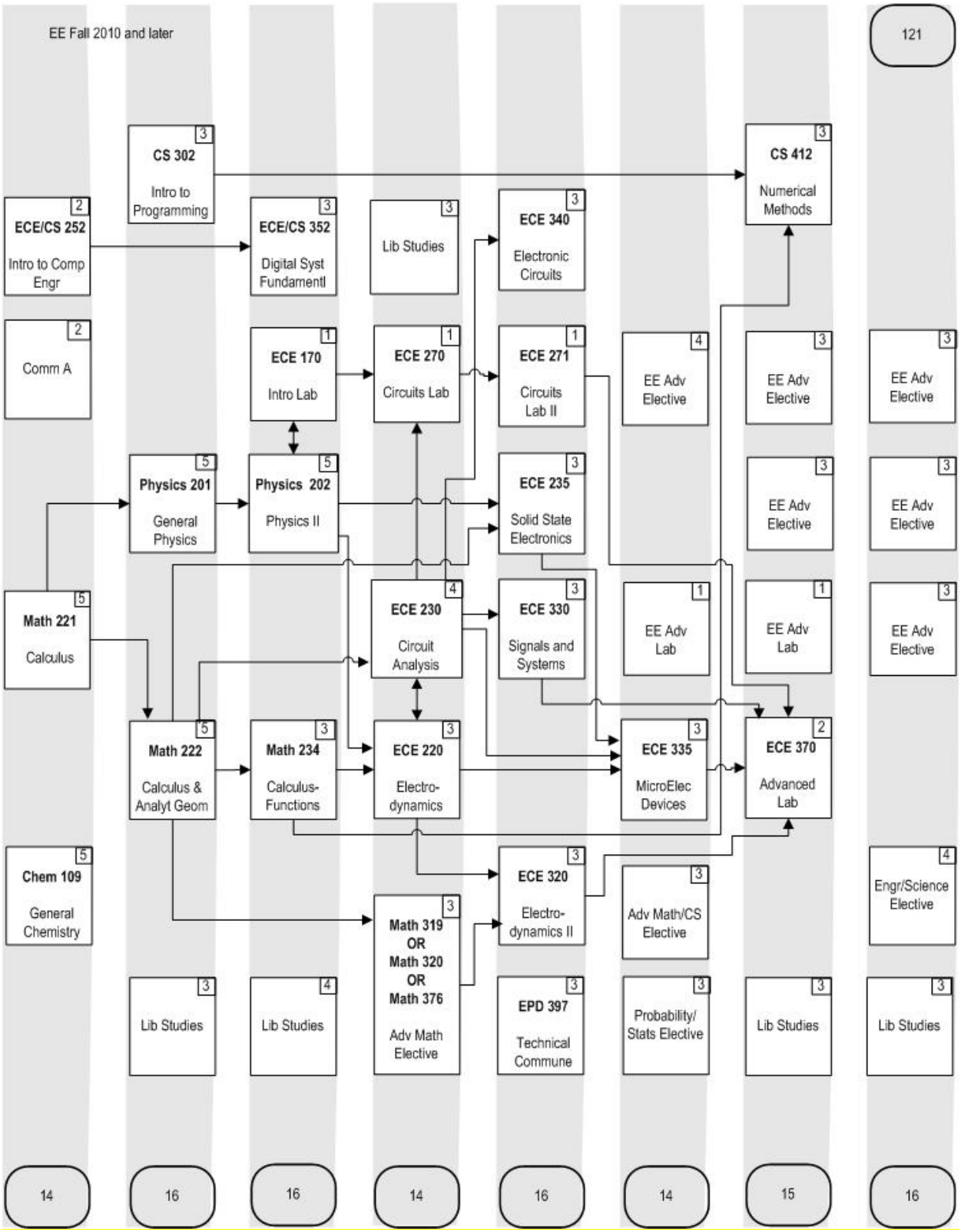
College of Engineering
UNIVERSITY OF WISCONSIN-MADISON

Electrical Engineering

Undergraduate Student Handbook and Curriculum Requirements

Curriculum Effective
Fall 2010

This handbook is published by the Department of Electrical and Computer Engineering (ECE) to provide guidance to undergraduates in managing their programs and in selecting courses toward the BS Electrical Engineering (BSEE) degree. This booklet supplements information in the UW-Madison Undergraduate Catalog. (See **http://pubs.wisc.edu/ug/**). *Handbook last updated in August 2010.*


EE Fall 2010 and later
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CS 302
Intro to Programming
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Digital Syst Fundamentl
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EE Adv Elective
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Math 221
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I. INTRODUCTION TO ELECTRICAL AND COMPUTER ENGINEERING

Important Contact Information

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booske@engr.wisc.edu — (608) 890-0804

Undergraduate Advising Chair – Prof. Bill Sethares — Office: 2556 Engineering Hall
sethares@ece.wisc.edu — (608) 262-5669

Student Services Coordinator – Julie Klein — Office: 2308 Engineering Hall
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Your Electrical Engineering Curriculum

Electrical engineers and computer engineers design and develop anything and everything that uses electricity: from the power systems that bring electricity to our homes and communication systems that allow us to keep in touch with family and friends, to the electronic devices, electrical appliances, computers, sensors, and medical equipment that shape our everyday lives. Typical careers may find computer engineers collaborating with medical doctors to model and simulate complex systems, embedding computers in advanced communications and transportation networks, and interacting with other engineers and professionals in the design of new kinds of computational devices. Many computer engineering graduates work as scientists, inventing new kinds of electronic technology, programming new kinds of instruments, and developing new devices to help people.

In order to prepare you for a career as a computer engineer, the faculty and staff of the UW-Madison have developed a curriculum that we believe will help you master the material you will need to get your career off to a great start. This includes many courses throughout science, math, and the humanities, as well as many specialized courses within the Electrical and Computer Engineering (ECE) department itself. Because the rules can be intimidating, we have prepared this booklet to provide guidance in managing your programs and in selecting courses toward the BS Electrical Engineering (BSEE) degree. This booklet supplements information in the UW-Madison *Undergraduate Catalog* (**http://pubs.wisc.edu/ug/**). It should be used in conjunction with the Degree Audit Reporting System (DARS). Students can request DARS reports from MyUW, which is accessible as a link from the university home page (**http://www.wisc.edu**). After logging into MyUW, enter the Student Center and select "View my DARS" under the Academic History heading. MyUW offers the ability to request reports for currently declared programs as well as "what-if" reports.

The Undergraduate Advising and Scholarship Committee within ECE and the South Student Services Center welcome suggestions for improving the presentation of this material.

II. REGULATIONS, POLICIES, & PROCEDURES

Admission

Initial Classification
http://studentservices.engr.wisc.edu/regulations/1.html

New students admitted to the College of Engineering but not yet to a degree-granting department are assigned the classification of Engineering General Resources (EGR). EGR students should transfer to a degree-granting department as soon as they are eligible. Students may not begin a semester with the EGR classification once they have completed four semesters as an EGR student. Summer session is not considered a semester.

Admission to a Degree-Granting Classification
http://studentservices.engr.wisc.edu/regulations/3.html

To be considered for admission to an academic department in the College of Engineering, a student must have:

1. Satisfied the General Education Communication Skills Part A requirement.
2. A minimum of 24 credits.
3. A minimum of 17 credits of calculus, statistics, chemistry, computer science, statics, and physics courses required for an engineering degree. These credits must include Math 222 or Math 276.
4. A grade point average of at least 2.50 for all math courses 217 and above, statistics courses 224 and above, chemistry (all classes), computer science (all classes), EMA 201, and physics courses 201 and above. For one and only one of these courses that a student has repeated, the more recent of the two grades will be used in the calculation.
5. A grade-point average at least 2.00 for all courses not included above in Requirement 4.
6. Successful completion of introductory chemistry (Chem 103/104 or 109 or 116); calculus-based mechanics (EMA 201 or Physics 201, 207, or 247); math through Math 222 or Math 276; and either InterEGR 101 or 160 or another introduction to engineering class from an approved list.

When the number of qualified applicants exceeds the capacity of the program, admissions will be limited to that capacity. Under these conditions, admission of students will be based on grade point averages, test scores, geographical background, personal background, and diversity. This basis for admission is intended to implement the University's goals of (1) maximizing the success of students who are admitted to a program and (2) achieving a heterogeneous and ethnically diverse student body. It is the student's responsibility to submit a timely application to the Dean's office for admission to the degree-granting classification.

Application periods are as follows:

For Fall Semester:	**January 15 to March 1**
For Spring Semester:	**September 15 to November 1**
For Summer Session:	**January 15 to March 1**

Students not admitted to an academic department may file an appeal with the Dean.

Admission to Courses
http://studentservices.engr.wisc.edu/regulations/4.html

Departments may specify courses as 1) not open to EGR students, or 2) open only to students in that specific department.

Transfer Admissions
http://studentservices.engr.wisc.edu/regulations/5.html
http://studentservices.engr.wisc.edu/regulations/6.html

Individuals, who are already attending another university, including those in the University of Wisconsin System, will need to meet the entry requirements of the degree program for which they are applying.

While making the decision to apply for a transfer to a UW-Madison program, please note that all students must meet the following requirements in order to graduate:

1. All students must complete at least 30 credits in residence in the College of Engineering, including 15 credits of work in their specific major.
2. All students must complete their last two semesters in residence in the College of Engineering as a full-time student.
3. All students must complete course substitution forms for transfer courses they wish to use as substitutes for curriculum requirements during their **first** semester.

Transfer students sometimes find themselves short of credits in mathematics, physics, or computer science. If you find yourself in that situation, seek advice from an academic advisor in the North or South Student Services Center. See page 14 for contact information.

Admission to an Additional Major
http://pubs.wisc.edu/ug/07engineering/reg.html#add

Engineering students may earn an additional major in the College of Letters and Science and have the additional major noted on their transcript at the time of graduation. To qualify, the student must have approval in advance from both the department in the College of Letters and Science offering the major and the academic dean of the College of Engineering, and must satisfy all requirements for the Letters and Science major by the time the engineering degree is completed. These requirements include those established by that department, as well as those of the College of Letters and Science (e.g., 15 credits minimum of advanced work in the major of residence at UW-Madison). For further details, contact the College of Engineering Student Service Office, 2620 Engineering Hall.

Adding additional majors from colleges other than Letters and Science is not accepted. For example, majors such as art (School of Education) and forestry (College of Agriculture and Life Sciences) cannot be completed in conjunction with an engineering degree. Likewise, students cannot pursue more than one undergraduate engineering degree concurrently.

Registration

Credit Load Constraints
http://studentservices.engr.wisc.edu/regulations/8.html

The minimum credit load is 12 enrolled credits per semester. The maximum credit load is 20 enrolled credits per semester. For summer sessions and other sessions, there is no minimum credit load and the

maximum credit load equals the number of weeks in the session. A student may freely choose to carry any number of credits between a minimum credit load and a maximum credit load, provided that the student is not on academic probation. A student may carry more than a maximum credit load, but only with the recommendation of an advisor and with written approval of the Dean.

A student who wishes to carry less than a minimum credit load must request written permission from the Dean to become a part-time student. Permission can only be requested for definitive reasons. Such reasons may include but are not limited to having one or more of the following:

- a documented disability.
- a necessity of employment or other outside obligation exceeding 15 hours per week.

Part-time permissions must be renewed during the first two weeks of each semester. Part-time students must satisfy all regulations other than the minimum credit load. For any semester for which part-time permission is granted and the semester following it, the academic status of the student is the responsibility of the Dean.
A student on academic probation is advised to carry not more than 14 credits per semester unless repeating a course. For every three credits being repeated, the student is advised to carry not more than one additional credit beyond 14, up to a maximum of 16 credits.

Credit Load Recommendations

The curriculum requirements for a Computer Engineering or Electrical Engineering degree can be satisfied in eight semesters of study by completing 14-16 credits of work each semester. Please see the flowchart on the inside of the front cover for a sample eight semester plan. Many students, however, choose to take longer than eight semesters. A nine-semester or ten-semester program may be selected to achieve broader coverage of an area of specialization, penetrate an area more deeply, pursue a certificate program, or pursue a second major. In addition, many students participate in the engineering cooperative education (co-op) program, which requires one or two additional semesters.

Pass-Fail Courses & Credit-No Credit Courses
http://studentservices.engr.wisc.edu/regulations/13.html

Pass-Fail (P-F) is a student-selected, alternative way of being graded in a regularly graded course. Credit-No Credit (CR-N) describes courses approved for two-level grading and is not a student option.

CEE students must take courses P-F in accordance with the College of Engineering Regulations. All engineering students may count two P-F courses toward an undergraduate degree. These courses MUST be liberal studies electives. However, students may not use P-F for the required Economics course or the required Environmental Issues course. Note that an ethnic studies class taken P-F will fulfill the Ethnic Studies requirement for any degree in the College of Engineering, but may not do so for degrees in another UW-Madison school or college.

Instructions for adding or canceling P-F requests on the online Course Change Request form can be found here: **http://registrar.wisc.edu/forms/student/ccr_info.php**. A student may change the grading option of a full-semester course to or from P-F only during the first four weeks of classes.

