

COMPUTER ENGINEERING

CURRICULUM GUIDE

**UNIVERSITY OF MINNESOTA
2004 - 2005**

December 1, 2004

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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 1999 or later and to any transition students who have been switched to the semester requirements.

A student may specialize somewhat by the selection of technical electives, primarily Senior Technical Electives. Suggested courses for various options are available in a separate packet entitled "CompE Senior Focus Area Guide".

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

- Institute of Technology Undergraduate Program Information
- Institute of Technology Student Survival Guide and
- CompE Senior Focus Area Guide

The first two are available in hard copy from the IT Student Affairs Office, 105 Lind Hall, and the last from the ECE Department Office. 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 612-625-3300 EE/CSci 4174

ECE Director Undergraduate 612-
Studies: Larry Kinney 624-9803 EE/CSci 4178C kinney@ece.umn.edu

ECE Academic Advisor &
Co-op Coordinator: 612-
Kathleen Propp 625-4327 EE/CSci 4174D propp@ece.umn.edu

ECE Co-op Committee 612-
Chair: James Holte 625- EE/CSci 4 holte@ece.umn.edu

ECE Honors Program: 612-
Mostafa Kaveh 625-0720 EE/CSci 4178D kaveh@ece.umn.edu

ECE Scholastic Standards: 612-
Emad Ebbini 625-1852 EE/CSci 6163 emad@ece.umn.edu

ECE Pre-Medicine Adviser: 612-
James Holte 625-0811 EE/CSci 4163 holte@ece.umn.edu

EE & CompE
Graduate Applications: 612-
Linda Jagerson 625-3564 EE/CSci 4174C grad_studies@ece.umn.edu

EE & CompE
Graduate Information: 612-
Linda Jagerson 625-3564 EE/CSci 4174C jagerson@ece.umn.edu

EE Director
Graduate Studies: 612-
Bruce Wollenberg 624-8875 EE/CSci 4174B wollenbe@ece.umn.edu

CompE Director
Graduate Studies: 612-
Gerald Sobelman 625-8041 EE/CSci 4157 sobelman@ece.umn.edu

I.T. Admissions Director: 612-
Benjamin Sharpe 624-8504 Lind Hall 105 studentaff@itdean.umn.edu

I.T. Lower
Division Advising 612-
624-2890 Lind Hall 128

Liberal Ed.
Requirements: 612-
624-8504 Lind Hall 105 studentaff@itdean.umn.edu

I.T. Career Services 612-624-4090 Lind Hall 50 itcs@tc.umn.edu

I.T. Honors Program 612-
Pamela Drake 625-2800 Lind Hall 136 drake004@umn.edu

Study Abroad - I.T. Student Affairs 107 Lind Hall kubit001@tc.umn.edu
Susan Kubitschek 612-624-8010

Student Financial 612-
Aid Office 624-1111 200 Fraser Hall helpingu@umn.edu

International Student & 612-
Scholar Services 626-7100 190 Humphrey Center, West Bank

Study Abroad - Global Campus 230 Heller Hall www.Umabroad.umn.edu
612-626-9000

2.0. ADMISSIONS

Initially, all engineering and science students are admitted to the I.T. Lower Division Program. While in Lower Division, students are encouraged to designate a major by the end of the first year.

Designation of Computer Engineering (CompE) as a proposed major in the Lower Division 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 in the Lower Division, 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:

- Grade-point Average in I.T. of 2.5.
- The following courses must be completed:
 - a) Three semesters of calculus
 - b) Two semesters of physics
 - c) CSci 1901 (with at least a C grade)
 - d) EE 2001 (with at least a C grade)
 - 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. Lower Division

While a student is in I.T. Lower Division, he or she is assigned a faculty adviser and peer advisers from the I.T. Lower Division Program. Before each semester's registration, a student must meet with the assigned adviser and receive approval of the intended registration.

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

3.2. Upper Division CompE

After admission to EE Upper Division, a student will meet with a member of the ECE Undergraduate Advising Committee (CADV). Each upper division student must prepare a One-Year Plan (OYP) of course work in consultation with a member of the ECE Faculty Advising Committee (CADV). The plan for the next academic year must be prepared, approved, and filed in the ECE Department Office before early Fall registration begins in mid-April. **There will be a computer hold blocking your registration for each Fall Semester called "Departmental Stamp" until you have submitted your approved One-Year Plan.** Schedule an appointment with the Receptionist in the ECE Dept Office, 4-174 EE/CSci Bldg. Bring your signed OYP Plan to the ECE Administrative Office to have the hold changed, allowing you to register.

