed Tewfik 625-6024 EE/CS 6177 tewfik@umn.edu  
David Lilja 625-0720 EE/CS 4178D lilja@umn.edu

ECE Upper Division Latin Honors:  
Larry Kinney 625-4359 EE/CS 6121 kinney@umn.edu

ECE Scholastic Standards:  
Larry Kinney 625-4359 EE/CS 6121 kinney@umn.edu

ECE Graduate Information & Applications:  
Linda Jageron 625-3564 EE/CS 4174C jager001@umn.edu

ECE Director Graduate Studies:  
Keshab Parhi 624-4116 EE/CS 6181 parhi@umn.edu

I.T. Student Services 624-8504 130 Lind Hall

Liberal Ed. Requirements: 624-8504 Lind Hall 130 studentaff@itdean.umn.edu

I.T. Career Services: 624-4090 Lind Hall 50 itcs@tc.umn.edu

I.T. Honors Program:  
Jeanne Anderegg 625-2800 Lind Hall 136 anderegg@umn.edu

Study Abroad - I.T. Student Affairs:  
Adam Pagel 624-8013 107 Lind Hall pagel@tc.umn.edu

Study Abroad - Global Campus:  
626-9000 230 Heller Hall www.UMabroad.umn.edu

Student Financial Aid Office:  
624-1111 200 Fraser Hall helpingu@umn.edu

International Student & Scholar Services:  
626-7100 190 Humphrey Center, West Bank

(The area code for all telephone numbers is 612.)

## 2.0. ADMISSIONS

Initially, all freshmen engineering and science students are admitted to I.T. and not to a specific major. Students are encouraged to designate a major by the end of the first year. Designation of Computer Engineering (CompE) as a proposed major carries no assurance of admission to the Upper Division in CompE. There is no minor available for Computer Engineering.

With the completion of 60 credits, each I.T. student is obliged to make formal application in room 105 Lind Hall for admission to the Upper Division. The requirements for admission to Upper Division in Computer Engineering are:

- I.T Technical Grade-point Average in of 2.3.
- The following courses must be completed:
  - a) Math 2373
  - b) Phys 1302
  - c) CSci 1901
  - d) EE 2001
  - e) At least one of EE 2011, EE 2301/301, EE 2361/361, and CSci 1902

Students in the Coordinate Campus I.T. program at UMD or UMM are considered for Upper Division admission to I.T. under the same criteria as for I.T. students.

Students who apply for transfer from other institutions are generally considered under different criteria for admission when applying directly to Upper Division Computer Engineering.

Upper Division status is required to enroll in third-year EE courses; overrides are not to be anticipated.

Electrical and Computer Engineering Department policy requires the completion of required EE 2XXX-level courses before registration for any 3XXX or 4XXX-level courses required for graduation; waiver of this rule requires written prior approval of the Electrical and Computer Engineering Department Director of Undergraduate Studies.

## 3.0 REGISTRATION AND ADVISING

### 3.1. Entering I.T.

When a student is admitted to I.T., he or she is assigned a faculty adviser from I.T. Student Services. Before each semester's registration, a student must meet with the assigned adviser and receive approval of the intended registration.

Any student who has questions about the CompE program is welcome to contact any ECE Undergraduate Advising Committee Member, the ECE Director of Undergraduate Studies, or the ECE Undergraduate Academic Adviser.

### 3.2. Upper Division CompE

After admission to CompE Upper Division, a student will meet with a member of the Undergraduate Advising Committee. Each upper division student must prepare a One-Year Plan (OYP) of course work in consultation with a Faculty Adviser at least once a year. The OYP lists the courses the student plans to take for the next semester or two; the OYP must be approved by a member of the Undergraduate Advising Committee.

A hold called a "Departmental Stamp (DS)" hold is always in effect on a student's registration. (Holds appear under Service Indicators on transcripts.) The DS hold blocks registration for a particular semester and following semesters. The semester to which a DS hold applies is found under a student's 'Holds' on One Stop. To move the DS hold to a future semester, a student must file an approved OYP plan in the ECE Dept Office that includes the planned courses for that semester and, ideally, the following semester. To file a OYP, a student must schedule an appointment with a member of the Undergraduate Advising Committee with the Receptionist in the ECE Dept Office (4-174 EE/CS Bldg, 625-3300). The signed OYP Plan must be returned to ECE Dept Office to have the DS hold changed. A copy of the OYP can be obtained at this time.

