



University of Pittsburgh
Department of Electrical Engineering

Summary of
Policies, Procedures, and Requirements
for the
Undergraduate Program

Spring 2003

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This document summarizes the current policies, procedures, and degree requirements that govern the Electrical Engineering Undergraduate Program at the University of Pittsburgh. It is the *student's responsibility* to be sure that he/she is in compliance with these policies and procedures. This material is prepared for the information of the students in the Electrical Engineering Department, and it is not intended to be a complete statement of all Department, School of Engineering, or University policies, procedures, and requirements. These policies, procedures, and requirements originate from department faculty action, administrative action, or from school and/or university policy and are subject to change at any time. The language used in this document is not intended to create a contract between the University of Pittsburgh and its students.

ADMISSIONS

Admission Criteria

A student from the Engineering Freshman Program at the University of Pittsburgh will be considered for admission into the Electrical Engineering Department if he/she satisfies the following criteria:

1. Has completed the first term of the freshman year i.e., Math 0220, Physics 0174, Engineering 0011, Chemistry 0960, plus a humanities or social science elective.
2. Has completed or is currently enrolled in the second term of the freshman year, i.e., Math 0230, Physics 0175, Engineering 0012, Chemistry 0960, plus a humanities or social science elective.
3. Has maintained a cumulative QPA of at least 2.00/4.00.

Note that the number of students admitted under these criteria is limited by the availability of space within the department.

A student from other segments of the University of Pittsburgh, including but not limited to the College of Arts and Sciences, the College of General Studies, the Regional Campuses, and other Engineering Departments, will be considered for admission into the Electrical Engineering Department if he/she satisfies the following criteria:

1. Has essentially completed the freshman year i.e., two calculus courses, two calculus-based physics courses, two chemistry courses, one "C" based computer programming course, all of which must be completed at the University of Pittsburgh.
2. Has maintained a cumulative QPA of at least 2.50/4.00.

A student who has completed part of his/her work at a community college or other college will be considered under the criteria for students from schools outside of the University of Pittsburgh as explained below.

Any other student, including those from community colleges and other schools outside the University of Pittsburgh, will be considered for admission into the Electrical Engineering Department if he/she satisfies the following criteria:

1. Has essentially completed the freshman year i.e., two calculus courses, two calculus-based physics courses, two chemistry courses, one "C" based computer programming course plus any liberal arts courses which are acceptable.
2. Has maintained a cumulative QPA of at least 2.50/4.00.
3. Is transferring from a program that has been certified for accreditation by the Accreditation Board for Engineering and Technology (ABET).

Students seeking a second degree will be considered for admission into the Electrical Engineering Department under these criteria for transfer, as is appropriate for the school or Program of record of the first degree.

Admission Dates

Dates for submission of applications for admission to the Department of Electrical Engineering are:

July 15 for the Fall Term
November 15 for the Spring Term
March 15 for the Summer Term

Transfer Credits

Transfer of credit from other institutions to the University of Pittsburgh involves at least the following three considerations:

1. The educational quality of the institution from which the student transfers.
2. The comparability of the nature, content, and level of the credits earned to those offered by the University of Pittsburgh.
3. The appropriateness and applicability of the credits earned to the programs offered by the University of Pittsburgh, in light of the student's educational goals.

Accreditation speaks primarily to the first of these considerations, serving as the basic indicator that an institution meets certain minimum standards. On this basis, transfer credits will be given for courses taken at other ABET accredited engineering programs according to the following criteria. Note that only the credits transfer. The grades do not transfer and are not included in the computation of the student's QPA at the University of Pittsburgh.

1. Non-EE courses with a C grade or better from accredited institutions that are applicable to the EE curriculum may be transferred.
2. EE courses with a C grade or better from ABET Accredited Electrical Engineering Programs may be transferred.
3. EE or EET courses taken in Electrical Engineering Technology Programs are not transferable.
4. Courses taken as a part of ABET Accredited Non-Electrical Engineering Programs may be transferable as Technical, Engineering Science, or Open Electives on a case by case basis.

The student must request a transfer of credits in writing and include a course syllabus, a copy of the catalog course description and description of prerequisites, and an official transcript from the school where the course was completed. All requests should be forwarded to the EE Undergraduate Administrator.

Special Student Status

Special student status is a category that will allow individuals who are not students in any school in the University to take courses within the Electrical Engineering Department. Although there can be a number of reasons why such cases might exist, the primary use of this status is for students who are enrolled in engineering programs at other Universities who may wish to complete one or two courses at Pitt. Applications for Special Student Enrollment are available in the Office of Administration, 253 Benedum Hall. Each of these applications is individually evaluated relative to course prerequisites, QPA, and the requirements of the student's home institution. The EE Undergraduate Coordinator will evaluate all such applications.