The P-F agreement is between the student and the Registrar, and is not revealed to the person teaching the course. The person teaching the course submits the appropriate letter grade to the Registrar, who converts C or higher grades to S (Satisfactory), D and F grades to U (Unsatisfactory). Courses designated as CR-N will not be counted in determining the number of P-F courses the student may elect.

Online Waiting List System (OWLS)

In any given semester, courses may fill up quickly depending on demand. If a student has sufficient reason for enrolling in the closed section, and would like to be placed on a waiting list, he or she should sign up on the Online Waiting List System (OWLS) located here: **https://admin.engr.wisc.edu/wait_list/**. OWLS will be available for students to sign-up on after the first day freshmen students are able to enroll. Students will be notified by email if they have been given permission to enroll. The department will do whatever it can to assist students in enrolling for the courses they need. However, it cannot be guaranteed that students will be allowed in to the closed section.

Performance & Evaluation

Academic Probation
http://studentservices.engr.wisc.edu/regulations/29.html

A student is placed on Academic Probation when he or she has, in the semester just completed:

1. Attained a GPA less than 2.0; or
2. Passed fewer than 12 credits without part-time permission from the Dean.

Once on probation, the student is continued on probation until either he or she is removed from probation or dropped from the program. It is advised that students on probation take no more than 14 credits per semester until removed from probation.

Removal from Probation
http://studentservices.engr.wisc.edu/regulations/30.html

Once on probation, the student is continued on probation until either he or she is removed from probation or dropped from the program. Removal from probation takes place when:

1. the student earns a cumulative grade point average becomes a 2.0 or higher;
2. the student earns a semester GPA of 2.0 in the last semester completed;
3. the student has passed 12 or more credits in the last semester completed; and
4. the student has passed at least 24 degree credits in the two most recent semesters in residence.

Drop from the College of Engineering
http://studentservices.engr.wisc.edu/regulations/31.html

A student on academic probation will be dropped at the end of any semester for which that student has submitted a GPA of less than 2.0 or passed fewer than 12 credits for a student without part-time permission from the Dean or passed less than ¾ of the credits attempted for a part-time student.

A student not on academic probation will be dropped at the end of any semester for which that student has passed fewer than half of the credits attempted.

Incomplete
http://studentservices.engr.wisc.edu/regulations/23.html
http://studentservices.engr.wisc.edu/regulations/24.html

An incomplete may be reported for a student who has carried a subject with a passing grade, but because of illness or other unusual and substantiated cause beyond the student's control has been unable to complete the final examination or some limited amount of term work. A student who stays away from a final examination without proof of being prevented from attending as indicated above will receive a grade of F, N, or U (whichever is appropriate). Even with such proof, if the term work has convinced the instructor that the student cannot pass, the grade shall be F, N, or U (whichever is appropriate).

College of Engineering Graduation Requirements
http://studentservices.engr.wisc.edu/regulations/34.html

It is the student's responsibility to ensure that graduation requirements have been met. All students should regularly consult their DARS (Degree Audit Reporting System) document in conjunction with their faculty advisor and/or academic advisor to ensure that all of the following requirements are met:

1. Have fulfilled the published graduation requirements of that curriculum, with all substitutions formally approved, and have achieved a minimum 2.0 GPA overall.
2. Have a PCR[1] of at least 2.0 for those semesters and sessions containing the last 60 credits taken at UW-Madison or for all credits taken at UW-Madison if fewer than 60.
3. Have a PCR[1] of at least 2.0 for all courses taken in the degree-granting department that count toward graduation.
4. Have completed at least 30 credits in residence in the College of Engineering, including 15 credits of work in the degree-granting department.
5. Have completed the last two semesters in residence in the College of Engineering as a full-time student.
6. Have a GPA of at least 2.0 both for the last semester and also for the combined last two semesters.

Department of Electrical and Computer Engineering Graduation Requirements

In addition to the College of Engineering graduation requirements listed above, students must also satisfy the following ECE graduation requirements to earn a CMPE or EE undergraduate degree:

1. Degree candidates must take EPD 397 and at least 15 credits of ECE Advanced Electives in residence.
2. Degree candidates declare the appropriate graduation term in your Student Center within your MyUW portal by the announced deadline.
3. Degree candidates submit an Advanced Elective Approval form, signed by his/her faculty advisor, to the South Student Services Center (2304a Engineering Hall) by the announced deadline.
4. Degree candidates must complete the Educational Benchmarking, Inc. (EBI) survey by the announced deadline.
5. If a degree candidate is clearing an incomplete grade during his/her semester of graduation, in a course applied toward your degree, the final grade for that course must be **dated** on or before the last day of final exams. An incomplete cleared later will prevent the degree candidate from graduating.

[1] PCR (Point-Credit Ratio) differs from the grade point average in that it involves only those credits that count toward graduation and the related grade points. When a course is repeated, the credits and grade points earned only for the final attempt are included in the point-credit ratio.

6. If a degree candidate is taking a UW Extension course during his/her semester of graduation, and the course is required for graduation, the Dean's office must receive a transcript dated on or before the last day of final exams. The Dean's office suggests that degree candidates take the final exam in his/her UW Extension course on the first day of the final exam period to allow enough time for paperwork to be processed.

Please remember, it is the degree candidate's responsibility to ensure that all graduation requirements are met.

Graduation Requirements for an Additional Major

Students must complete their additional major requirements no later than the semester of graduation with their engineering degree. Students who have finished all of their engineering degree requirements may **not** delay graduation in order to finish their additional major. Students who complete an additional major will only receive one diploma (noting their engineering degree); their additional major will be noted on an official transcript at the time of graduation.

Commencement

For information regarding the Commencement schedules, ordering attire, and parking please visit the following website: **http://www.secfac.wisc.edu/commence/**

Second Bachelor's Degree

http://pubs.wisc.edu/ug/07engineering/reg.html#sec

Persons with a Bachelor of Science or Bachelor of Arts degree from UW-Madison or other accredited institutions may, if eligible, pursue a second bachelor's degree from the College of Engineering.
Candidates from other institutions and UW-Madison graduates who have been out of school for one semester or more must apply for admission (or readmission) with the regular UW System Undergraduate Admissions application. Continuing UW-Madison students do not need to submit this form but must file a transfer application, available at the EGR Office. All candidates need permission from the Admissions Coordinator of the Engineering Student Services Office.

The following graduate requirements must be met for the second bachelor's degree: Students must complete a minimum of 30 credits in residence, including 15 credits of work in the degree-granting department. Candidates must complete all university, college, major, and curricular degree program requirements.

III. UNDERGRADUATE ADVISING

The College of Engineering (COE) encourages students to seek guidance from multiple sources throughout their undergraduate studies. Just as no one mentor can fulfill all of a developing professional's needs, no one advisor can fulfill all of a student's needs. A student will receive richer and more valuable advice by seeking that advice from multiple advisors.

Role of the Student in the Advising Process

The COE requires, and expects, students to be active in educational planning and advisement. Students are expected to know what their degree requirements are; to monitor their academic progress, which includes knowing what courses have been completed, what courses remain, and what good academic standing means; to be aware of policies and procedures which guide their studies; to consult regularly with an advisor, especially before every registration period; and to be aware of how he/she learns in order to balance course schedules.

DARS

The Degree Audit Reporting System (DARS) is part of UW–Madison's commitment to academic advising for undergraduate students. An automated summary of a student's academic progress toward a degree, a DARS report, is particularly helpful when combined with the personal wisdom and insight of skilled advisors. DARS reports should always be reviewed with transcripts.

Most students may order a DARS report on the Web through My UW–Madison at my.wisc.edu on the Student Records tab. DARS shows which requirements have already been completed and which remain unsatisfied.

DARS is not intended to replace students' contact with academic and faculty advisors. Instead, the quick and thorough analysis provided by DARS allows more time in an advising appointment to discuss course options, research opportunities, plans for graduate school, or issues of personal interest or concern to students.

Please remember that DARS is just a computer program and it may occasionally make mistakes or place courses in a non-optimal fashion. If you see something on your DARS report that does not seem right, or does not make sense, please contact an advisor and we can help you sort it out.

Course Guide

The Course Guide provides a broad spectrum of course information in a consistent format and in a single location. It is an enriched, searchable course catalog with aggregated information from many campus sources. The Course Guide is available for use by students, faculty and instructional staff, departments, advisors, and staff. In addition, it is available to prospective students and their parents along with anyone interested in UW-Madison course information. For students, faculty and instructors, advisors, and UW-Madison staff (i.e., those with a UW-Madison NetID), log onto MyUW at **http://my.wisc.edu/** and click on the Course Guide tab. Prospective students, parents, high school counselors or anyone without a UW-Madison NetID should access the Course Guide at **http://public.my.wisc.edu/**

Engineering General Resources (EGR) Advisors

All undergraduate students who have been admitted to the COE but are not yet affiliated with a degree-granting department are given the general classification of Engineering General Resources (EGR). All EGR students receive advising from an EGR advisor in the EGR office (1150 Engineering Hall). Students are welcome to discuss a wide variety of topics with their EGR advisor such as: (a) personal interests and career goals, (b) majors in or outside of engineering, (c) curriculum requirements and course selection, (d) academic support, such as tutoring services and study groups, (e) admission to engineering departments, (f) extracurricular activities, (g) campus resources and services, and (h) referrals for nonacademic problems.

EGR students are required to meet with their EGR advisor at various times throughout their tenure as an EGR student. EGR students should check with the EGR office for detailed information on required advising.

Faculty Advisors

All undergraduate students who have been admitted to a degree-granting department will also be assigned to a faculty advisor. All students are **strongly encouraged** to take the initiative to build a mentoring relationship with their faculty advisor as well as with other faculty members. Building a mentoring relationship with faculty is best done by meeting in person with faculty for scholarly advice such as guidance on research/independent study projects and advice on post-graduation plans. Faculty advisors are the best advisors to see for questions about course content, questions about course intensity and for help selecting advanced coursework or advanced electives to align with your post-graduation plans.

Students majoring in Computer Engineering (CMPE) or Electrical Engineering (EE) are required to see their faculty advisor to obtain approval on their selection of advanced course electives

Academic Advisors

All undergraduate students who have been admitted to a degree-granting department will be assigned to an academic advisor (i.e., a staff advisor). The academic advisor advises students on curriculum requirements; COE and UW-Madison policies and procedures; and the graduate school or professional school application process. An academic advisor can work with students to develop individual educational plans, answer questions about DARS reports, and connect students with other campus resources (e.g., Office of Student Financial Services, Engineering Transfer Admissions, International Engineering Studies and Programs, Engineering Career Services, etc.). The way to meet with an academic advisor in the South Student Services Center (serving CEE/ECE/GLE students) is to make an individual appointment or to stop in during drop-in advising times. To schedule an individual appointment or to inquire about drop-in advising with an academic advisor, use the Online Scheduling Tool (**https://tools.wisccal.wisc.edu/available/**) or contact Sherry Liantonio via telephone at 608/260-2420 or stop by her office in 2304a Engineering Hall.

South Student Services Center (SSSC)

The South Student Services Center (SSSC) is the office that the academic advisors for CEE, ECE, and GLE undergraduate students work. Additional information on the mission, vision, and objectives of the SSSC follows. The SSSC is located in 2304a Engineering Hall and can be reached via phone at 608/890-2420.

Mission Statement

The South Student Services Center (SSSC) within the College of Engineering at the UW-Madison provides support to both undergraduate and graduate students. We support undergraduate students who are declared Civil Engineering, Computer Engineering, Electrical Engineering, or Geological Engineering majors and graduate students studying Civil and Environmental Engineering, Electrical Engineering, or Geological Engineering.

Vision

The vision of the South Student Services Center (SSSC) within the College of Engineering at the UW-Madison is to: (1) be, and be recognized as, an effective and efficient student services center for both the students and the academic programs that we serve; (2) provide quality academic advising in partnership with the student's faculty advisor; and (3) continually ask ourselves "is this good for our students?"

Objectives

The South Student Services Center (SSSC) within the College of Engineering at the UW-Madison will strive to attain its vision by…

…creating a welcoming, inclusive, and supportive learning environment for SSSC students

…providing services of the highest quality that help SSSC students to develop and enrich their academic abilities, personal aspirations, and professional goals

…facilitating students' entry into and success within SSSC graduate programs

…continually improving the recruitment and retention of engineering students by enhancing the College of Engineering's interaction with: (1) UW-Madison students, programs, and student service organizations and (2) prospective SSSC students.

…supporting and collaborating with the student organizations that serve SSSC students

…recruiting, supporting, and retaining the best undergraduate and graduate students, especially women and underrepresented groups

…assessing and evaluating the dual advisor model being piloted by the SSSC

…collaborating with faculty and the appropriate advising and curriculum committees within each program to help students achieve their academic goals

…providing student feedback to the faculty and appropriate committees within each program

…streamlining administrative processes amongst the Civil and Environmental Engineering, Electrical and Computer Engineering, and Geological Engineering programs

IV. SCHOLARSHIPS

University & College Wide Scholarships

http://scholarships.wisc.edu/Scholarships/

Scholarships@UW-Madison showcases the range of scholarship opportunities available at UW-Madison, including scholarships offered through the College of Engineering. To access Scholarships@UW-Madison, log in to your MyUW portal with your NetID and password.