**You are responsible for your student copy of the One-Year Plan. Retain it and have it available when needed.**

### 3.3. Graduation Paperwork

Prepare your One-Year Plan for your senior year, and have it signed by ECE Undergraduate Advising Committee in the usual manner. When you are near the end of the next to last semester before your anticipated graduation, prepare an Application for Degree Form. This form is available on the web ([www.onestop.umn.edu/registrar/Graduating/info.html](http://www.onestop.umn.edu/registrar/Graduating/info.html)). It is an essential step in qualifying for graduation since it will inform the Degree-Clearance Office what must be completed to earn the degree. Please turn in the completed form to the Registrar's Office in 200 Fraser Hal by the designated deadline. See Section 11 for more information.

### 3.4. Class Reservation and Waiting List

To accelerate the organization of classes under high-enrollment conditions and to reduce uncertainty about class size, the following policy will be enforced: **a student registered for an EE or CSci course must attend the first meeting of the class to retain the reservation.** If the first class is not attended, the student's place will be transferred to an attending student on the wait list. The CSE Dept maintains their own Electronic Waitlist, contact them for further information. The University Waitlist web site is on the Registration panel.

Further, any student not enrolled but desiring admission to the class must also attend the first meeting to be considered.

## 4.0. ECE PROGRAMS AND ACTIVITIES

### 4.1. Engineering Co-op Program

#### 4.1.1 General Information

The Department of Electrical and Computer Engineering participates in an Engineering Co-op Education Program for junior and senior level undergraduate students who are either EE or CompE majors. This program allows students to participate in hands-on experience in various companies and government agencies involved in the engineering and technical fields. Both companies and students participating in this program find this a rewarding experience. Many companies have been a part of the Co-op Program for many years because of their positive experiences.

Students are encouraged to apply to the program late in their sophomore year for work experience in their junior and senior years. Upon acceptance into the Co-op Program, students interview with participating companies on a competitive basis. Students are paid at the going salary rate for the position in the company. Employers are expected to assign meaningful engineering tasks to the students, and to arrange for them to experience as many facets of the organization's operations as possible. Students are encouraged to interact with other professionals within the organization and improve their technical and personal communication skills.

#### 4.1.2 Engineering Co-op Program Fall 2006 or Later

Starting Fall 2006 the Electrical and Computer Engineering co-op program combined with the Mechanical Engineering co-op program. The program will operate the same as the ME program except CompE students will register for EE co-op courses rather than ME co-op courses. CompE co-op students receive credits for the three co-op assignments by registering for EE 3041 (2 cr), EE 4043W (4 cr) and EE 4044 (2 cr); these apply to the non-major technical elective category. At least the first two co-op assignments must be completed to receive credit.

See <http://www.me.umn.edu/education/coop/about%20co-op.shtml> for more information about the co-op program.

### 4.2. I.T. Upper Division Honors Program

The Electrical and Computer Engineering Department participates in the I.T. Honors Program. During their Senior Year, qualified students may elect to participate in the Senior Honors Design Courses instead of the Senior Design Project course. This is a two-semester, two-credit per semester design course performed under the direction of a faculty adviser and Professors A. Tewfik and D. Lilja. Advance permission from Professor Tewfik or Lilja is required to register for this sequence.

In addition, a student may graduate with Latin honors (cum laude, magna cum laude, summa cum laude) by obtaining the required grade point average, completing the required honors experiences, and completing an honors thesis. Contact the I.T. Honors Office in 136 Lind Hall, or Professor L. Kinney in Electrical and Computer Engineering for further information.

### 4.3. Study Abroad

There is no such thing as a “local” company or issue anymore. You need the skills that international experience will provide to work effectively in industry, in industry, academia, or the public sector. I.T. students should consider gaining international experience through study abroad.

Regular financial aid and scholarships can be applied to study abroad. And, there are many additional scholarships available. Program fees vary widely, with some costing less than a semester on campus.

If you plan to take **courses in your major**, several universities have been identified where EE courses could be pursued for a semester or an academic year. Most students take courses abroad during either their sophomore or junior years, though there is not one formula for everyone.

You may wish to explore topics outside of the EE major, such as international business, a foreign language, international technology management, or take courses toward a minor or second major outside of I.T.

For example, you can take a summer, semester, or academic year program in Finland, in English, focusing on International Technology Management.

CompE students can study abroad and cover major and **liberal education** requirements. You may be able to complete an **internship** or take **major courses**, take a couple of your **technical electives**, or do **research**. Many programs offer a flexible curriculum. Advance planning will ensure that courses taken during study abroad will fit smoothly into your degree program.