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

NOTE: Anytime you meet with a CADV Member, bring a copy of your current approved One-Year Plan, and

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 CADV Faculty Advisor 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 in the ECE Dept Office, 4-178 EE/CSci Bldg. or can be obtained off the web (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.

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 waiting list. The CSci Dept maintains an 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. Co-op Program List

4.1.1 General Information

The Department of Electrical and Computer Engineering offers a Co-op Education Program for junior and senior level undergraduate students in both 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. The program alternates full-time work assignments of approximately six months duration with a semester of full-time coursework. The work assignments either combine spring semester with summer or combine summer with fall semester. A written technical report is required at the end of each work assignment, and students receive one and two academic credits for each work assignment written report. 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 Entering Co-op Program Fall 2004

Note: Admission to this program is limited to students who have successfully completed all non-EE course requirements of the CompE Lower Division plus EE 2002, 2001, and either EE 2011 or 2301/301 and have been admitted to the CompE Upper Division for Fall Semester 2004.

EE 3961 and 4961 may be applied to the degree requirements as non-CompE technical electives (see the section on degree requirements below), provided both are taken.

With prior written approval of the Director of Undergraduate Studies, a third work assignment may be added and two additional credits obtained through EE 4962.

4.2. I.T. Honors Program List

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 Course. This is a two-semester, two-credit per semester design course performed under the direction of a faculty adviser and Professor M. Kaveh. Advance permission from Professor Kaveh is required to register for this sequence.

In addition, a student may be graduated with honors (cum laude, magna cum laude, summa cum laude) by obtaining the required grade point average, honors experiences, and thesis requirements. Contact the I.T. Honors Office in 136 Lind Hall, or Professor J. Holte 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 ECE, 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 is awarded an individual diploma. See an adviser in the IT Student Affairs Office, 105 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 received 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 Affairs Office, 105 Lind Hall.

5.3. COMBINED IT / CARLSON SCHOOL of MANAGEMENT DEGREE

For information please contact the Carlson School of Management for information about "The Management Minor for IT Students", 612-624-3313. The web site for further information is at <http://www.csom.umn.edu/Page546.aspx>

5.4. PROFESSIONAL ENGINEERING LICENSE

Engineers who perform engineering that may affect the public health and safety are required to 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/>). Information about registration and the advantages can be obtained from the National Society of Professional Engineers (NSPE) (www.nspe.org).

6.0. CURRICULUM AND COURSE RESTRICTIONS

6.1. DIRECTED STUDY; EXTRA CREDIT REGISTRATION

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

No more than 3 co-op or directed study (4970) credits are allowed as Senior Technical Electives.

6.2. GENERAL COLLEGE COURSE POLICY

Students who have taken or plan to take General College classes should check the complete transfer guide in the IT Student Affairs Office, 105 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 are not allowed in fulfilling the Computer Engineering Senior Technical Program.

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. See also Section 6.2. for General College Course Policy.
6. 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.

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 require 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 Affairs Office, 105 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. 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 3961, 4961, 4962, 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 adopted college-wide for all I.T. students.
 - (1) **All EE courses must be taken A-F with the following exception: EE 1001, 3961, 4961, 4962.**
 - (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.*