Scholarships are awarded to recognize the outstanding academic work of current and future UW-Madison students. Awards range from $400 to $6,000. Some scholarships offer awards for a single academic year while others may be renewable for up to four years. While not the only factor, financial need is often considered in the selection process.

Eligibility criteria will vary, even within individual schools and colleges. Pay particular attention to submission deadlines, as they vary by school and college. Most deadlines are either February 1 or March 1, though some may be earlier.

There is no single date when all scholarships are awarded. Recipients will be notified when final decisions have been made.

ECE Departmental Scholarships

Scholarships (ranging in amounts from $400 to $2000) are available to ECE undergraduates and to EGR students expecting to be admitted to the ECE department for the term of the scholarship. Most awards are based on academic merit and not on financial need. Applications are available online (**http://www.engr.wisc.edu/ece/current/undergrad/scholarship.pdf**) or from the South Student Services Center (2304a Engineering Hall) at the beginning of the Spring semester and are typically due mid-April. All applicants receive notification in late summer or early fall.

Grainger Textbook Scholarship

The Grainger Foundation has established a textbook scholarship for declared Computer Engineering (CMPE) or Electrical Engineering (EE) majors who are either US citizens or permanent residents. Once an eligible student enrolls in a qualifying course, they will be contacted by ECE department staff about picking up their **free** textbooks. The current list of the 13 qualifying courses is as follows:

- ECE 220
- ECE 230
- ECE 235
- ECE 270
- ECE 271
- ECE 320
- ECE 330
- ECE 335
- ECE 340
- ECE 352
- ECE 353
- ECE 354
- CS 367

Grants Information Collection

http://grants.library.wisc.edu/index.html

The Grants Information Collection (GIC) is a collection of print and electronic materials available to students who wish to help fund their university expenses with money other than scholarship aid. The GIC houses numerous databases of grants available to individuals. Students are to conduct their own research into grants, however any reference staff member is available to help show students the location of the collection and answer basic questions. The GIC is open during normal library hours.

Nikki Busch
(608) 262-3242
nbusch@library.wisc.edu
262 Memorial Library

V. TUTORING & ACADEMIC ASSISTANCE

http://studentservices.engr.wisc.edu/classes/tutoring/

Free academic support if available to engineering students through tutoring, study groups, and supplemental instruction.

CeO Student Support Services

http://www.education.wisc.edu/ceo/services.aspx

The Center for Educational Opportunity (CeO) houses the federally-funded TRIO Student Support Services program. Student Support Services (SSS) provides many services similar to the CeO center including: academic advising, assistance with accessing campus services including financial aid, mentoring, tutoring, opportunities to participate in social/cultural activities, career/graduate school advising, and much more. Students interested in becoming an SSS participant must complete an application for the CeO center.

Chemistry Learning Center

http://www.chem.wisc.edu/areas/clc/signup.htm

The mission of the Chemistry Learning Center is to assist students who are enrolled in general and organic chemistry courses in becoming successful and independent learners. Participation is voluntary and there is no fee. They offer a supportive learning environment where students meet in small groups with staff to work out effective strategies for mastering the chemical content. They have resources for students in some lectures of General Chemistry 103 and 104, and some lecture sections of Organic Chem 343 and 345. Please note that not all courses nor lecture sections in a course are covered at all times.

Counseling Service, College of Engineering

http://studentservices.engr.wisc.edu/counseling/

The College of Engineering's Counseling Service is available because it's easier to concentrate on your studies if you can deal effectively with personal, academic and career concerns. Talking with someone who is objective and empathetic can help you sort through these concerns. Appointments can be made with the College of Engineering Counselor, David Lacocque, by telephoning him at 608/265-5600 or by stopping by the office at 333 East Campus Mall (7th Floor). Confidentiality is assured within applicable legal and ethical guidelines. Nothing will be recorded in your academic file.

Diversity Affairs Office (DAO)

http://studentservices.engr.wisc.edu/diversity/

The Diversity Affairs Office (DAO) provides guidance and support to underrepresented students and women in the College of Engineering. DAO also sponsors the Tutor by Request program for all new transfer students and underrepresented students in engineering.

Drop-In Tutoring

http://studentservices.engr.wisc.edu/classes/tutoring/index.html#Wendt

Bring along your friends, study at tables, finish homework, and prepare for exams. Look for the red table signs. Feel free to study at the tables and consult the tutors as needed. Drop-in tutoring is free and open to all.

Sponsored by Engineering Student Services
Contact Person: Jia-Ling Lin
Hours: 6:30-9:00 pm (check web for current schedule)
Location: Wendt Library, 4th floor

Mathematics Tutorial Program

http://www.math.wisc.edu/~tprogram/

The Mathematics Tutorial Program offers free tutoring in a cooperative learning environment for students enrolled in Math 95, 101, 112, 113, 114, 211, 213, 231, 222, 171/217, and 234.

McBurney Disability Resource Center

http://www.mcburney.wisc.edu/

Students who have a documented disability, or suspect that they may have an undiagnosed disability are encouraged to contact the McBurney Disability Resource Center to inquire about obtaining academic accommodations. The McBurney Center provides academic accommodations such as: adaptive/assistive technology access, assistive listening devices, document conversion, elevator keys, ASL interpreting, notetaking support, testing accommodations, and reduced credit load recommendations to name a few. Students must provide documentation and be registered with the McBurney Center to receive at Verified Individualized Services & Accommodations (VISA) before they can obtain accommodations.

Telephone: (608) 263-2741
TTY: (608) 263-6393
Hours: Mon-Fri: 8:00-4:30
Location: 1305 Linden Drive (1st floor)

Supplemental Instruction (SI)/InterEGR 150

http://studentservices.engr.wisc.edu/classes/tutoring/supplemental.html

The Supplemental Instruction (SI) Program is an academic support program for "gateway" courses (EMA 201, EMA 202, ME 240, Physics 201 and Physics 202). SI helps to reinforce concepts, bridge gaps between teaching and learning, and supply strategies to promote problem solving skills with understanding. Students interested in SI are asked to commit time to two 60-minute group discussions facilitated by upper class CoE students. Students enroll in InterEGR 150, which is a zero credit course.

Location: Engineering Hall Atrium/Café area
Hours: Vary by semester

Tutor by Request (one-on-one help)

https://studentservices.engr.wisc.edu/classes/tutoring/request/

New transfer students in their first two semesters at UW-Madison and underrepresented students in engineering may be qualified for one-to-one tutoring, if an engineering tutor is available. If you qualify, you are likely to be preauthorized to enroll by visiting the Website listed above. If you believe you qualify and you are not preauthorized to enroll, contact Dr. Lin (**http://www.engr.wisc.edu/admin/staff/lin_jia-ling.html**).

Writing Center

http://writing.wisc.edu/

The UW Writing Center provides free of charge face-to-face and online consultations which focus on a number of different writing scenarios (i.e. drafts of course papers, resumes, reports, application essays, cover letters, theses, etc). Writing Center instructors will not edit or proofread papers. Instead, their goal is to teach students to edit and proofread in order to become a better, more confident writer.

Telephone: (608) 263-1992
Location: 6171 Helen C. White Hall

VI. ORGANIZATIONS & LEADERSHIP

Student Leadership Center (SLC)/Student Organizations

There are over 750 registered student organizations at the UW-Madison. Over 50 of those organizations are recognized as official student organizations within the College of Engineering. For a complete listing of the student organizations registered at the UW-Madison through the Center for Leadership and Involvement, please visit: **http://www.cfli.wisc.edu/student_organizations.htm**. For a complete listing of the student organizations recognized by the College of Engineering, please visit: **http://slc.engr.wisc.edu/organizations.html**. The following student organizations are organizations in which many ECE undergraduate students are involved:

American Indian Science and Engineering Society
http://www.aises.org

Engineering EXPO
http://engineeringexpo.wisc.edu/

Enlight
http://enlight.engr.wisc.edu/

Eta Kappa Nu (HKN)
http://www.engr.wisc.edu/studentorgs/hkn/

Hmong Association of Engineers
http://www.engr.wisc.edu/studentorgs/hae/

Inst. of Electrical and Electronic Engr. (IEEE)
http://www.engr.wisc.edu/studentorgs/ieee/

IEEE Robot Team (aka UW Robotics Team)
http://www.engr.wisc.edu/studentorgs/ieeerobo/

Kappa Eta Kappa (KHK)
http://delta.khk.org

National Society of Black Engineers – Wisconsin Black Engineering Student Society
http://www.engr.wisc.edu/studentorgs/wbess/

Polygon Engineering Student Council
http://www.engr.wisc.edu/studentorgs/polygon/

Society of Hispanic Professional Engineers
http://www.shpemadison.org/

Society of Women Engineers
http://www.engr.wisc.edu/studentorgs/swe/

Women in Science and Engineering
http://www.housing.wisc.edu/wise/

VII. SERVICE UNITS AVAILABLE TO STUDENTS

Engineering Career Services (ECS)

https://ecs.engr.wisc.edu/public/index.php

Engineering Career Services provides lifetime tools for successful career development in a rapidly changing world. ECS helps students in preparing for internship/co-op as well as job searches (resume & cover letter writing, listing of potential employers, etc), practicing interviewing skills (mock interviews, sample interview questions), and other important career information such as negotiating job offers and salaries. Students can become lifetime members of ECS by registering and paying a one-time $20 fee.

The staff at ECS teaches a course called Career Orientation (listed as PRO OR 200 under Professional Orientation). The course generally meets one time per week and is worth one credit. Students gain exposure to the world of work and valuable knowledge and skills related to the job search.

Contact Person: Assistant Dean John Archambault
Telephone: (608) 262-3471
Location: M1002 Engineering Centers Building

Office for Equity and Diversity (OED)

http://oed.wisc.edu/

The Office for Equity and Diversity (OED), promotes, integrates, and transfers equity and diversity principles to nurture human resources and advance the mission of the University of Wisconsin-Madison (university). The OED employs multiple approaches to attain its strategic objectives. These include:

- provide leadership and consultation to develop and implement equity and diversity strategies throughout the campus;
- promoting the use of standardized and proactive human resources processes;
- maximizing human resources through the effective use of continuous improvement principles;
- establishing collaborative partnerships with Schools/Colleges and Divisions; and
- coordinating campus compliance with affirmative action and equal opportunity requirements, referred to as AA/EEO compliance.

The UW-Madison is committed to providing equal opportunity and equal access and to complying with all applicable federal and state laws and regulations and University of Wisconsin System and university non-discrimination policies and procedures. The OED has prepared an informative Website (**http://oed.wisc.edu/dishar.html**) containing a series of questions and answers to describe how our discrimination/harassment complaint process works at the university. These questions and answers are meant to help employees, applicants for employment, students, applicants for admission, and anyone using the university's programs or activities, including visitors to campus, understand how they can file a complaint of discrimination/harassment and how the investigative process works.

International Student Services (ISS)

http://www.iss.wisc.edu/

To maintain F-1 and J-1 status, international students must be enrolled in a full course of study each fall and spring semester. For undergraduate students, a full course of study is 12 enrolled credits per semester. Summer enrollment is not required by the US federal government for F-1 and J-1 visa holders unless you are a new student (with a summer school reporting date on your I-20 for initial attendance).

Check with an advisor in the International Student Services (ISS) Office if you want to confirm that you are in compliance with your visa regulations.

There are valid academic and medical reasons for an international student to reduce his/her credit load. For any semester an international student intends to reduce his/her course load, he/she must complete the Reduced Course Load for F-1 and J-1 Students Form, have his/her academic advisor or medical professional sign the form, and submit the form to the ISS Office for review. The form is available at:

http://www.iss.wisc.edu/upload/documents/rcl.pdf

University Health Services (UHS)

http://uhs.wisc.edu/

Students may seek medical assistance through UHS in the following areas: primary care, women's health, HIV and sexually transmitted infections, allergies and immunizations, dermatology, health concerns for those travelling abroad, sports medicine, and psychiatric services. Most medical services are prepaid and included in student fees and tuition.

To schedule an appointment, call: (608) 265-5600
Hours: Mon, Tue, Thur, Fri: 8:30-5:00
Wed: 9:00-5:00
Location: 333 East Campus Mall (5th and 6th floors)

VIII. STUDY ABROAD OPPORTUNITIES

Studying abroad offers valuable cross-cultural experiences and the opportunity to improve your language skills, learn to live and work in culturally diverse surroundings, and improve your value on the job market. **Planning for your study abroad experience is of utmost importance.** This includes meeting with your academic and/or faculty advisor **and** meeting with the coordinator of the study abroad experience. When you meet with your academic and/or faculty advisor, please discuss the courses you plan to take abroad in order to ensure an academically successful experience. Make sure you know what courses you need to take overseas to fulfill degree and graduation requirements so that you do not fall behind in your academic progress. Discuss the following topics with your advisor:

- Advisor approval/clearance forms
- Departmental course equivalencies
- DARS designations for courses that fulfill elective credits
- Grading of courses taken abroad
- Completing the last 30 credits abroad (if applicable)

Students are ultimately responsible for understanding how courses taken abroad will or will not fulfill degree requirements.