The following universities abroad offer course work in engineering in English unless otherwise noted:

Australia, University of Melbourne  
Australia, University of Sydney  
Canada, University of Calgary  
China, Hong Kong U of Sci and Tech  
England, Cambridge University  
England, Oxford University  
England, University College-London  
England, University of Leeds  
Hungary, Tech U of Budapest  
Ireland, Trinity College - Dublin  
Korea, Pohang University of Science & Technology (POSTECH)

Norway, Norwegian U of Sci and Tech - Trondheim  
Scotland, University of Edinburgh  
Scotland, University of Strathclyde  
Sweden, Chalmers University of Tech, Gothenberg

These are just a few of the options available to you. There are many additional international colleges and universities who offer Study Abroad programs, but not taught in English. For a complete listing of study abroad opportunities, you can speak to Susan Kubitschek in the I.T. Student Affairs Office, attend a Global Campus First Step Meeting, talk with a Global Campus advisor, look at the U of M Study Abroad Catalog, and visit the Global Campus web site.

## 5.0. NON-CompE PROGRAMS

### 5.1. EARNING A CLASS MAJOR OR MINOR

A CompE student may pursue a minor, major, or entire second degree through CLA. A CLA minor or major is noted on the student's official transcript upon graduation. A second degree is also listed on the transcript and the student is awarded an individual diploma. See an adviser in the IT Student Services Office, 130 Lind Hall, for procedures and forms.

A Computer Science minor is also available through CLA. Contact the Computer Engineering & Science Department for information.

### 5.2. EARNING AN IT SECOND MAJOR

A student may earn a degree in a second IT program by completing the course requirements for both CompE and the second program. The student's transcript will show degrees earned for both majors, and the degrees can be earned at the same time or sequentially. A separate "Application for Degree" must be filed for each. A student interested in a second major should submit a petition in the IT Student Services Office, 130 Lind Hall.

### 5.3. CARLSON SCHOOL of MANAGEMENT MINOR

Please contact the Carlson School of Management for information about "The Management Minor for IT Students", 612-624-3313, 2-190 Hanson Hall. The web site for further information is at <http://www.csom.umn.edu/> followed by 'Undergraduate', 'Admissions' and 'Management Minor'. For CompE students obtaining a Management Minor some of the 3xxx level management and marketing courses are accepted in the 6-credit non-major technical elective category in the EE program.

### 5.4. PROFESSIONAL ENGINEERING LICENSE

Engineers who perform engineering that may affect the public health and safety must be licensed by the state in which they work. An engineer who is licensed is a 'Professional Engineer' (P.E.). This licensing is particularly important for those engineers who may serve as consultants, technical witnesses in courts, etc. on matters affecting the public health and safety.

Registration standards are set and governed by a state board established for that purpose. In Minnesota it is the State Board of Architecture, Engineering Land Surveying, Landscape Architecture, Geoscience, & Interior Design, The Golden Rule Building, Ste. 160 • 85 East Seventh Place, St. Paul 55101-2113, (651) 296-2388 • Fax: (651) 297-5310, [http://www.aelslagid.state.mn.us./](http://www.aelslagid.state.mn.us/). Information about registration and the advantages can be obtained from the National Society of Professional Engineers (NSPE) ([www.nspe.org](http://www.nspe.org)).

## 6.0. CURRICULUM AND COURSE RESTRICTIONS

### 6.1. DIRECTED STUDY

Under certain conditions a student may register for a directed-study project (EE 4970). For information about the necessary procedures, request information in the ECE Department Advising Office (EE/CS 4-174).

**No more than three directed study (4970) credits are allowed as Senior Technical Electives.**

### 6.2. GENERAL COLLEGE COURSE POLICY

Students who have taken General College classes should check the complete transfer guide in the IT Student Services Office, 130 Lind Hall.

Generally:

1. Courses with a liberal arts focus transfer to IT.
2. Courses with a technical focus (math, chemistry, physics, and computer science) **do not** transfer to IT.

### 6.3. RESIDENCY REQUIREMENT POLICY

A student earning a bachelor's degree must complete 30 semester credits after admission to I.T. in his or her declared major department.

Transfer credits cannot be used to fulfill credits for the Computer Engineering Senior Technical Program except for non-EE and CompE courses.

### 6.4. COURSES NOT ACCEPTED FOR THE BCompE DEGREE POLICY

1. Technical courses in which a grade below C- has been earned do not transfer to the CompE Program.
2. Credit may be applied only once for courses treating equivalent subject matter.
3. Technical courses from a technology or technician program do not transfer.
4. Physical education courses (beyond 3 credits) may not be applied.
5. Generally, work experience does not satisfy any academic requirements. The only exceptions to this would be for those students that are part of the ECE Coop Program, or students who are allowed to test out of a course by the course instructor.

See also Section 6.2. for General College Course Policy.

### 6.5. TRANSFER CREDIT POLICY

A student who enters with transfer credit from another accredited institution may need to complete additional coursework in order to satisfy minimum credit requirements in mathematics, basic sciences, and/or engineering subjects.