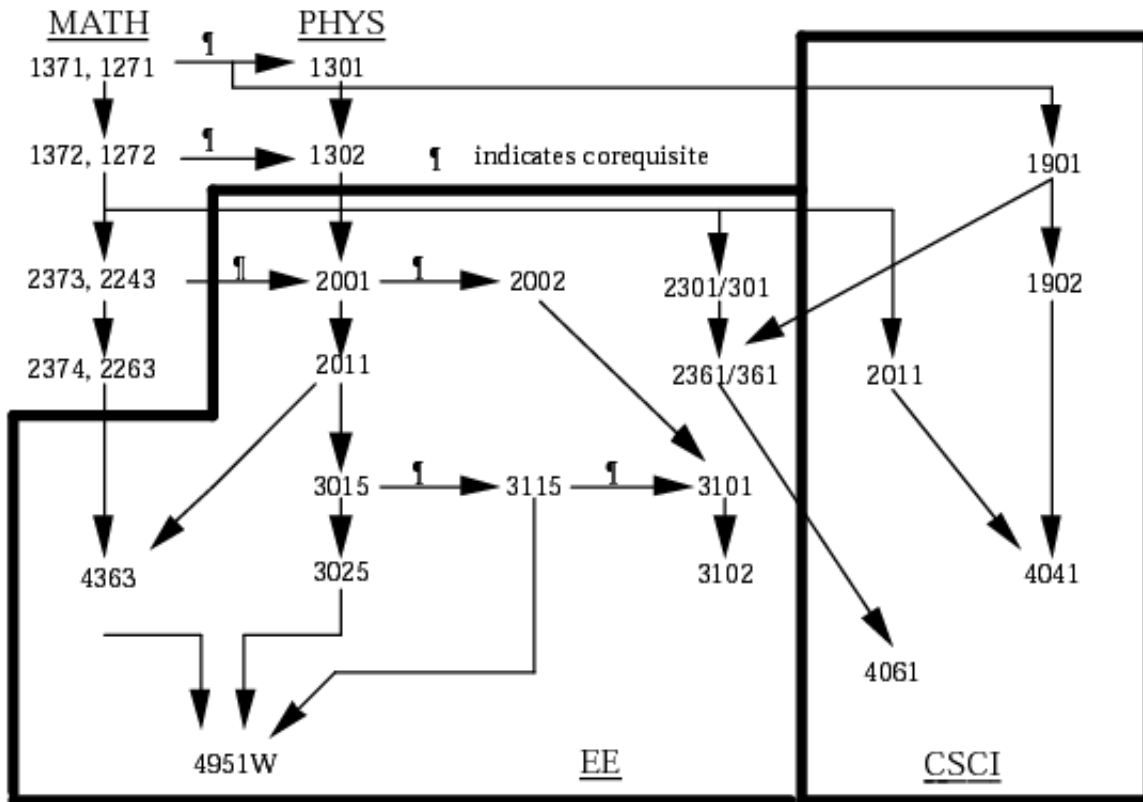
The I.T. Bulletin states "The instructor assigns an I when, due to extraordinary circumstances, the student was prevented from completing coursework on time. An I requires a written agreement between the instructor and the student specifying the time and manner in which the student will complete the 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)



8.0. CompE SEMESTER SYSTEM 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 126 semester credits.**

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

The “Upper Division Technical Writing Requirement” is that each student must take at least four courses that contain a “significant writing component”, one of which must be in the major department. These courses are designated as ‘writing intensive’ (WI). EE courses satisfying this requirement are EE 1701W, EE 4951W, and EE 4982V, EE 5657W; CSci courses satisfying this requirement are CSci 2101W, CSci 4081W, 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
<u>OR</u>	
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 **Required 12 cr**

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

8.4.2 Upper Division **Required 8 cr**

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 **Required 15 cr**

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

EE 3115 (4 cr)
EE 3015 (3 cr)
EE 3025 (3 cr)
EE 3101-3102 (4 cr)
EE 4363 (4 cr)

Required 18 cr

Analog & Digital Electronics
Signals & Systems
Statistical Methods
Circuits & Electronics Lab I-II
Computer Architecture

8.6. CompE Technical Program **Required 26 semester semester cr**

8.6.1 CompE Senior Technical Electives (20 cr minimum required)

1) One of the following projects courses:

EE 4951W (2 cr) Senior Design Project (1 Lab) **OR**
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 System Design (1 Lab)

3) 4xxx or 5xxx EE or CSci Courses that, in combination with above, total at least 20 semester credits, and obtain three EE 4xxx or 5xxx level courses which contain a laboratory component.

8.6.2. Additional Electives (0-6 credits from the following list):

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 at least 26. **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)
BAE 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.