International Engineering Studies & Programs (IESP)
http://studentservices.engr.wisc.edu/international/

International Engineering Studies and Programs (IESP) is a service unit within the College of Engineering that prepares UW-Madison engineering students to study abroad. As an IESP participant, you can choose from more than 50 study abroad programs in the Americas, Asia and the Pacific, and Europe and most programs are available for a semester or year. Many programs offer instruction in English. The courses completed abroad can help you make progress towards their engineering degree or allow you to explore additional academic areas.

While abroad on an IESP program, you will maintain student status and you (as an engineering student) will earn pass/fail grades for coursework completed overseas. If you take liberal studies courses while on an IESP program, you can still elect to take up to two additional liberal studies courses pass/fail at UW-Madison. The College of Engineering does not consider study abroad programs in residence; therefore you will need to request a waiver (at the time of application) of the college's residency requirements if you plan to study abroad during your final 30 credits.

The majority of programs are exchanges, which means that you would pay the same tuition as you currently do at UW-Madison. Financial aid is available to all UW degree-seeking students on study abroad programs – even those who have not received aid in the past. A minimum GPA of 3.0 (for most programs) is required to apply. Application deadlines are **October 1** for the spring semester, and **March 1** for the fall semester or for the entire academic year.

In order to obtain a certificate in International Engineering, students must have a five-week (minimum) study abroad experience. Additional information on the International Engineering certificate can be found in the following pages.

Contact Person: Amanda Hammatt
Email: international@engr.wisc.edu
Telephone: (608) 263-2191
Location: M1002A Engineering Centers Building

International Academic Programs (IAP)

http://www.studyabroad.wisc.edu/

International Academic Programs (IAP) offers over 150 study abroad programs to UW-Madison students across campus. Instruction is in a wide range of languages, including many options in English. Most programs are limited to course options in social sciences and humanities through a limited number of programs do have engineering courses available. While abroad on an IAP program, you will maintain your student status and you are typically assigned a letter grade for the courses that you will take. If you have questions about the grading basis for a particular course, you will need to talk **both** to IAP **and** to your advisor. The College of Engineering does not consider study abroad programs in residence; therefore you will need to request a waiver (at the time of application) of the college's residency requirements if you plan to study abroad during your final 30 credits.

For more information, contact IAP at: 250 Bascom Hall, 500 Lincoln Drive, Madison, WI 53706, T: 608/265-6329, F: 608/262-6998, peeradvisor@bascom.wisc.edu. Engineering students with additional questions regarding how their IAP study abroad program will or will not satisfy their engineering degree requirements can contact Bonnie Schmidt (1150 Engineering Hall, 608/262-4822, schmidt@engr.wisc.edu)

Other UW-Madison Study Abroad Experiences

If a UW-Madison engineering student chooses to study abroad through another UW-Madison study abroad unit it is **extremely important** that the student meet with the following people **before** going abroad: (1) their academic and/or faculty advisor; (2) the coordinator of the study abroad program; and (3) Bonnie Schmidt (1150 Engineering Hall, 608/262-4822, schmidt@engr.wisc.edu).

Non UW-Madison Study Abroad Experiences

If a UW-Madison engineering student chooses to study abroad through a non UW-Madison program (i.e., either through another university's study abroad program, an independent study abroad company, or solely on their own initiative), it is **extremely important** that the student meet with the following people **before** going abroad: (1) Amanda Hammatt in the International Engineering Studies and Programs office in M1002A Engineering Centers Building, (2) their academic and/or faculty advisor, and (3) Bonnie Schmidt (1150 Engineering Hall, 608/262-4822, schmidt@engr.wisc.edu).

Students who participate in a non UW-Madison study abroad program do not enroll at UW-Madison for the semester(s) they will be abroad. Students must apply for re-entry through the Office of Admissions before they can return to UW-Madison. For information about the online application and recommended deadlines, see **http://www.admissions.wisc.edu/reentry.php**. Most financial aid packages do not apply towards non UW-Madison study abroad programs. The academic institution abroad must be accredited in order for a student to apply for transfer credit for the courses taken while abroad. See Bonnie Schmidt (contact information above) to discuss possible course equivalencies. An engineering student who participates in a non UW-Madison study abroad program **must** do so early enough in their academic career so that, at the time of graduation, they are in compliance with the all of these regulations (**http://studentservices.engr.wisc.edu/regulations/34.html**).

IX. HONORS PROGRAMS

There are two undergraduate honors programs available to ECE students, Engineering Honors in the Liberal Arts (EHLA) and Honors in Research. A student who completes either program receives an Honors designation on his or her transcript.

Engineering Honors in the Liberal Arts (EHLA)

http://studentservices.engr.wisc.edu/classes/ehla.html

High-ability students who enter the College of Engineering as first-year students with particularly broad educational goals and exceptional academic skills may be interested in the EHLA program (Engineering Honors in Liberal Arts). It is a clone of the honors program in the College of Letters in Science, and as such gives selected students both access and motivation to take honors-level classes to fulfill basic engineering degree requirements. Note that the College of Engineering does not offer honors classes, except for a few honors independent studies.

Honors in Research

Objectives and Goals of the Program: The Honors in Research program gives an undergraduate the opportunity to participate in a research project under the direction of a faculty member. It is expected that the student will be actively involved in research that could lead to new knowledge. The project can be independent or a component of a larger team effort. The research culminates in a senior thesis that the student presents in an Honors Seminar.

Admission Requirements: In order to be admitted to the Honors in Research program, a student must:

1) Complete at least one semester on the UW-Madison campus,
2) Have a cumulative GPA of at least 3.5,
3) Major in Computer Engineering (CMPE) or Electrical Engineering (EE),
4) Identify an ECE faculty advisor who is willing to supervise the research project.

Admission Process: The student should submit a letter to the South Student Services Center (2304a Engineering Hall) requesting admission to the Honors in Research program. The letter should identify the faculty advisor for the project and the topic under investigation. A one-page summary of the research project should be attached. The student should also submit a supporting letter from the faculty advisor. The ECE Curriculum Committee will review applications and make admission recommendations.

Academic Credit: Students admitted to the program should register for one to three credits of ECE 489 (Honors in Research) and submit a completed Application for Independent Study Credit to the South Student Services Center (2304a Engineering Hall). A letter grade will be assigned each semester. If the project will extend into the next semester, a grade of P (Progress) is given. A final letter grade (A-F) is assigned after the senior thesis is submitted and reviewed by the faculty advisor, or if the student formally withdraws from the program. Previous grades of P are eventually replaced by the final grade. Up to six credits of ECE 489 may count as Advanced Electives.

Senior Thesis: A senior thesis worth three credits of ECE 489 is required. The thesis is a written document that details the objectives of the project, the methods used to carry out the research, and the results of the research activity. The thesis must be approved by the faculty advisor and presented at an Honors Seminar.

Honors Designation: The designation "Honors in Research" will be awarded to Computer Engineering graduates or Electrical Engineering graduates who:

1) Complete either the CMPE or EE degree requirements
2) Have a cumulative GPA of at least 3.3 at graduation
3) Complete a total of at least eight credits of ECE 489
4) Receive a final grade of at least B in ECE 489

X. CERTIFICATE PROGRAMS

http://studentservices.engr.wisc.edu/advising/degrees/certificates.html

While UW-Madison does not have minors, it does offer organized programs in specific disciplines that lead to a certificate and a transcript notation indicating successful completion.

Biology in Engineering Certificate

http://studentservices.engr.wisc.edu/advising/degrees/certificates.html

The Biology in Engineering Certificate, administered by Academic Affairs in the College of Engineering, is designed for engineering students who want to strengthen their biology backgrounds. It is offered especially to encourage engineering students in traditional disciplines to prepare themselves to understand the special engineering problems in biology and medicine. A student successfully fulfilling the requirements will have the notation "Biology in Engineering Certificate" added to their transcript.

The 15-credit Biology in Engineering Certificate (BEC) program was designed and will be administered by a BEC Committee composed of faculty from multiple engineering disciplines. Students normally should begin the program during their sophomore or junior year, but seniors may also apply. For more information, visit 2620 Engineering Hall or call 608/262-3484.

Engineering for Energy Sustainability Certificate

http://www.energy.wisc.edu/?page_id=1077

The objective of the Engineering for Energy Sustainability certificate program is to offer undergraduate students a suite of courses addressing energy sustainability that span across the engineering curriculum, with firm roots in "real world" design and engineering practices. Students interested in completing the certificate program must contact a particular faculty member in his or her major department to apply. The student faculty member must, together complete the Declaration of Intent and Tentative Study Plan (found here: **http://www.energy.wisc.edu/wp-content/uploads/2009/08/cees-dec_of_intent.pdf)** in order to enter the certificate program.

Certificate in Engineering Risk, Uncertainty, and Decision Analysis

http://studentservices.engr.wisc.edu/advising/degrees/2009ERUDA.pdf

The design and analysis of engineering systems are becoming much more dependent on the ability of the engineer to analyze the system in the context of uncertainties in system performance, evaluate the reliability of normal operation and the risk of off-normal operation, and then make appropriate decisions to maintain reliability with optimal performance. As a result, many industries such as manufacturing, chemical, and nuclear are looking for engineering graduates with appropriate understanding and knowledge in these areas. The Certificate in Engineering Risk, Uncertainty and Decision Analysis includes courses in statistics and probability, modern uncertainty analysis, decision analysis, and probabilistic reliability and risk assessment. The primary goal of this program is to significantly increase the number of engineers with a fundamental understanding of uncertainty, reliability and risk-based decision making.

Certificate in Integrated Studies in Science, Engineering and Society (ISSuES)

http://sts.wisc.edu/education/ISSuES.html

The Certificate in Integrated Studies in Science, Engineering and Society (ISSuES) is offered to all undergraduate students, but it is aimed especially at undergraduate engineering students. The program is designed to provide students outside of the College of Letters and Sciences coherent exposure to the social sciences and humanities with an emphasis on the relationship between science, technology, engineering, and society. Students will be required to take a variety of courses that relate to and build on each other, each one contributing to a major focus of the certificate. Currently, the ISSuES Certificate offers four focuses, each with a corresponding cluster of courses from all across campus. The four themes are: ethnic focus, leadership focus, design focus, and general focus.

Certificate in International Engineering

http://studentservices.engr.wisc.edu/advising/degrees/certificates.html
http://studentservices.engr.wisc.edu/advising/degrees/cert_IntlEngr_req.html

The Certificate in International Engineering provides recognition for a student's efforts to prepare for an international career by learning about one or more countries other than the United States. An undergraduate student in the College of Engineering or the Department of Biological Systems Engineering can earn the Certificate by completing at least 16 credits worth of courses with a primary focus on the language, culture, history, geography, society or institutions of a particular country or region of the world. For reference, information on Areas Studies Programs at UW-Madison is available from the International Institute here: **http://www.intl-institute.wisc.edu/MemberPrograms/index.htm**

Certificate in Japanese Studies for Engineering Students

www.engr.wisc.edu/epd/tjc

The Certificate in Japanese Studies for Engineering Students helps undergraduate engineering students gain conversational and written skills in colloquial Japanese, reading and translation skills in technical Japanese, and an understanding of Japanese culture. Increasing numbers of American companies conduct business in Japan, and many Japanese companies have expanded their activities in the United States. These companies need engineers who can read and communicate in both English and Japanese. The Certificate in Japanese Studies addresses this need.

The certificate requires 27 credits, including three semesters of Japanese language, two semesters of intermediate-level technical Japanese, and one additional course related to Japanese language or culture. Interested students should begin taking Japanese courses in their first year. For more information, contact Professor James L. Davis, Room M1056D Engineering Centers Building, 608/262-4810.

Note: EE students pursuing a Certificate in Japanese Studies earn three credits of undesignated Advanced Electives for successful completion of EPD 375 (Intermediate Technical Japanese II).

Technical Communication Certificate

http://tc.engr.wisc.edu/

The Technical Communication Certificate (TCC) complements all undergraduate engineering degrees. The TCC curriculum helps students gain a broad range of skills in these areas:

- Written, oral, and graphic communication
- Online communication and electronic publishing
- Team projects and interpersonal communication
- Professional communication through the TCC internship

The Technical Communication Certificate has established itself as a program that meets industry and government agencies' demands for engineers with skills as communicators and for communication specialists. Typically, engineers spend half of their time or more communicating in their roles on project teams, as technical experts, or as managers. Because employers value well-developed communication skills, TCC courses will enhance success in co-op/intern positions and post-graduation careers. The more than 200 TCC graduates overwhelmingly confirm not only that the certificate gave them an edge over other candidates during the recruitment process, but also that the communication knowledge, skills, and attitudes they acquired while in the program helped them succeed in their jobs and helped prepare them for the communication and management tasks in today's multifunctional team environments.

The TCC requires 24 credits, including 9 credits in technical courses (many already required for any engineering degree) and 15 credits in technical communication (3 or 5 communication credits might count toward technical, liberal, or free electives, depending on the major). Aside from the relevant courses offered in the TCC, students especially value the close contact with faculty through advising, independent study projects, and collaboration. Students in the program often take on leadership roles in other college or campus-wide student organizations and projects, further developing their communication, team, and management skills. For up-to-date information, visit the Technical Communication Center website at **http://tc.engr.wisc.edu/** or contact the TCC Office (**http://tc.engr.wisc.edu/contact.html**) at (608) 262-2472 or in M1080 Engineering Centers Building.