## 6.6. CHANGING DEGREE REQUIREMENTS POLICY

Any changes to the degree requirements need prior written approval by the Director of Undergraduate Studies. Requests for such variances must be submitted by petition. Petitions are filed in the IT Student Services Office, 130 Lind Hall.

Possible approval of such variance requests is enhanced if supported by written statements, e.g., a statement from a CADV Advisor or other ECE Faculty member with knowledge of the specific situation supporting the change.

## 6.7. GRADING POLICIES

### 6.7.1. The "D" grade

1. Starting fall 1999 all courses required of the major, except liberal education courses, must be passed with a grade of C- or better.
2. Concerning technical courses transferred from other colleges, no credit is given for a course with a grade below C-.

### 6.7.2. S-N Grading - ECE Policy

1. All EE courses will be offered for either A-F or S-N grading with the exceptions of EE 1000, EE 3041, 3990, 4043W and 4044 which are offered S/N only.
2. For **CompE majors** the following restrictions will apply to their selection of grading systems, in addition to those restrictions adopted college-wide for all I.T. students.
  - (1) **All EE courses must be taken A-F with the following exceptions: EE 1001, EE 3041, EE 3990, EE 4043W and EE 4044.**
  - (2) **All required technical courses must be taken A-F** except those offered S-N only.

### 6.7.3. The "I" grade

The I grade is used "in accordance with provisions announced in class at the beginning of the semester, when in the instructor's opinion there is a reasonable expectation that the student can complete successfully the missing work of the course. *The I grade is assigned only when a student has completed all but a small portion of the work of a course and has made prior arrangements with the instructor to make up the work.*

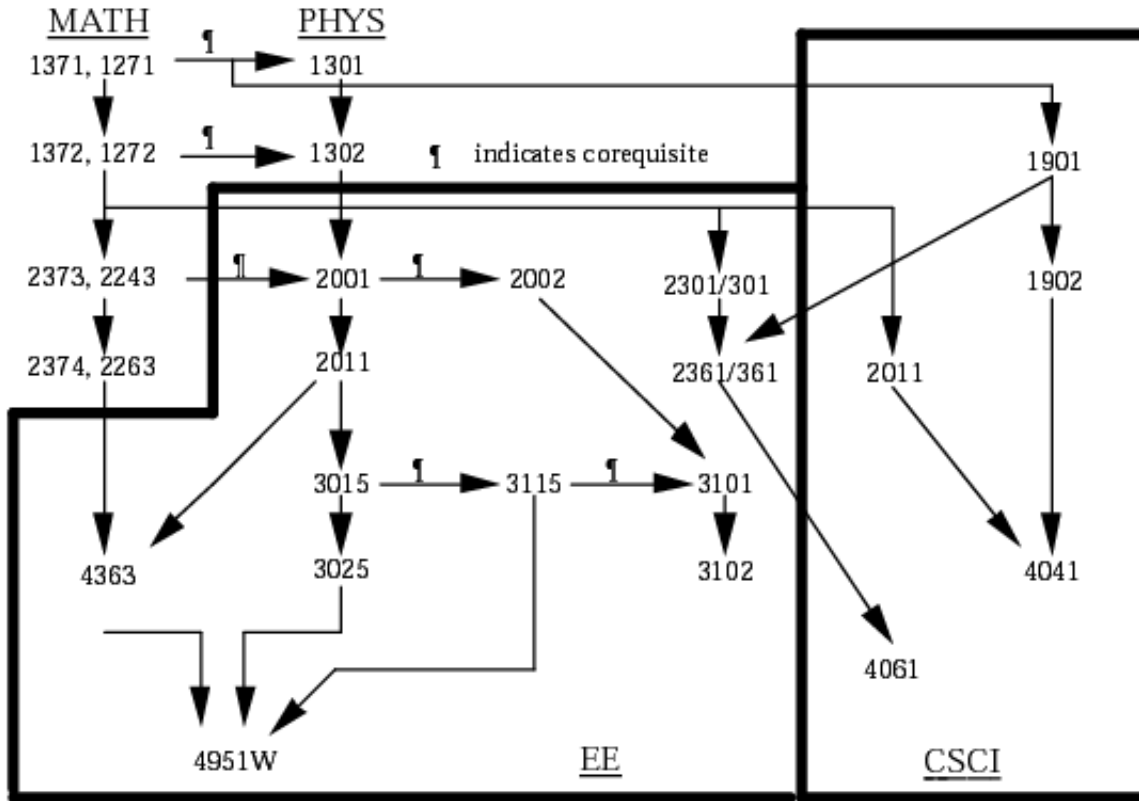
*The I.T. Bulletin states "The instructor assigns an I when, due to extraordinary circumstances, the student was prevented from completing coursework on time. An I requires a written agreement between the instructor and the student specifying the time and manner in which the student will complete the course requirements during the student's next term of enrollment."*

*For undergraduates and non-degree students, work to make up an I must be submitted within 72 hours of the last final examination of the student's next term of enrollment; if not submitted by that time, in the sixth week of the next term the I will automatically change to an F (if A-F registration) or N (if S-N registration)."*

If a student wishes to take an "I" in a course, a written statement co-signed by both faculty instructor and student must be presented to the ECE Undergraduate Advising Office prior to submission of the "I" grade, specifying all details on how & when the "I" will be removed.