CURRICULUM

Electrical Engineering Curriculum

The Electrical Engineering curriculum includes the freshman engineering requirements, a core of required courses, EE electives, technical electives, humanities and social sciences electives, a communication elective, and an open elective. In addition to these requirements, each student is expected to attend the Undergraduate Seminar each term during his/her sophomore, junior, and senior years. The curriculum meets the ABET requirements for an accredited engineering degree.

A new sequence of laboratory courses has been implemented in the curriculum, effective May 2000. The new courses provide increased emphasis on digital technology and use of computers in design. Students entering the program after May 2000 take the lab sequence EE 1201, EE/COE 0501, EE 1212, at 3 credits each for a total of 9 credits, and they complete 5 EE electives. Elective requirements are described below. Students entering the program prior to May 2000 take the lab sequence EE 0046, EE 1258, EE 1268, at 2 credits each for a total of 6 credits, and they complete 6 EE electives. All students take EE 1563 (Signal Processing Laboratory). The charts on pages 4 and 5 show how these requirements can typically be fit into a four-year academic program. Students may deviate from these schedules, depending on their specific situation and interests.

Required Courses

The following are required courses in the EE curriculum.

- EE/COE 0031 Linear Circuits and Systems 1
- EE/COE 0041 Linear Circuits and Systems 2
- EE/COE 0132 Digital Logic
- EE/COE 0142 Computer Organization
- EE 0257 Analysis and Design of Electronic Circuits
- EE/COE 0501 Digital Laboratory
- EE 1201 Electronic Measurements and Circuits Laboratory
- EE 1212 Electronic Circuit Design Laboratory
- EE 1247 Semiconductor Device Theory
- EE 1259 Electromagnetics
- EE 1552 Signals and Systems Analysis
- EE 1563 Signal Processing Laboratory

Probability and Statistics Requirement

Each student must complete ENGR 0020, Probability and Statistics for Engineers.

Substitute Courses

The following University of Pittsburgh courses may be substituted for required courses in the EE curriculum.

- Chemistry 0110 and/or 0120 for Chemistry 0960 and/or 0970.
- Physics 0475 and 0476 (honors physics) for Physics 0174 and 0175.
- Physics 0160 for EE 1259.

If a student wishes to have any other course considered as a substitute for a required EE course, he/she must submit a written request to the Undergraduate Coordinator, including a course syllabus, catalog description, and description of pre-requisites.

Design Requirement

The design requirement, which involves design and implementation of a solution to a real problem, provides students with a significant and complete design experience, including problem definition, investigation of the state-of-the-art, prototype design, implementation, and evaluation. Projects require synthesis of a hardware or software structure to solve a problem, specification of how the structure can be realized, and construction of the solution. The projects allow students to apply the analysis and synthesis skills they have developed during their undergraduate coursework and to appreciate how different areas of the curriculum are related to each other. Students also gain practical experience in problem definition, laboratory skills, teamwork and inter-group communication, prototyping techniques, project scheduling, and other aspects of engineering practice that are not encountered in coursework.

Both written and oral reports are presented. Typically, the project requires:

1. A proposal - Description of the problem and design approach.
2. A schedule - Specific tasks to be accomplished with milestones identified.
3. A final report - Description and evaluation of the final design
4. A poster presentation and an oral presentation at a Senior Design Expo, held at the end of the fall and spring terms. (Only an oral presentation is required for projects completed in the summer term. However, students are encouraged to present a poster at a subsequent Expo, if possible.)

Projects can involve two terms, for example, using a design course to initiate the project and an independent study to complete it.

Several mechanisms are used to assign credit for the project, including the EE design course (EE 1896 Senior Design Course), a specialty area design course, an independent study project (EE/COE 1898), or a school-wide design course (such as ENGR 1050 Product Realization). Design topics may be suggested as part of a course, but students usually select their own projects. In most cases, students work on a team of 3-5 students.

The specialty area design courses include:

- EE/COE 1160 Embedded Computer System Design I
- EE/COE 1161 Embedded Computer System Design II
- EE/COE 1192 Introduction to VLSI Design
- EE 1391 Projects in Computer Vision
- EE 1523 Digital Filter Design
- EE 1865 Electric Vehicle Technology and Design
- EE/COE 1896 Senior Design Project
- EE/COE 1898 Engineering Project

These courses have limited enrollment.

Electives

As indicated on the Electrical Engineering Curriculum chart, there are several types of electives that the student must take. The Electrical Engineering Faculty has approved the following lists of electives. These lists are not exhaustive, and the EE Undergraduate Curriculum Committee can approve courses not on these lists.