Other Certificates – Official List

http://registrar.wisc.edu/documents/85_Official_Certificates.pdf

The Office of the Registrar, under the direction of the Office of the Provost and Vice Chancellor for Academic affairs, maintains the official list of certificate programs authorized for the UW-Madison. Only certificates on this official list (Website listed above) appear on the student's transcript. Listed after each certificate is the code for the College or School through which it can be obtained and the level of student to which it is available.

XI. PROFESSIONAL ENGINEER REGISTRATION

States require licensing of those engineers who engage in professional activities that may affect public health and safety. To be licensed, an engineer must earn the designation Professional Engineer (PE). While an "industrial exemption" covers many who are employed by industry, many engineers working for companies that deal with health and safety issues (e.g. utilities companies) find it advantageous to be registered as PE's. The PE designation is particularly important for those engineers serving as consultants or technical witnesses in court, where matters of public safety are an issue. Information concerning the advantages of registration can be obtained from the National Society of Professional Engineers (NSPE) at **http://www.nspe.org/**

Registration standards are set and governed by each state. In Wisconsin, this is handled by the Department of Regulation & Licensing. The Examining Board in Wisconsin uses exams from the National Council of Examiners for Engineering and Surveying (NCEES) (see **http://www.ncees.org/**). The NCEES exams are also used by all U.S. states and territories, so obtaining registration in another state does not normally require retaking the exam.

The first step toward registration is to apply to take the Fundamentals of Engineering (FE) exam. This exam focuses on the material you learned in your undergraduate degree program and is held twice per year, once every April (register by mid-January) and October (register by mid-July). To register for the exam online, go Section 2a on the Wisconsin Department of Regulation and Licensing Website (**http://drl.wi.gov/prof/engi/cred.htm**). Satisfactory completion of the FE exam and graduation with a BS in engineering (or equivalent) earns the applicant the Engineer-in-Training (EIT) certification. After four years of training and practical experience, the Engineer-in-Training is eligible to take the Principles and Practice of Engineering exam (and a short exam on Barrier Free Design). Passing these exams then qualifies the applicant for registration as a PE.

The Fundamentals of Engineering exam consists of 180 multiple-choice questions in Mathematics, Engineering Probability and Statistics, Chemistry, Computers, Ethics and Business Practices, Ethics and Business Practices, Engineering Mechanics (Statics and Dynamics), Strength of Materials, Material Properties, Fluid Mechanics, Electricity and Magnetism, and Thermodynamics. It is not expected that every applicant will be knowledgeable in all areas; however, an adequate breadth and mastery of the material is needed in order to pass the exam. The Principles and Practice of Engineering exam consists of 80-100 multiple-choice questions tailored to the specific engineering disciplines (e.g. civil, mechanical, and electrical). Electrical and computer engineers choose an exam in one of three sub-disciplines; computer engineering, power engineering, or electrical and electronics engineering. Information booklets and sample exam questions can be ordered from NCEES.

PE registration is not mandatory for every engineering position. In fact, most electrical and computer engineering graduates go to work for private industry, government, or other employers without taking any of the steps toward registration. However, if registration is important in the type of engineering work in which you wish to be engaged, it is wise to carefully choose the engineering electives in your program so that you will not have difficulty passing the exams. If you are not certain whether you will need registration later, you may wish to take the appropriate steps now rather than studying for the exams 10 years from now!

XII. SENIOR-GRADUATE STATUS

http://www.wisc.edu/grad/education/acadpolicy/guidelines.html#160
http://grad.wisc.edu/catalog/admis.html#sengrad

Senior-graduates are UW-Madison undergraduate seniors who are within 1-6 credits of completing the requirements for a bachelor's degree and enroll in the Graduate School simultaneously. The student applies through the normal Graduate School process and must meet minimum admission requirements. In addition, the student must submit a senior-graduate form that verifies courses/credits needed to complete the bachelor's degree. The admitting department/program must recommend admission in full standing. Senior-graduates may not be admitted on probation (GPA below 3.0). The Senior-Grad Request Form by contacting the Graduate School Office of Admissions, 228 Bascom Hall, (608) 262-0735.

Senior-grads must follow the undergraduate enrollment guidelines to be considered full-time student. In other words, senior-grads must enroll in 12 credits minimum per semester. All senior-graduates pay graduate fees and are eligible for teaching assistantship or project assistantship appointments, including tuition remission. However, they are not eligible for fellowships or research assistantships.

Courses taken as a senior-grad will be noted on the student's undergraduate transcript. All grade points earned as a senior-graduate are counted in the computation of the cumulative undergraduate grade-point average. Graduate credit will be awarded only if the requirements for the bachelor's degree are completed by the end of the semester of senior-graduate enrollment. Failure to earn the bachelor's degree within one semester will result in termination of senior-graduate status and loss of credits toward the graduate degree. The student will be granted graduate standing the semester following receipt of the bachelor's degree.

Application for senior-graduate status is made at time of application to Graduate School. For more information, contact the Graduate School Office of Admissions and Academic Services, 228 Bascom Hall, 262-2433.

Senior-Grad Frequently Asked Questions

Q: What are the eligibility requirements to be a senior-grad?

A: To be eligible for the senior-grad status, you must be a UW-Madison undergraduate student within 1-6 credits of completing the requirements for your bachelor's degree.

Q: Do I need permission from an advisor before applying to be a senior-grad?

A: While meeting with an advisor would be a good idea to verify that you indeed are within 1-6 credits of completing your bachelor's degree; permission from an advisor is not required to apply to the program.

Q: How do I apply to be a senior-grad?

A: Students apply though the normal Graduate School process and must meet the minimum admission requirements. In addition, the student must submit, at the time of application, a senior-grad request form that verifies courses/credits needed to complete the bachelor's degree. The admitting department/program must recommend admission in full standing. Senior-grads may not be admitted on probation.

Q: Where can I get the senior-grad request form?

A: You can get the senior-grad request form by contacting the Graduate School Office of Admissions, 228 Bascom Hall, 608/262-0735.

Q: How many credits do I need to enroll in as a senior-grad to be considered a full time student?

A: Senior-grads must follow the undergraduate enrollment guidelines to be considered full time students. In other words, senior-grads must enroll in 12 credits to be considered a full time student.

Q: Am I charged undergraduate tuition and fees or graduate tuition and fees as a senior-grad?

A: All senior-grads pay graduate tuition and fees. Current graduate tuition and fees can be obtained from the Office of the Registrar (**http://registrar.wisc.edu/students/fees_tuition/tuition.php**).

Q: As a senior-grad am I eligible for any funding?

A: Senior-grads are eligible for teaching assistantship or project assistantship appointments, including tuition remission. They are not eligible for fellowships or research assistantships.

Q: Is there an official notation somewhere to prove that I am/was a senior-grad?

A: Yes, a senior-grad notation is made on a senior-grad's undergraduate transcript.

Q: Are the courses I take as a senior-grad noted on my undergraduate transcript or my graduate transcript?

A: Courses taken as a senior-grad will be noted on a senior-grad's undergraduate transcript. All grade points earned as a senior-grad are counted in the computation of the cumulative undergraduate grade-point average. Graduate credit will be awarded only if the requirements for the bachelor's degree are completed by the end of the semester of senior-grad enrollment. Failure to earn the bachelor's degree within one semester will result in termination of senior-grad status and loss of credits toward the graduate degree. The student will be granted graduate standing the semester following receipt of the bachelor's degree.

Q: When should I apply for undergraduate graduation in my Student Center? Are they any special requirements?

A: The term that you select as your undergraduate graduation term in your Student Center should be the term that you will complete your undergraduate degree requirements. There are no special requirements.

Q: Where can I get more information if I have additional questions?

A: If you have additional questions, please contact the Graduate School Office of Admissions and Academic Services, 228 Bascom Hall, 262-2433.

XIII. GRADUATE STUDIES

http://www.wisc.edu/grad/
http://www.wisc.edu/grad/catalog
http://www.grad.wisc.edu/education/mas/toc.html
http://www.engr.wisc.edu/ece/prospective/grad/admission.html

Students interested in pursuing a graduate degree are encouraged to discuss this with their faculty advisors and/or an academic advisor in the South Student Services Center (2304a Engineering Hall). More information on UW-Madison graduate studies and graduate financial support (including fellowships) can be found by visiting the links listed above.

XIV. ELECTRICAL ENGINEERING (EE) CURRICULUM

Unless the ECE department provides information to the contrary, **the curriculum you should follow is the one in effect during your first semester in the ECE Department.** Exceptions to this rule may occur in the case of students who are readmitted. The program you follow must be based on the *Advising Information* booklet for **your curriculum** (please note that this may not be the most recent edition of the *Advising Information* booklet).

The Electrical Engineering (EE) undergraduate curriculum ensures sufficient breadth and depth in EE, engineering at large, science, mathematics, as well as non-technical subjects. Course requirements within the EE program can be divided into two levels. The first level consists of courses that every EE student must complete. These courses form the EE Core, consisting of eight classroom courses and four labs. They form a common basis upon which successive courses are built. The second level is comprised of EE Advanced Electives and EE Laboratories. At this level, there are some general choices to be made corresponding to your interests, but within certain constraints. You are required to take at least one course from each of three groups; the three are selected from a list of six. You must also take two labs. To aid you in making these decisions, descriptions of eight areas of specialization within the EE curriculum are included in this booklet in Section 8. Area recommendations on course selection appear throughout this section.

Few students know exactly which areas they wish to emphasize when they begin the EE curriculum. It is important that you begin thinking about your choice early so that you can take full advantage of your electives in developing a coherent program. Through exposure to the required courses and consultation with your advisor, you should choose one or two areas by your senior year. In addition to ECE courses, students must take courses in Mathematics, Science, Communication Skills, and Liberal Studies. Guidelines for the choice of these courses can be found later in this section. In the EE curriculum, credit requirements are distributed as follows:

Requirement	Credits
Mathematics	22
Science	28
Liberal Studies	16
EE Core	29
EE Advanced Electives	19
EE Laboratories	2
Communication Skills	5
	121

Upon close examination of the EE curriculum, one may note that some courses can be applied to more than one requirement. For example, Math 431 can be used as the Probability/Statistics course, or it can be used as the Math/CS course. In fact, it is quite acceptable to split a course between two categories. For example, 3 credits of the 4-credit course Stat 311 may be used the Probability/Statistics course, while the remaining credit may be applied to the Science category Nevertheless, you are **not** allowed to "double-count" credits toward the BSEE degree (i.e., no credit may count simultaneously to satisfy two different requirements. Credits may be double-counted, however, for a second major in Letters and Sciences.

Sometimes a student may wish to make a course substitution in order to enhance a specific aspect of his or her program. If the student can demonstrate that such a request is well-founded, a substitution can often be made, but it must be approved by the Associate Chair for Undergraduate Activities. Such a request is also subject to review by a series of departmental and college committees.

Mathematics Requirements (22 credits)

DARS Category	ECE Requirement	Credit Requirement	Course
1) Calculus	Calculus I	3 semesters required	Math 221 (5 cr.) OR Math 275 (5 cr.)
1) Calculus	Calculus II		Math 222 (5 cr.) OR Math 276 (5 cr.)
1) Calculus	Calculus III		Math 234 (3 cr.) OR Math 375 (5 cr.)[2]
2) Advanced Math Elective	Differential Equations	3 cr.	Math 319 (3 cr.) OR Math 320 (3 cr.) OR Math 376 (5 cr.)[2]
3) Adv. Math/CS Elective	Advanced Math/CS	3 cr.	Math 300 – Math 699[3] OR CS 354 (3 cr.) OR CS 367 (3 cr.) OR CS 536 (3 cr.) OR CS 537 (3-4 cr.) OR CS 540 (3 cr.)
4) Probability/Statistics Elective	Probability/Statistics	3 cr.	ECE 331 (3 cr.) OR Math 431 (3 cr.) OR Stat 311 (4 cr.) OR Stat 424 (3 cr.)[4] OR Stat 426 (3 cr.)[5]
TOTAL CREDITS		**22 cr.**	

[2] Students taking Math 375 will not receive credit for Math 234, Math 320, or Math 340. If a student takes Math 375, **but not** Math 376, 2 credits of Math 375 will be applied to Other Science/Engineering Electives. If a student takes Math 375 **and** Math 376, you will automatically fulfill the Advanced Math Elective requirement and the Advanced Math/CS Elective requirement with the remaining credit applied to Other Science/Engineering Electives requirements.
[3] Math 376, Math 473, and Math 490 are not allowed.
[4] Stat 224 is a prerequisite for Stat 424. Stat 224 can be applied to Other Science/Engineering Electives requirements.
[5] Stat 224 is a prerequisite for Stat 426. Stat 224 can be applied to Other Science/Engineering Electives requirements.

Area Mathematics Recommendations

The following table lists mathematics course recommendations by area of specialization. Courses should be selected carefully, since some are prerequisites for advanced electives. Entries are ranked as: (1) strongly recommended, (2) recommended, or (3) useful. Additional information is available from faculty advisors in each area.