## 7. PREREQUISITE FLOW CHART FOR COMPE CORE COURSES

(1st, 2nd, and 3rd years)



Before enrolling in senior-level courses, a student should achieve a certain degree of proficiency and maturity by satisfactory completion of (preferably) all required junior-level courses and laboratories; however, to minimize delay in academic progress, **at most two non-laboratory EE 3XXX-level courses can be postponed and must then be taken the first time offered** while registered for a senior-level course.

## 8.0. CompE DEGREE CURRICULUM REQUIREMENTS

The curriculum in the CompE program leads to a Bachelor of Computer Engineering (B.Comp.E.) degree without a designated emphasis on the diploma. The curriculum requires a minimum of 128 semester credits (126 for students entering prior to Fall 2006).

### 8.1. Liberal Education (including all required Writing Practice)

#### Approximately 23 cr required

The liberal education requirements are detailed on the web page  
[http://www1.umn.edu/tc/students/registrar/liberal\\_ed\\_req.html](http://www1.umn.edu/tc/students/registrar/liberal_ed_req.html)

Students are required to take four 'writing intensive' WI courses two, of which, must be upper division courses, and one of the latter must be in the major. The course number for these courses has a suffix of W. EE courses satisfying this requirement are EE 1701W, EE 4043W, EE 4389W, EE 4951W, EE 4982V and EE 5657W; CSci courses satisfying this requirement are CSci 4970W and CSci 5512W.

### 8.2. Mathematics (16 cr required)

Math 1371-1372 (8 cr)	IT Calculus I-II
Math 2373 (4 cr)	IT Linear Algebra & Differential Equations
Math 2374 (4 cr)	IT Multivariable Calculus & Vector Analysis

#### OR

Math 1571-1572H	Honors Calculus I-II
Math 2573H	Honors Calculus III
Math 2574H or 3574H	Honors Mathematics IV

### 8.3. Physics (8 cr required)

Phys 1301W-1302W (8 cr) Introductory Physics I-II

### 8.4. Computer Science Core Courses

#### 8.4.1 Lower Division (12 cr required)

CSci 1901-1902 (8 cr)	Structure of Comp Programming I-II
CSci 2011 (4 cr)	Discrete Structures of CSci

#### 8.4.2 Upper Division (8 cr required)

CSci 4041 (4 cr)	Algorithms & Data Structures
CSci 4061 (4 cr)	Intro to Operating Systems (Completion of EE 2301/301 & EE 2361/361 satisfies Csci 2021 prerequisite.)

### 8.5. Electrical Engineering Core Courses

#### 8.5.1 Lower Division (15 cr required)

EE 2301/301 (4 cr)	Into Digital System Design/Discussion
EE 2361/361 (4 cr)	Intro to Microcontrollers/ Discussion
EE 2001 (3 cr)	Intro Electronic & Electrical Circuits
EE 2002 (1 cr)	Intro Circuits & Electronics Lab

EE 2011 (3 cr)	Linear Systems & Circuits
----------------	---------------------------

#### 8.5.2 Upper Division (18 cr required)

EE 3115 (4 cr)	Analog & Digital Electronics
EE 3015 (3 cr)	Signals & Systems
EE 3025 (3 cr)	Statistical Methods
EE 3101-3102 (4 cr)	Circuits & Electronics Lab I-II
EE 4363/CSci 4203 (4 cr)	Computer Architecture

### 8.6. CompE Technical Program (28 cr required) (26 for students entering prior to Fall 2006)

#### 8.6.1 CompE Senior Technical Electives (22 cr minimum required) (20 for students entering prior to Fall 2006)

##### 1) One of the following projects courses:

EE 4951W (4 cr)	Senior Design Project (1 Lab) <b>OR</b>
EE 4981H-4982V (4 cr)	Senior Honors Project (2 Labs)

##### 2) At least one of the following design courses:

EE 4301 (4 cr)	Digital Design w/Programmable Logic (1 Lab)
EE 4341 (4 cr)	Microprocessor & Microcontroller Sys. Design (1 Lab)

##### 3) 4xxx or 5xxx EE or CSci Courses that, in combination with above, total at least 22 semester credits (20 for students entering prior to Fall 2006), and obtain three EE 4xxx or 5xxx level courses which contain a laboratory component. EE 4041, 4043W and 4044 do not count as part of the 22 credits listed above (Section 8.6.1.), but will count as part of the 6 credits below (Section 8.6.2.).