CE 3501 (3 cr)	Environmental Engineering
CE 3502 (4 cr)	Fluid Mechanics (prereq: AEM 2012 or AEM 3031, MATH 2373, or IT or F or P major)
CE 4101W (3 cr)	Project Management
CE 4111 (3 cr)	Engineering Systems Analysis
Chem 2301 (3 cr)	Organic Chemistry I
Chem 2302 (3 cr)	Organic Chemistry II
Chem 2311 (4 cr)	Organic Chemistry Lab (cr change from 3 cr to 4 cr as of Spring 2001)
Chem 3501 (3 cr)	Physical Chemistry I
Chem 3502 (3 cr)	Physical Chemistry II
EE 3961 & 4961 (3 cr)	Industrial Assignment I & II / Co-op Students only
EE 3165 (3 cr)	Intro to Microelectronic Devices with Applications
IE 5441 (4 cr)	Engineering Cost Accounting, Analysis, & Control
IE 5511 (4 cr)	Human Factors & Work Analysis
IE 5512 (4 cr)	Applied Ergonomics (requires IE 5511)
IE 5513 (4 cr)	Engineering Safety
IT 5522 (4 cr)	Quality Engineering & Reliability
IE 5531 (4 cr)	Engineering Optimization
IE 5541 (4 cr)	Project Management
IE 5551 (4 cr)	Production Planning & Inventory Control
IE 5552 (4 cr)	Design & Analysis of Manufacturing Systems
IE 5553 (4 cr)	Simulation of Manufacturing Systems
MatS 3011 (3 cr)	Intro to Materials Science and Engineering
MatS 3012 (4 cr)	Metals and Alloys
MatS 4013 (3 cr)	Elect. & Mag Properties of Materials
Math 4XXX	Any 4000-level Mathematics Course
Math 5XXX	Any 5000-level Mathematics Course
ME 3321 (4 cr)	Thermodynamics
ME 3324 (4 cr)	Intro to Thermal Science
PhsI 3051 (4 cr)	Human Physiology
PhsI 3061 (4 cr)	Principles of Physiology
Phys 2303 (4 cr)	Physics of Matter (formerly Physics III) OR
Physics 2403H (4 cr)	Honors Physics III
Phys 2601 (4 cr)	Quantum Physics
Phys 2605 (3 cr)	Quantum Physics Laboratory
Phys 4101 (4 cr)	Quantum Mechanics
Phys 4201 (3 cr)	Statistical and Thermal Physics
Stat 5041 (3 cr)	Bayesian Decision Making (prereq: STAT 4101 OR 5021 or 5101)
Stat 5101 (4 cr)	Theory of Statistics I
Stat 5102 (4 cr)	Theory of Statistics II

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 Requirements		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
EE 4363	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	--	2
CSci 4061	Intro to Operating Systems	4	--
*Technical Elective	Technical Electives	12	10
Lib. Ed.	Liberal Education Electives	--	3
		16	15

Total Credits (31)

Total Credits: 126

***See Section 8.6. in the CompE Curriculum Guide**

Spring-Summer Co-op Work Assignment

9.2. ComPE Coop Program

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 Summer-Fall or Spring-Summer. These two cases are shown below.

Summer-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 3961	Industrial Assignment I	1	--
*Technical Elective	Technical Elective	--	4
Lib. Ed	Liberal Education	--	3
		1	16

Total Credits (17)

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
EE 4363	Computer Architecture	--	4
*EE 4961	Industrial Assignment II	2	--
Lib. Ed	Liberal Education	--	4
		2	17

Total Credits (19)

Fifth Year	Title	Credits Fall	Credits Spring
EE 4951W	Senior Design Project	--	2
CSci 4061	Intro to Operating Systems	4	--
*Technical Elective	Technical Electives	12	10
Lib. Ed.	Liberal Education Electives	--	3
		16	15

Total Credits (31)

Total Credits: 126

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 3961	Industrial Assignment I	--	1
*Technical Elective	Technical Elective	4	--
Lib. Ed	Liberal Education	3	- ? -
		16	1

Total Credits (17)

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	--
EE 4363	Computer Architecture	4	--
*EE 4961	Industrial Assignment II	--	2
Lib. Ed	Liberal Education	4	- ? -
		17	2

Total Credits (19)

Fifth Year	Title	Credits Fall	Credits Spring
EE 4951W	Senior Design Project	--	2
CSci 4061	Intro to Operating Systems	4	--
*Technical Elective	Technical Electives	12	10
Lib. Ed.	Liberal Education Electives	--	3
		16	15

Total Credits (31)

Total Credits: 126

* 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 4363 Computer Architecture and Machine Organization

11.0. APPLICATION FOR DEGREE

11.1. General

Students graduating after December 1996 will no longer use the Graduation Check Sheet or the ECE Department Graduation Check List. Instead, a student's eligibility for graduation will be evaluated from the student's APAS/APAR (Academic Progress Audit Report).

The APAS/APAR is available at
www.onestop.umn.edu/registrar/transcripts/index.html.

Students should obtain a copy of their APAS on a regular basis (at least twice a year) and monitor their progress against the program they are completing. The APAS 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 APAS 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 APAS 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 APAS 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.
 - 3) G.P.A. of 2.0 in all 3- and 4-level EE courses completed at the University of Minnesota.
 - 4) 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 may download this form off the web (www.onestop.umn.edu/registrar/Graduating/info.html), or pick up a hard copy in the ECE Department Office. 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 2003-04 are given in the table below:

<u>SEMESTER</u>	<u>DEADLINE</u>
Summer Session 2004	6/30/2004
Fall 2004	09/20/2004
Spring 2005	01/31/2005
May Term 2005	approx. 3/15/2005
Summer Session 2005	approx. 6/20/2005

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.

12.0. ONE-YEAR PLAN

The next two pages contain a chart suitable for listing courses already taken and those planned for future semesters.