*Note: Students may receive credit for only **one** of the following three courses: Math 320, Math 340, and Math 375.*

Area	Advanced Math	Advanced Math/CS	Probability/Statistics
Automatic Control Systems	(1) Math 319	(1) Math 340 (2) Math 521	(1) ECE 331 (2) Math 431
Biomedical Engineering	(1) Math 320	(1) Math 431	(1) ECE 331 (2) Stat 311
Communications & Signal Processing	(1) Math 319	(1) Math 340 (2) Math 521, 443 (3) Math 541, 419	(1) ECE 331
Electric Machines & Power Electronics	(1) Math 320 (2) Math 319	(1) Math 340 (2) Math 321 (3) Math 443	(1) ECE 331 (2) Math 431
Electromagnetic Fields & Waves	(1) Math 319	(1) Math 340, 321, 322 (2) Math 521, 522, 623 (3) Math 431	(1) ECE 331 (2) Math 431
Plasmas & Controlled Fusion	(1) Math 319	(1) Math 321, 322, 340 (2) Math 431, 419 (3) Math 623	(1) ECE 331 (2) Math 431
Power Systems	(1) Math 320 (2) Math 319	(1) Math 340 (2) Math 419, 443 (3) Math 431	(1) ECE 331 (2) Math 431
Solid-State Electronics & Photonics	(1) Math 319	(1) Math 340, 321, 322 (2) Math 419, 431, 443, 521	(1) ECE 331 (2) Math 431

Science Requirement (28 credits)

DARS Category	ECE Requirement	Credit Requirement	Course	Alternative Courses	Alternative Courses
1) Computer Science	Computer Science	6 cr.	CS 302 (3 cr.)		
1) Computer Science	Computer Science		CS 412 (3 cr.)		
2) Physics	Mechanics	13 cr.	Physics 201 (5 cr.)[6]	EMA 201 (3 cr.) **AND** EMA 202 (3 cr.)[6]	EMA 201 (3 cr.) **AND** ME 240 (3 cr.)[6]
2) Physics	Physics		Physics 202 (5 cr.)		
2) Physics	Physics		ECE 235 (3 cr.)		
3) Chemistry	Chemistry	5 cr.	Chem 109 (5 cr.)	Chem 103 (4 cr.) **AND** Chem 104 (5 cr.)	
4) Other Science/ Engineering Electives	General Science	0-4 cr.	Students must choose courses from any of the following categories to bring the total number of Science credits to at least 28: (1) Courses having a Timetable designation of B, N, or P[6] (Biological, Natural, or Physical Science) that are **NOT** offered by, or crosslisted with, ECE. (2) Math 240 or Math course numbered 300-699. (3) Stat 224[7] or Stat 311[8] (4) College of Engineering courses 200-699 that are **NOT** offered by, or crosslisted with, ECE, EPD, or PRO OR. (5) CS 354, InterEgr 160, GLE 171, or ISyE 191.		
TOTAL CREDITS		**28 cr.**			

[6] Physics 201 and EMA 202 cannot both be taken for degree credit. Physics 201 and ME 240 cannot both be taken for degree credit.

[7] If a student elects to take either Stat 424 or Stat 426 for their Probability/Statistics Elective requirement, they will need to take Stat 224 as a pre-requisite. Stat 224 will be counted towards the Other Science/Engineering Elective requirement.

[8] If a student elects to take Stat 311 for their Probability/Statistics Elective requirement, three credits will be counted towards the Probability/Statistics requirement and one credit will be counted towards the Other Science/Engineering Elective requirement.

EE Core Requirement (29 credits)

DARS Category	ECE Requirement	Credit Requirement	Course
1) Electrodynamics	EE Core	6 cr.	ECE 220 (3 cr.)
1) Electrodynamics	EE Core		ECE 320 (3 cr.)
2) Circuits	EE Core	10 cr.	ECE 230 (4 cr.)
2) Circuits	EE Core		ECE 335 (3 cr.)
2) Circuits	EE Core		ECE 340 (3 cr.)
3) Systems	EE Core	8 cr.	ECE 252 (2 cr.)[9]
3) Systems	EE Core		ECE 330 (3 cr.)
3) Systems	EE Core		ECE 352 (3 cr.)
4) Laboratory	EE Core	5 cr.	ECE 170 (1 cr.)
4) Laboratory	EE Core		ECE 270 (1 cr.)
4) Laboratory	EE Core		ECE 271 (1 cr.)
4) Laboratory	EE Core		ECE 370 (2 cr.)
TOTAL CREDITS		**29 cr.**	

[9] ECE 252 fulfills the Introduction to Engineering part of the COE General College Requirements

Advanced Electives (19 credits)

Choose EE advanced elective courses to provide at least 19 credits. An important component of advanced study in EE is the introduction of the student to engineering design. Hence, in addition to ordinary degree credits, each advanced elective course is assigned a certain number of "design credits." This number quantifies the amount of design experience obtained by taking the course. Normally, courses are chosen from the EE advanced electives table on the following page(s). The courses you choose must satisfy the following five conditions:

1) There must be at least one course from three of the six groups listed on the next page. Please note that ECE 321, 354, 376, and 377 are excluded from this list. (ECE/CS 354 may be used as part of the Science Requirement).

2) At least 9 degree credits must be in courses numbered 400 and above.

3) A capstone design course (i.e., a course with at least 2 or more design credits must be taken. Capstone design courses are designated on the next page. ECE 399 (Independent Study), ECE 699 (Advanced Independent Study), and ECE 489 (Honors in Research) may **not** be used to satisfy this requirement; however ECE 491 (Senior Design Project) may be used.

4) The total number of design credits must be at least 6.5.

5) At least 15 of the 19 degree credits must be taken at UW-Madison.

A course not appearing on the EE advanced electives table is admissible only under the following eight rules:

1) You may use at most one degree credit from ECE 301-317. No design credit is earned in this case.

2) You may apply credits in ECE 379, 601, and 602 (Special Topics in Electrical and Computer Engineering) toward advanced electives. These credits may be used toward your degree, even if more than one course is taken with the same numerical designation (except when course content is repeated.) For example, ECE 601 may be taken more than once, as long as the subject matter in the course is different each time.

3) If your cumulative GPA is at least 2.5, you may register for ECE 399 and/or ECE 699 and apply up to 6 degree credits toward the EE advanced elective requirement. The faculty member supervising the Independent Study course assigns design credits. (You must submit an Application for Independent Study Credit, applications available in 2304a EH or on the ECE Website, prior to the semester in which the course is taken.)

4) If your cumulative GPA is at least 3.5, you may register for ECE 489 (Honors in Research) and apply up to 6 degree credits toward the requirement. In this case, the faculty member supervising the course assigns design credits. (You must submit an Application for Independent Study Credit, applications available in 2304a EH or on the ECE Website, prior to the semester in which the course is taken.)

5) If your cumulative GPA is at least 2.5, you may register for ECE 491 and apply 3 degree credits and 2 design credits toward the requirement. (You must submit an Application for Independent

Study Credit, applications available in 2304a EH or on the ECE Website, prior to the semester in which the course is taken.)

6) You may use one degree credit of ECE 001 (Cooperative Education Program). No design credit is earned in this case.

7) EE students pursuing a Certificate in Japanese Studies earn three credits of undesignated advanced electives for successful completion of EPD 375 (Intermediate Technical Japanese II).

8) You may apply other courses to this category only with the approval of your faculty advisor. These courses must have a clear pertinence to your selection of advanced courses in ECE. Substitute courses are assigned no design credit.

Selection of EE Advanced Electives is a matter of major importance; it should be done in consultation with your faculty advisor. Since not all advanced courses are offered every semester, you are advised to plan ahead and to begin taking some of these courses prior to your final year. For a schedule of advanced courses, see the handout "ECE Department *Tentative* Course Offerings," available online (http://www.engr.wisc.edu/ece/current/) or in the South Student Services Center (2304a Engineering Hall).

By the deadline corresponding to your graduation date, you must submit an EE Advanced Elective and Laboratory Approval form, signed by your faculty advisor, to the South Student Services Center (2304a Engineering Hall).

EE Advanced Electives

Group 2: Fields and Waves	Degree Credits	Design Credits	Capstone Course?
420	3	1	
434	3	1	
440	3	1	
444	3	1	
525	3	0.5	
527	3	0.5	
528	3	1	
536	3	1	
546	2-3	1	
547	3	2	Yes
561	3	0	
562	3	0.5	

Group 3: Systems and Control	Degree Credits	Design Credits	Capstone Course?
332	3	1	
334	3	1	
409	4	3	Yes
415	3	1	
417	3	1	
439	3	2	Yes
461	3	1	
520	3	0	
577	4	3	Yes

Group 4: Power and Machines	Degree Credits	Design Credits	Capstone Course?
355	3	1	
356	3	0.5	
411	3	1	
412	3	2	Yes
427	3	1	
504	2-3	1	
511	3	1	
512	3	2	Yes

Group 5: Communications and Signal Processing	Degree Credits	Design Credits	Capstone Course?
331	3	1	
431	3	2	Yes
432	3	2	Yes
435	3	0	
436	3	2	Yes
437	3	2	Yes
438	1	1	
447	3	2	Yes
455	3	2	Yes
531	3	2	Yes
532	3	2	Yes
533	3	2	Yes
534	3	1	
535	3	1	
537	3	2	Yes
539	3	2	Yes
641	3	0	

Group 6: Circuits and Devices	Degree Credits	Design Credits	Capstone Course?
342	3	1	
401	3	1	
445	3	1	
462	3	2	Yes
466	3	0.5	
541	3	2	Yes
542	3	2	Yes
543	3	3	Yes
544	3	0	
545	3	2	Yes
548	3	2	Yes
549	3	2	Yes
555	3	2	Yes

Group 7: Computers/ Computing	Degree Credits	Design Credits	Capstone Course?
353	3	1.5	
CS 367	3	0	
453	4	3	Yes
463	3	1	
468	4	3	Yes
551	3	2	Yes
552	3	1.5	
553	3	2	Yes
554	4	3	Yes
556	3	2.5	Yes

Area Advanced Elective Recommendations

The following table lists EE Advanced Elective course recommendations by area of specialization. Courses should be selected carefully, since some are prerequisites for other advanced electives. Entries are ranked as: (1) strongly recommended, (2) recommended, or (3) useful. Additional information is available from faculty advisors in each area.

Area	**Recommendations**
Automatic Control Systems	(1) 332, 334, 409, 417 (2) 342, 353, 355, 411, 412, 439, 462, 468, 520
Biomedical Engineering	Computers: (1) 342, 353, 436, 453, 462, 463, 468, 552 Devices: (1) 342, 353, 436, 453, 462, 463, 468 Models: (1) 332, 334, 342, 415, 436, 461
Communications and Signal Processing	Communications Systems: (1) 331, 431, 436, 437 , 438 (2) 332, 432, 531, 533, 537, 539 Communication Hardware: (1) 331, 431, 436, 437, 438 (2) 342, 420, 432, 444, 447, 453, 535 Signal Processing: (1) 331, 431, 432, 436; (2) 332, 353, 437, 438, 531, 532, 533, 539
Electrical Machines and Power Electronics	(1) 342, 355, 411, 412, 511, 512 (2) 332, 334, 417, 453, 468 (3) 420, 436
Electromagnetic Fields and Waves	(1) 420, 434, 440, 444 (2) 342, 436, 445, 447, 466, 525, 534, 545, 546, 547
Plasmas and Controlled Fusion	(1) 420, 440, 525, 527 (2) 436, 444 (3) 445
Power Systems	(1) 332, 342, 355, 412, 427, 511 (2) 334, 411, 415, 468 (3) 420, 453
Solid-State Electronics and Photonics	Solid-State Electronics: (1) 342, 420, 445, 466, 548, 549 (2) 353, 412, 440, 447, 535, 546, 555, 562 Photonics: (1) 420, 434, 436, 440, 533, 534, 546 (2) 342, 431, 440, 466

Laboratory Requirement (2 credits)

First, choose one course numbered ECE 301-317. Then choose a second course from the same list, or use one credit of an advanced lab ECE 409, 432, 438, 453, 468, 504, 512, 545, 549, 554, or 577. If you apply one credit of an advanced lab toward this requirement, you may still apply all design credits associated with the lab toward the EE advanced elective requirement.

Area Laboratory Recommendations

The following table lists Laboratory course recommendations by area of specialization. Entries are ranked as: (1) strongly recommended, (2) recommended, or (3) useful. Additional information is available from advisors in each area.

Area	Recommendations
Automatic Control Systems	(1) 315 (2) 306, 308, 313, 317 (3) 305
Biomedical Engineering	(1) 306, 308, 312, 315, 317
Communication and Signal Processing	(1) 313 (2) 301, 315, 317 (3) 308, 314
Electric Machines and Power Electronics	(1) 304 (2) 308 (3) 305
Electromagnetic Fields and Waves	(1) 301 (2) 305, 314
Plasmas and Controlled Fusion	(1) 310, 314, 316 (2) 301
Power Systems	(1) 304 (2) 301, 313
Solid-State Electronics and Photonics	(1) 301, 305, 306, 308, 313, 317

Communication Skills (5 credits)

DARS Category	ECE Requirement	Credit Requirement	Course
1) Basic Communications (Communications Part A Requirement)[10]	Communication Skills	2 cr.	Com Arts 100 (3 cr.) OR English 100 (3 cr.) OR English 118 (3 cr.) OR EPD 155 (2 cr.) OR Life Sciences Com 100 (3 cr.)
2) Professional Expression	Communication Skills	3 cr.	EPD 397 (3 cr.)
TOTAL CREDITS		**5 cr.**	

[10] Students are expected to satisfy the Communications Part A requirement prior to admission to the CMPE program. Students may be exempted from the Communications Part A requirement by approved college coursework while in high school, AP test scores, or placement testing. Exemption does **NOT** reduce the total 124-credit requirement for the BSEE degree.