#### 8.6.2. Additional Electives (0-6 credits):

If needed, select from the approved list of courses below so that, in combination with 8.6.1 above, the total number of credits is obtained. **When courses are listed in pairs, both must be taken to receive credit as technical electives. Availability of courses may depend upon prerequisites; some that require prerequisites are marked below.**

AEM 2021 (4 cr)	Statics & Dynamics
AEM 2011 & 2012 (6 cr)	Statics; Dynamics
AEM 2011 & 3031 (6 cr)	Statics; Deformable Body Mechanics
AEM 4601 (3 cr)	Instrumentation Laboratory (Prereq: Csci 1113, EE 3005, EE 3006)

BBE 3013 (3 cr)	Engr. Principles of Molecular & Cellular Processes
-----------------	--

BioC 3021 (3 cr)	Biochemistry
------------------	--------------

**BLaw 3058 (4 cr)	The Law of Contracts and Agency
**BLaw 5078 (2 cr)	Partnerships and Corporations
**BLaw 5088 (2 cr)	Law of Personal Property, Real Property, & Commercial Paper

\*\*Students not in Carlson School of Mgmt (CSOM) can only register after Registration Queue Period, & then only by obtaining permission from Undergraduate Office of CSOM.

BME 5401 (3 cr)	Adv Functional Biomedical Imaging
CE 3502 (4 cr) CE 4101W (3 cr)	Fluid Mechanics (prereq: AEM 2012 or AEM 3031) Project Management
Chem 2301 (3 cr) Chem 2302 (3 cr) Chem 2311 (4 cr) Chem 3501 (3 cr) Chem 3502 (3 cr)	Organic Chemistry I Organic Chemistry II Organic Chemistry Lab Intro to Thermodynamics, Kinetics, Statistical Mechanics Intro to Quantum Mechanics and Spectroscopy
EE 3041 & 4043W (6 cr) EE 4044 (2 cr)	Industrial Assignment I & II - Co-op Students only Industrial Assignment III - Co-op Students only
IE 5441 (4 cr) IE 5511 (4 cr) IE 5512 (4 cr) IE 5513 (4 cr) IT 5522 (4 cr) IE 5531 (4 cr) IE 5541 (4 cr) IE 5551 (4 cr) IE 5552 (4 cr) IE 5553 (4 cr)	Engineering Cost Accounting, Analysis, & Control Human Factors & Work Analysis Applied Ergonomics (requires IE 5511) Engineering Safety Quality Engineering & Reliability Engineering Optimization Project Management Production Planning & Inventory Control Design & Analysis of Manufacturing Systems Simulation
MatS 3011 (3 cr) MatS 3012 (4 cr) MatS 3851W (2 cr) MatS 4013 (3 cr)	Intro to Materials Science and Engineering Metals and Alloys Materials Properties Lab (prereq MatS 3011) Elect. & Mag Properties of Materials
Math 3283W Math 4XXX Math 5XXX	Sets, Series and Sequences Any 4000-level Mathematics Course Any 5000-level Mathematics Course
ME 3324 (4 cr)	Intro to Thermal Science
Phsl 3061 (4 cr)	Principles of Physiology
Phys 2303 (4 cr) Physics 2403H (4 cr) Phys 2503 (4 cr) Phys 2601 (4 cr) Phys 2605 (3 cr) Phys 4101 (4 cr) Phys 4201 (3 cr)	Physics of Matter (formerly Physics III) <b>OR</b> Honors Physics III Foundations of Mod Phys Quantum Physics Quantum Physics Laboratory Quantum Mechanics Statistical and Thermal Physics

Stat 5041 (3 cr)	Bayesian Decision Making (prereq: STAT 4101 <b>OR</b> 5021 or 5101)
Stat 5101 (4 cr)	Theory of Statistics I
Stat 5102 (4 cr)	Theory of Statistics II

Students obtaining a Management Minor may use the following courses as technical electives:

Acct 3001 (3 cr)	Intro Managerial Accounting
Fina 3001 (3 cr)	Finance Fundamentals
Mgmt 3001 (3 cr)	Principles of Management
Mktg 3001 (3 cr)	Principles of Marketing

### 8.7. CompE Senior Technical Program

The courses offered in satisfaction of the CompE Technical Program (except for non-EE and non-CSci courses in Section 8.6.2.) must be completed at the University of Minnesota while officially enrolled in I.T. as a CompE major.

### 8.8. Further Notes

Every student should be aware that degree requirements must be referred to the date of graduation rather than to the date of entry into the program. When a student's program is prolonged well beyond the nominal 4-year duration, degree requirements and even course content can change considerably, and the student must be prepared to take additional coursework as necessary to satisfy the new requirements.

## 9.0. SEMESTER SCHEDULES

### 9.1. CompE Degree Program

#### STANDARD SEMESTER-BASED COMPUTER ENGINEERING PROGRAM

First Year	Title	Credits Fall	Credits Spring
EngC 1011	Univ. Writing & Critical Reading	4	--
Math 1371	IT Calculus I	4	--
Math 1372	IT Calculus II	--	4
Phys 1301	Introductory Physics I	4	--
Phys 1302	Introductory Physics II	--	4
CSci 1901	Structure of Computer Programming I	--	4
Liberal Ed		4	--
Biol. Sci.	Biol. Sci. w/ lab (CLE Elective)	--	4
		16	16

**Total Credits (32)**

Second Year	Title	Credits Fall	Credits Spring
Math 2373	IT Lin Alg & Diff. Eq	4	--
Math 2374	IT Multivariable Calculus & Vector Analysis	--	4
CSci 1902	Structure of Computer Programming II	4	--
CSci 2011	Discrete Structures of CSci	--	4
EE 2301/301	Intro. Digital System Design	4 (lab)	--
EE 2361/361	Introduction to Microcontrollers	--	4 (lab)
EE 2001	Intro. Electronic & Electrical Circuits	3	--
EE 2002	Intro. Circuits & Electronics Lab	1	--
EE 2011	Linear Systems & Circuits	--	3
		16	15

**Total Credits (31)**

Third Year	Title	Credits Fall	Credits Spring
EE 3115	Analog & Digital Electronics	4	--
CSci 4041	Algorithms & Data Structures	--	4
EE 3015	Signals & Systems/	3	--
EE 3025	Statistical Methods	--	3
EE 3101	Circuits & Electronics Lab. I	2	--
EE 3102	Circuits & Electronics Lab. II	--	2
EE4363/CSci 4203	Computer Architecture	--	4
*Technical Elective	Technical Elective	3	--
Lib. Ed	Liberal Education	4	4
		16	17

**Total Credits (33)**

Fourth Year	Title	Credits Fall	Credits Spring
EE 4951W	Senior Design Project	--	4
CSci 4061	Intro to Operating Systems	4	--
*Technical Elective	Technical Electives	12	9
Lib. Ed.	Liberal Education Electives	--	3
		16	16

**Total Credits (32)**

**Total Credits: 128**

**\*See Section 8.6.**

## 9.2. CompE Engineering Co-op Program Schedule

A student enters the co-op program after the second year; consequently, the first two years are the same as for a non-co-op student. The third and fourth years vary depending on whether the work assignment is Fall, Spring or Summer. Example schedules for a Fall and a Spring assignment are shown below. Note that these example schedules do not include a third co-op assignment nor do they include Summer courses; if Summer courses are taken, the program can be shortened by at least a semester.

### Fall Co-op Work Assignment

Third Year	Title	Credits Fall	Credits Spring
EE 3115	Analog & Digital Electronics	--	4
EE 3015	Signals & Systems	--	3
EE 3101	Circuits & Electronics Lab. I	--	2
*EE 3041	Industrial Assignment I	2	--
*Technical Elective	Technical Elective	--	3
Lib. Ed	Liberal Education	--	4
		2	16

**Total Credits (18)**

Fourth Year	Title	Credits Fall	Credits Spring
CSci 4041	Algorithms & Data Structures	--	4
EE 3025	Statistical Methods	--	3
EE 3102	Circuits & Electronics Lab. II	--	2
EE4363/CSci 4203	Computer Architecture	--	4
*EE 4043W	Industrial Assignment II	4	--
Lib. Ed	Liberal Education	--	4
		4	17

**Total Credits (21)**

Fifth Year	Title	Credits Fall	Credits Spring
EE 4951W	Senior Design Project	--	4
CSci 4061	Intro to Operating Systems	4	--
*Technical Elective	Technical Electives	12	3
Lib. Ed.	Liberal Education Electives	--	3
		16	10

**Total Credits (26)**

**Total Credits: 128**

### Spring Co-op Work Assignment

Third Year	Title	Credits Fall	Credits Spring
EE 3115	Analog & Digital Electronics	4	--
EE 3015	Signals & Systems	3	--
EE 3101	Circuits & Electronics Lab. I	2	--
*EE 3041	Industrial Assignment I	--	2
*Technical Elective	Technical Elective	3	--
Lib. Ed	Liberal Education	4	--
		16	2