Liberal Studies Requirement (16 credits)

http://www.wisc.edu/pubs/ug/07engineering/liberal.html

The College of Engineering requires one semester's worth (approximately 16 credits) of liberal elective courses in humanities and social studies for graduation. The college specifies that students should obtain both **breadth** (i.e., both social studies and literature or humanities), and **depth** (i.e., more than one course in at least one area).

The college has established general liberal elective guidelines that have been adopted by all departments, some of which have additional stipulations. Please see the fourth subrequirement (listed below) for the additional subrequirement required for all EE and CMPE students.

As a graduation requirement, and to fulfill campus general education guidelines, all engineering undergraduate students must take 16 credits of liberal electives (15 in curricula requiring 120 credits). These credits must fulfill the following subrequirements:

I. A minimum of two courses from the same department or program. At least one of these two courses must be above the elementary level. (i.e., must have I, A, or D level designator), as indicated in the Schedule of Classes (*Timetable).*

II. A minimum of 6 credits designated as humanities (H or L or Z credit), and an additional minimum of 3 other credits designated as social studies (S or Z). Foreign language courses count as H credits[11].

III. At least three credits in courses designated as ethnic studies (lower case "e" in the Schedule of Classes [*Timetable*]). These credits may help satisfy subrequirements I or II as well, but they count only once toward the total required.

IV. No more than 3 liberal elective credits may be from the School of Business or from classes crosslisted with the School of Business.

[11] **Exception:** "Retrocredits," which are credits awarded by foreign language departments for successful completion of a higher level course, do not count toward this subrequirement, nor toward the total credits required (15 or 16). They are still helpful: If a student takes even one foreign language course at the intermediate level and is awarded retrocredits, then subrequirement I above is satisfied because the student is judged to have achieved "depth" in liberal studies.

Curriculum Checklist

Course requirements for the BSEE degree are summarized in the following table. Note that this information complements both the flow chart at the beginning of this handbook and your DARS report. You should fill in the table at the end of each semester or session and bring it with you whenever you see your advisor.

Mathematics	**Credits**	**Grade**
Math 221	5	
Math 222	5	
Math 234	3	
Adv. Math Elective	3	
Adv. Math/CS	3	
Probability/Statistics	3	
Subtotal	**22**	

Science	**Credits**	**Grade**
Physics 201	5	
Physics 202	5	
ECE 235	3	
CS 302	3	
CS 412	3	
Chem 109	5	
Science/Eng. Elect.	0-4	
Subtotal	**28**	

Liberal Studies	**Credits**	**Grade**
Subtotal	**16**	

Comm Skills	**Credits**	**Grade**
Comm A		
EPD 397	2	
Subtotal	**5**	

EE Core	**Credits**	**Grade**
ECE 170	1	
ECE 220	3	
ECE 230	4	
ECE/CS 252	2	
ECE 270	1	
ECE 271	1	
ECE 320	3	
ECE 330	3	
ECE 335	3	
ECE 340	3	
ECE/CS 352	3	
ECE 370	2	
Subtotal	**29**	

EE Adv. Electives	**Credits**	**Grade**
ECE		
ECE		
ECE		
ECE		
ECE		
ECE		
ECE		
Subtotal	**19**	

EE Labs	**Credits**	**Grade**
ECE	1	
ECE	1	
Subtotal	**2**	

Total Credits: 121

Eight Semester Plan[12]

The following table describes one possible plan for graduation with a BSEE degree in eight semesters.

FRESHMAN I	Credits
Math 221	5
Chem 109	5
ECE/CS 252	2
Comm A	2
	14

FRESHMAN II	Credits
Math 222	5
Physics 201	5
CS 302	3
Liberal Studies	3
	16

SOPHOMORE I	Credits
Math 234	3
Physics 202	5
ECE 170	1
ECE/CS 352	3
Liberal Studies	4
	16

SOPHOMORE II	
Adv. Math Elective	3
ECE 220	3
ECE 230	4
ECE 270	1
Liberal Studies	3
	14

JUNIOR I	
EPD 397	3
ECE 235	3
ECE 271	1
ECE 320	3
ECE 330	3
ECE 340	3
	16

JUNIOR II	
Probability/Statistics	3
Adv. Math/CS	3
ECE 335	3
EE Advanced Elect.	4
EE Lab	1
	14

SENIOR I	
CS 412	3
ECE 370	2
EE Advanced Elect.	3
EE Advanced Elect.	3
EE Lab	1
Liberal Studies	3
	15

SENIOR II	
Science/Eng. Elect.	4
Liberal Studies	3
EE Advanced Elect.	3
EE Advanced Elect.	3
EE Advanced Elect.	3
	16

[12] Some ECE Advanced Electives are not offered every semester; therefore, this plan may require modification in the last three semesters. See the handout "ECE Department Tentative Course Offerings," available online (**http://www.engr.wisc.edu/ece/current**) or in the South Student Services Center (2304a Engineering Hall), for more information.

Nine Semester Plan[13]

Some students prefer to progress through the curriculum at a slower rate due to course intensity, study abroad experiences, or participation in a co-op. In addition, many students choose to earn an additional major from the College of Letters and Science (e.g., Computer Science), requiring additional course work. Below is a suggested nine-semester plan.

FRESHMAN I	Credits	**FRESHMAN II**	Credits	**SOPHOMORE I**	Credits
Math 221	5	Math 222	5	Math 234	3
Chem 109	5	Physics 201	5	Physics 202	5
CS 302	3	ECE/CS 252	2	ECE 170	1
Comm A	2	Liberal Studies	3	Liberal Studies	4
	15		15		13
SOPHOMORE II		**JUNIOR I**		**JUNIOR II**	
Adv. Math Elective	3	EPD 397	3	Probability/Statistics	3
ECE 220	3	ECE 235	3	ECE 330	3
ECE 230	4	ECE 271	1	ECE 335	3
ECE 270	1	ECE 320	3	Adv. Math/CS	3
ECE/CS 352	3	ECE 340	3		12
	14		13		
SENIOR I		**SENIOR II**		**SENIOR III**	
ECE 370	2	EE Advanced Elect.	3	CS 412	3
Liberal Studies	3	EE Advanced Elect.	3	EE Advanced Elect.	3
EE Advanced Elect.	3	EE Advanced Elect.	4	EE Lab	1
EE Advanced Elect.	3	EE Lab	1	Liberal Studies	3
Sci/Eng. Electives	2	Liberal Studies	3	Sci/Eng. Electives	2
	13		14		12

[13] Some ECE Advanced Electives are not offered every semester; therefore, this plan may require modification in the last three semesters. See the handout "ECE Department Tentative Course Offerings," available online (**http://www.engr.wisc.edu/ece/current**) or in the South Student Services Center (2304a Engineering Hall).

Areas of Specialization in Electrical Engineering

The EE curriculum provides broad elective opportunities for students to specialize in one or more areas of particular interest. Students should begin to plan the area or areas they would like to pursue at least two years prior to graduation.

Brief descriptions of the general areas within EE are given below. Faculty in each area and references for introductory reading are also included.

Automatic Control Systems

Faculty: Barmish, Cobb, DeMarco, Dobson, Hiskens, Sethares

Description: Control engineers are concerned with the problem of controlling modern, complex, interrelated systems that arise in a large variety of applications. Control is considered "automatic" when it is achieved through the use of feedback. Under this scheme, physical variables are regulated by a "compensator", which can range anywhere from a simple analog circuit to a powerful on-board digital computer.

Numerous examples of feedback control can be found, for example, in the home. Every refrigerator, oven, furnace, and water-heater requires feedback regulation of temperature. These are relatively simple control systems. More advanced systems can be found in industry, involving the regulation of position, speed, temperature, pressure, thickness, composition, color, and viscosity. Control theory can be applied to the control of aircraft, ships, trains, and other vehicles. The electric power industry uses automatic control because of the complex relationships between scores of physical variables intrinsic to power generation and distribution. Feedback is commonly applied to robotic automation problems in factories and warehouses. Other applications include chemical processing, traffic-flow, inventory regulation, biomedical, and economic systems.

Clearly, automatic control is a fundamental aspect of our modern world

References: Students interested in Automatic Control will find a variety of timely articles in the periodical *Control Systems Magazine*, published by the Control Systems Society of the Institute of Electrical and Electronic Engineers. These articles are intended for a general engineering audience and cover a broad range of control system applications and design methods. *Control Systems Magazine* is available on the periodical racks on the first floor of Wendt Library.

The textbooks used in ECE 332 (Feedback Control Systems) also provide introductory information outlining the nature and application of control theory. The following books are commonly used:

1) R. C. Dorf, R. H. Bishop, *Modern Control Systems*, Ninth Edition, Addison-Wesley, 1998.
2) B. C. Kuo, *Automatic Control Systems*, Seventh Edition, Prentice-Hall, 1995.

Biomedical Engineering

Faculty: Cerrina, Hagness, Hu, Jiang, Milenkovic, Nowak, Sayeed, Sethares, Van Veen, van der Weide

Description: Biomedical Engineering is the application of the tools of mathematics and the physical sciences to biological and medical problems. Within the Department of Electrical and Computer Engineering, Prof. Tompkins works in the area of computers in medicine and microprocessor-based medical instrumentation. Prof. Webster develops sensors, electrodes, amplifiers, and other devices in the medical instrumentation area. Prof. Lal develops silicon-based micromachines, surgical tools and microfluidic pumps, valves, and ultrasonic resonators for drug delivery. Prof. Milenkovic does speech signal processing.

You can consult the appropriate professor for additional information and personal advice on any proposed biomedical engineering program. You may be able to simultaneously fulfill the premedical requirements (premedical requirements at UW-Madison are listed online at: **http://www.med.wisc.edu/education/admissions/requirements.php**) while earning your BSEE degree. There are also separate degrees BS BME, MS BME, and PhD BME (see **http://www.engr.wisc.edu/bme/).**

References: Many books on this subject are available in Wendt Library, located in sections QH through RM, or placed on reserve for the ECE Biomedical Engineering courses ECE 312, 461, 462, and 463.

Communications and Signal Processing

Faculty: Boston, Bucklew, Draper, Gubner, Hu, Milenkovic, Nowak, Sayeed, Sethares, Van Veen

Description: The representation and manipulation of signals is fundamental to communications and signal processing. Communications is concerned with principles and techniques for using signals to transmit information, so that it can be received intact, despite the presence of noise and distortion. Signal processing concerns principles and techniques for extracting information from signals to gain an understanding of the underlying physical phenomena.

Examples of communication systems include AM and FM radio, television, wireless telephones, and the Internet. Messages to be transmitted include audio signals, video signals, and data. These messages are converted into coded signals for transmission over a physical medium. The physical medium often introduces distortion originating from effects such as dispersion, as well as noise due to sources such as lightning discharges, electrical devices, and thermal effects intrinsic to receiver electronics. Signal processing operations, often implemented with a digital computer, enhance detection and measurement of the corrupted message.

Signal processing involves the design, analysis, and implementation of algorithms for separating the desired component of a signal (i.e. containing the information of interest) from the corrupted signal. Signal processing methods extract information from a wide range of signals, including those found in biomedical, speech, image, audio, radar, sonar, optical, and seismic applications.

References:
1) S. Haykin, *Communication Systems*, Third Ed., Wiley, 1994, Chapter 1.
2) S. Haykin and B.D. Van Veen, *Signals and Systems*, Second Ed., Wiley, 2002, Chapter 1.
3) S. K. Mitra, *Digital Signal Processing: A Computer Based Approach*, McGraw-Hill, 1998, Chapter 1.

Electric Machines and Power Electronics

Faculty: Jahns, Venkataramanan

Description: Whether we realize it or not, electric machines affect our lives almost continuously. Almost all electrical energy produced today is generated by rotating electrical machines. Approximately two-thirds of this electrical energy is then used by electric motors in an incredibly wide variety of industrial, residential, and commercial applications.

Most electric motors today are directly connected to the utility grid and, as a result, rotate at constant speed. A substantial percentage of the energy used by these motors could be saved, if the machine speed were adjusted to match the changing operating conditions. Power electronics provides the means of converting electrical power from one form into another (for example, from fixed-frequency AC at 50 or 60 Hz to variable-frequency AC) to provide this desired motor speed adjustability.

Variable-speed machine drives are already having a major impact on our society, and many exciting new applications are being pursued. These include propulsion systems for electric and hybrid automobiles, high-performance servo drives for industrial robots, and combined suspension-propulsion drive systems for magnetically-levitated (Maglev) trains.