**Total Credits (18)**

Fourth Year	Title	Credits Fall	Credits Spring
CSci 4041	Algorithms & Data Structures	4	--
EE 3025	Statistical Methods	3	--
EE 3102	Circuits & Electronics Lab. II	2	--
EE4363/CSci 4203	Computer Architecture	4	--
*EE 4043W	Industrial Assignment II	--	4
Lib. Ed	Liberal Education	4	--
		17	4

**Total Credits (21)**

Fifth Year	Title	Credits Fall	Credits Spring
EE 4951W	Senior Design Project	--	4
CSci 4061	Intro to Operating Systems	4	--
*Technical Elective	Technical Electives	12	3
Lib. Ed.	Liberal Education Electives	--	3
		16	10

**Total Credits (26)**

**Total Credits: 128**

\* If both EE 3961 and 4961 are completed, then they count as 3 credits within the senior technical elective requirements.

## 10.0. NEW OR CHANGED COURSES

EE 4951W is changed from 2 credits to 4 credits starting Spring 2007. EE 4389W Introduction to Empirical Inference and Soft Computing was added Spring 2007. EE 5607 Wireless Hardware System Design was converted to EE 4607 starting Spring 2009. EE 5181 Introduction to Nanotechnology was added for Fall 2007.

## 11.0. APPLICATION FOR DEGREE

### 11.1. General

A student's eligibility for graduation will be evaluated from the student's APAS report (APAR-Academic Progress Audit Report).

The APAR is available at [www.onestop.umn.edu/registrar/transcripts/index.html](http://www.onestop.umn.edu/registrar/transcripts/index.html).

Students should obtain a copy of their APAR on a regular basis (at least twice a year) and monitor their progress against the program they are completing. The APAR divides the requirements for graduation into the various categories of required and elective courses. The particular categories and requirements depend upon the student's program of study. Within Computer Engineering, a student may be in the Coop Program or I.T. Honors or both. If your APAR does not correspond to your desired program of study, contact the ECE Advising Office to request a change or clarification of your status.

Students, who have transferred courses to the University of Minnesota that satisfy requirements, need to check their APAR to verify that these courses have been assigned to the proper category of program requirements. If a transfer course is not listed in the proper category, then that course is not satisfying required credits in that category. If your transfer credits do not appear to be listed as satisfying a requirement as you expected, contact the ECE Advising Office to request a review of your APAR record.

For the B.Comp.E. degree to be granted officially, all following requirements must be satisfied:

1. Curriculum requirements
  - a. Specific course requirements of the Lower and Upper Division.
  - b. Total credit requirement (with applicable courses and credits).
2. Grade average requirements
  - a. G.P.A. minimum of 2.0 for all applicable University of Minnesota courses.
  - b. G.P.A. of 2.0 in all EE and CSci courses completed at the University of Minnesota.
  - c. All required courses must be passed with a minimum grade of C-. Otherwise the course must be repeated.

## 11.2. Application for Degree

When a student registers for his or her last semester of courses, he or she must file The Application for Degree (Form OTR179). You must download this form off the web (<http://www.onestop.umn.edu/onestop/graduating.html>). This form must be submitted on time to avoid a semester's delay in the official granting of the degree. The absolute deadlines for submission of the Application for Degree for 2007-08 are given in the table below:

<u>SEMESTER</u>	<u>DEADLINE</u>
Summer Session 2008	06/10/2008
Fall 2008	09/16/2008
Spring 2009	02/03/2009
May Term 2009	03/26/2009
Summer Session 2009	06/09/2009

I.T. has only one graduation ceremony per year, held at the end of Spring Semester (May).

## 11.3. Graduation Clearance

After registration is completed for the FINAL semester of course work, The Registrar's Office will send a notice listing any course or credit deficiencies that may exist. Of course, these deficiencies must be removed before a student can be graduated. If any of these listed deficiencies appear to be in error, contact the ECE Advising Office. In addition, all courses marked as IP ("In-Progress") must be successfully completed before the student is eligible for graduation. **(NOTE: If a student's APAS shows a course as "In-Progress" that satisfies some of the credit requirements for an APAS category and that course is not successfully completed, then graduation will not be permitted even though enough additional courses were completed to satisfy that category or requirement.** If this situation occurs, the student must request the ECE Advising Office to remove the course from the APAR requirement category. **(It will not happen automatically.)**

## 11.4. Curriculum Requirements

1. For specific course requirements and approved substitutions, see current CompE Curriculum Guide, Section 8.
2. Inapplicable Courses  
Some courses offered at the University of Minnesota or transferred from another college or university may not apply to the BCompE degree even as electives. Such courses may be useful and interesting - even necessary, but are considered supplemental to and not part of the engineering degree program. See Section 6.4. for courses not accepted for the BCompE degree. See Section 6.2. for policy regarding General College courses.