There are many other important applications of power electronics that do not involve rotating machines, such as computer power supplies, uninterruptible power supplies for critical electrical loads, and compact fluorescent lamp ballasts. There is world-wide excitement about fuel cells as a future source of electrical energy, but it should be recognized that power electronics will be needed with every fuel cell to convert its output electrical power into a useful form.

The importance of electric machines and power electronics technology in our lives is destined to grow rapidly during coming years, particularly as global concerns about energy conservation and emissions control escalate. The ECE graduate program in electric machines and power electronics is the largest in North America and is supported by an industrial consortium with over 40 member companies. The UW-Madison program is also a major participant in an NSF-sponsored Engineering Research Center that is dedicated to advancing the state-of-the-art of power electronics technology.

References for further reading:
1) B.K. Bose (Editor), *Power Electronics and Variable Frequency Drives*, IEEE Press, 1997, Chapter 1.
2) N. Mohan, T. Undeland, W. Robbins, *Power Electronics*, Second Ed., Wiley, 1995, Chapter 1.

Electromagnetic Fields and Waves

Faculty: Anderson, Behdad, Booske, Hagness, Hitchon, Scharer, Shohet, van der Weide, Wendt

Description: Electromagnetics provides basic physical and mathematical understanding of electric, magnetic, and electromagnetic field phenomena, and continues to be one of the most important and fundamental subjects in the Electrical Engineering curriculum. With the advent of very high-speed digital computers and instrumentation, electromagnetics has also become a necessary component of Computer Engineering. Indeed, electromagnetics is basic to virtually every aspect of electronic and microelectronic

circuits, energy conversion and transmission, microelectronic and photonic materials, and high frequency machine design. In recent years, electromagnetics has been applied to an increasing number of commercial products and research areas, including high speed digital circuit design and packaging, optical communications, superconducting devices, global navigation guidance systems, microwave-satellite communications systems, materials processing, biomedical imaging, biological effects of radiation, and fusion energy development. It is safe to say that new research and development related to electrical and computer applications (including their environmental and biological impact) will require an understanding of electromagnetics, as it has in the past.

References:

1) J. D. Kraus, *Electromagnetics*, Fourth Edition, McGraw-Hill, 1992.
2) L. E. Larsen, J. H. Jacobi (editors), *Medical Applications of Microwave Imaging*, IEEE Press, 1986.
3) H. B. Bakoglu, *Circuits, Interconnections, and Packaging for VLSI*, Addison-Wesley, 1990, Chapters 6 and 7.

Plasmas and Controlled Fusion

Faculty: Anderson, Hitchon, Scharer, Shohet, Wendt

Description: This area of specialization examines the behavior of a state in which more than 99% of the matter in the universe is found -- plasma. Basically, a plasma is the "fourth state of matter" after solid, liquid, and gas. A plasma is a collection of charged particles formed from a gas or solid material. The word "plasma" means "fluid", and this form of matter often behaves like one. Plasmas are found on earth in neon signs, fluorescent lamps, lightning, flames, rocket exhausts, around re-entering space vehicles, and in research laboratories, as well as in manufacturing systems. Stars are plasmas as well. One goal of engineers who study plasmas is to produce a miniature star on earth. This would be controlled thermonuclear fusion. If this is successful, the human race will have a source of energy of virtually unlimited extent, with nearly inexhaustible supplies of fuel. The fuel is in all naturally occurring water -- polluted or not.

In industry, plasmas are used for processing of materials for etching, depositing coatings, synthesizing new materials, as well as for cutting and welding and refining of base metals. It is likely that future semiconductors, for example, will have to be etched with plasmas, in order to make linewidths of less than l micron. Future ceramics, welding processes, diamond coating, and pharmaceuticals will all have plasmas as a major part of their fabrication process.

The plasma area encompasses many branches of engineering, physics, mathematics and chemistry. It is, by its very nature, interdisciplinary, and attracts students who are interested in a broadly based education. Research is conducted at UW-Madison on high temperature plasmas for fusion studies, on plasmas in the ionosphere and outer space, and on the interactions of plasmas with materials. Experiments on the production, confinement, heating, and measurement of the properties of a plasma are conducted. Students may actively participate in plasma research through independent study projects. A wide range of activities exists, based on large experimental facilities, small experiments, and theoretical work.

References:

1) F. F. Chen, *Introduction to Plasma Physics and Controlled Fusion*, Plenum, 1983.

2) J. L. Shohet, *The Plasma State*, Academic Press, 1971.
3) F. W. Crawford, “Electronic Applications of Waves in Plasmas”, *Proceedings of the IEEE*, January, 1971.
4) S. R. Seshadri, *Fundamentals of Plasma Physics*, American Elsevier Publishing Company, 1973.

5) W. C. Gough, B. N. Eastlund, "Prospects for Controlled Fusion", *Scientific American*, February, 1971.

Power Systems

Faculty: DeMarco, Dobson, Hiskens, Lesieutre, Venkataramanan

Description: Power system engineering includes siting and developing new generating plants, transmission lines, and distribution facilities, interconnecting systems, and making present and new power systems more economical and fault-free. In recent years, systems have become much larger and complex. Use has been made of advances in solid-state devices, power electronics, and integrated circuit technology. Computers have played an increasingly important role to predict system performance and to monitor system operation. Important advances in techniques for the analysis of systems have been made. New areas of development have been concerned with HVDC transmission and the interfacing with AC transmission and distribution. Of increasing concern is the design and development of systems to minimize air and water thermal pollution, while still increasing the available energy level to meet the needs of society. Nuclear plants bring additional environmental and ecological considerations. Energy management and the proper engineering of new alternative energy sources are of increasing concern.

Growth in electrical energy demand has slowed down. However, future increases are expected, as suggested measures for pollution control come into being over and above normal load growth. Cooling towers, electrostatic precipitators, waste recyclers, thermal controls, plant remote location or relocation -- to name a very few pollution control measures -- all require energy above and beyond customary demands. The only rational view as one faces the future is that a great deal of new technology is required when we commit ourselves to controlling the results of technology. Power system engineers are now busily complying with new antipollution legislation and designing systems to meet the ever-greater demands, which also economize natural resources and do not detract economically or aesthetically from the environment.

Research areas at UW-Madison include HVDC technology, real-time computer control of interconnected systems, superconducting magnetic energy storage systems, and the development of better analytical and computerized techniques for the study of very large systems.

References:
1) S. A. Nasar, *Electric Power Systems*, Schaum's Outline Series, McGraw Hill, 1990.
2) C. Flavin, A. Durning, *Building on Success: The Age of Energy Efficiency*, Worldwatch Institute, Washington, DC, 1988, Library call #TJ1638/F588/1988.

Solid-State Electronics and Photonics

Faculty: Blick, Botez, Cerrina, Hagness, Hitchon, Jiang, Knezevic, Ma, Mawst, McCaughan, Scharer, van der Weide

Description: The rapid advance of ***solid-state electronics*** on the submicron scale in the past several decades has been fueled in part by progress in the manufacturing techniques that are used. Originally developed to fabricate a variety of electronic components, these techniques are now also being used to fabricate micro-electro-mechanical devices on microchips. These devices, which include pressure and acceleration sensors for industrial and automotive applications, thermal imagers for night vision, digital mirror displays for imaging, neural probes and ultrasonic cutters for biomedical instrumentation, and many other applications, can also be integrated with circuits to form complete microsystems.

The promise of microsystems technology lies not only in the miniaturization and ease-of-use that it offers by bringing mechanical devices down to the scale of integrated circuits, but also in the ability to exploit certain physical effects that are significant only at the micro-scale. Moreover, we expect to benefit from the cost-scaling advantages that have made microelectronic systems, such as computers, so pervasive in modern society. This technology offers the means to allow computers to communicate with the real world.

In addition, nanoscale electronic structures, such as quantum wires and dots, offer an exciting testbed for probing the fundamental laws of nature, typically at very low temperatures, as well as yiled new and exciting applications in optics, biology, quantum computing etc. Micro- and nanoscale electronic systems is a very active field of research in which UW-Madison has maintained a leading program for a number of years, in close collaboration with colleagues from other departments such as Physics, Materials Science and Engineering, and Chemical Engineering.

Photonics deals with generation, transmission, and detection of light. Light is generated using devices such as the light emitting diode and the laser. Light is transmitted through the atmosphere, through optical systems composed of lenses, mirrors, and crystals, or through light pipes (i.e. optical fibers). Light is detected using such devices as photodiodes, photocells, or the photoconducting surface of a vidicon camera. The amount of light generated or transmitted is controlled using electric devices, such as electrooptic and acoustooptic modulators, electronic shutters, and scanners, and even by light itself.

Light is used as a carrier of information or energy. In optical communication, light carries information (e.g. an audio or a video signal) from a transmitter to a receiver. In laser radar, light is used to detect the presence and properties of a target. In holography, laser light is used to record three-dimensional information on a photographic film, a hologram. In metrological applications, lasers are used to locate objects. Light may be used as a carrier of energy in applications ranging from surgery to nuclear fusion.

Industrial, medical, and military applications of photonics are growing at a very rapid pace. Many new applications are likely to be found as a result of the present intensive efforts of research and development. Research areas at UW-Madison include coherent, high-power semiconductor diode lasers, surface-emitting diode lasers of the vertical-cavity type and the grating-outcoupling; LiNbO3-based electro-optic modulators and amplifiers; and X-ray lithography.

References:

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1) S. M. Sze, editor, *Semiconductor Sensors*, John Wiley, 1994.
2) M. Madou, *Fundamentals of Microfabrication*, CRC Press, 1997.
3) A. S. Sedra, K. C. Smith, *Microelectronic Circuits*, Fourth Edition, Oxford University Press, 1998.
4) P. R. Gray, R. G. Meyer, *Analysis and Design of Analog Integrated Circuits*, Third Edition, John Wiley, 1993.
5) M. Annaratone, *Digital CMOS Circuit Design*, Kluwer, 1986.

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1) A. Yariv, *Optical Electronics*, Holt, Rinehart, and Winston, 3rd ed., 1985.
2) B.E.A. Saleh, M. C. Teich, *Fundamentals of Photonics*, John Wiley, 1991.
3) L. Coldren, S. Corzine, *Diode Lasers and Photonic Integrated Circuits*, John Wiley, 1995.
4) D. Botez, D. Scifres, *Diode Laser Arrays*, Cambridge University Press, 1996.

USEFUL WEBSITES (NOT MENTIONED ELSEWHERE)

Academic Calendar	**http://www.secfac.wisc.edu/acadcal/**
Adult and Student Services	**http://www.dcs.wisc.edu/info/**
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Bursar's Office	**http://www.bussvc.wisc.edu/bursar/bursar.html**
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Child Care and Family Resources	**http://occfr.wisc.edu/**
Code of Conduct	**http://students.wisc.edu/saja/misconduct/misconduct.html**
College of Engineering Student Services	**http://studentservices.engr.wisc.edu/**
Commencement	**http://www.secfac.wisc.edu/commence/**
Computer-Aided Engineering	**http://www.cae.wisc.edu/**
Information Technology, Division of	**http://www.doit.wisc.edu/**
Innovation Days	**http://innovation.wisc.edu/**
International Student Services	**http://iss.wisc.edu/**
Job Center, UW Student	**http://jobcenter.wisc.edu/**
LGBT Campus Center	**http://lgbt.wisc.edu/**
Morgridge Center for Public Service	**http://www.morgridge.wisc.edu/index.html**
Multicultural Student Center	**http://msc.wisc.edu/msc/**
New-Student Programs	**http://www.newstudent.wisc.edu/**
Recreational Sports, Division of	**http://www.recsports.wisc.edu/**
Registrar, Office of the	**http://www.registrar.wisc.edu/**
SAFE Nighttime Services	**http://www2.fpm.wisc.edu/trans/Safeservices.asp**
Schedule of Classes	**http://registrar.wisc.edu/schedule_of_classes.htm**
Software Training for Students	**http://www.doit.wisc.edu/training/student/**
Steuber Prize for Excellence in Writing	**http://tc.engr.wisc.edu/steuber/**
Student Advocacy and Judicial Affairs	**http://students.wisc.edu/saja/index.html**
Student Financial Aid, Office of	**http://www.finaid.wisc.edu/**
Student Health Insurance Plan	**http://www.uhs.wisc.edu/home.jsp?cat_id=116**
Student Life, Division of	**http://students.wisc.edu/**
Student Shop, College of Engineering	**http://coestudentshop.engr.wisc.edu/**
Transfer Student Services	**http://www.newstudent.wisc.edu/transfer/**
Transportation Services	**http://www2.fpm.wisc.edu/trans/**
Undergraduate Catalog	**http://pubs.wisc.edu/ug/**
University Apartments	**http://www.housing.wisc.edu/universityapartments/**
University Housing	**http://www.housing.wisc.edu/**
University Police Department	**http://www.uwpd.wisc.edu/**
Veteran Services	**http://students.wisc.edu/veterans/veterans.html**
Visitor and Information Programs	**http://www.vip.wisc.edu/**
Wendt Library	**http://wendt.library.wisc.edu/**
Wisconsin Experience	**http://www.learning.wisc.edu/**
Wisconsin Union	**http://www.union.wisc.edu/**