Electrical Engineering Electives

In addition to the design requirement, each student must complete at least five additional EE Elective courses. (Students entering the program prior to May 2000 and completing the lab sequence EE 0046, EE 1258, EE 1268 must

complete six additional EE electives. EE/COE 0501, Digital Laboratory, can be taken as an elective.) These courses may be chosen from the above Design Electives or from the following list of EE Electives:

- EE/COE 1150 Introduction to Computer Networks
- EE/COE 1170 Special Topics: Computers
- EE/COE 1185 Computer System Interfacing
- EE/COE 1186 Software Engineering
- EE 1232 Introduction to Lasers and Optical Electronics
- EE 1236 Electronic Design with Integrated Circuits
- EE 1238 Digital Electronics
- EE 1240 Photonics I
- EE 1241 Photonics II
- EE 1266 Applications of Fields and Waves
- EE 1270 Special Topics: Electronics
- EE 1286 Analysis and Design of Analog Integrated Circuits
- EE 1390 Introduction to Image Processing/Computer Vision
- EE 1472 Analog Communication Systems
- EE 1473 Digital Communication Systems
- EE 1562 Digital and Analog Filters
- EE 1570 Special Topics: Signals and Systems
- EE 1580 Biomedical Applications of Signal Processing
- EE 1673 Linear Control Systems
- EE 1769 Power System Analysis I
- EE/COE 1898 Engineering Project

In addition to these courses, students with an overall cumulative QPA of 3.00 or above may take any EE 2000 level Graduate Course with the permission of their advisor and the course instructor.

Special Projects

The EE 1898 Special Projects Course is a course designed for unique situations that may occur within a particular student's program. The use of this course to fulfill a requirement generally falls into one of the following three categories: an EE Required or Elective Course; a Technical Elective; an EE Design Course. The approval mechanism for each of these situations is through the EE Undergraduate Curriculum Committee. In each case the student must submit a petition to the Undergraduate Administrator indicating the work to be accomplished, the rationale for using this particular course number, and the signature of the faculty member who has agreed to monitor the completion of the coursework and grading.

Technical Electives

In addition to the above requirements, students must complete 3 additional Technical Electives. Technical Electives can be any EE/COE Elective, or any other School of Engineering course, except IE 1010, which has not been used to fulfill another requirement or does not substantially duplicate other required course material. Most courses in mathematics, physics, chemistry and computer science that can be taken by students majoring in those departments can be used as technical electives by EE students. Examples include:

- PHYS 1150 Mechanics
- PHYS 1119 Principles of Modern Physics
- PHYS 1170 Introduction to Quantum Mechanics I
- PHYS 1917 Modern Physics - Atoms and Nuclei

- CHEM 0250 Introduction to Analytical Chemistry

CHEM 0310 Organic Chemistry I
CHEM 1410 Physical Chemistry I

BIOSC 0150 Foundations in Biology I

MATH 1290 Topics in Geometry
MATH 1530 Advanced Calculus I
MATH 1540 Advanced Calculus II
MATH 1550 Vector Analysis and its Applications
MATH 1560 Complex Variables and Applications

Enrollment in any of these courses is constrained by the space and prerequisite limitations of the host department.

Humanities and Social Science Electives

The ABET criteria for the humanities and social sciences requires a minimum of 1 term (16 credits) of such material and that "the courses selected must provide both breadth and depth and not be limited to a selection of unrelated introductory courses." The EE Department requirements go beyond these minimum standards and require students to choose from among those courses contained in the School of Engineering List of Acceptable Humanities and Social Science Courses. A copy of this list is available in the Undergraduate Office, Room 348, Benedum Hall or on our web site at:

<http://www.engrng.pitt.edu/computer/courses/humss.html>

At least one humanities and/or social science course must include a substantial writing component (a course designated by 'WRIT*'). At least two (2) must be from the same discipline (e.g. two (2) English courses or two (2) Economics courses, etc.) and the courses should be selected from three (3) different departments (exceptions can be made by petition to the Undergraduate Committee).

Some humanities and social sciences courses are offered in the external studies program of the University of Pittsburgh. Any courses offered in this manner are **not** acceptable in fulfilling the requirements of the Electrical Engineering program.

First-year foreign language courses may be utilized to fulfill up to two of the humanities/social science course requirements. These courses are counted on a course basis. That is, a first-year 5-credit language course is equivalent to a 3-credit humanities/social science course. This also applies to AP courses transferred from high school. The language must be other than English and other than the student's native tongue, and the course must be a regular (not conversation) language course.

*The WRIT requirement can also be satisfied through the communication skills elective ENGCOMP 0400, by select technical electives, or the open elective when such a course is designated WRIT in the course bulletin.

Communication Skills Elective

To complete the Communications Skills Elective, one of the following courses or options should be chosen.

Industrial Engineering Department
ENGR 1010 Communications Skills for Engineers

Rhetoric and Communication Department
COMMRC 0500 Argument
COMMRC 0520 Public Speaking
COMMRC 0540 Discussion
COMMRC 1101 Evidence

Note that English BW (ENGCOMP 0150: Basic Writing) and GW (ENGCOMP 0200: General Writing) cannot be used to satisfy this requirement. All engineering students complete an examination upon entry into the University to determine their ability in written communication. If a student does not perform satisfactorily on this exam, one of these courses is required as a remedial course beyond the normal requirements.

Open Elective

Any course that is NOT of a similar nature to, or lower level than, a required or previously taken course can be used to fulfill this requirement. Successful completion of three Co-operative Education rotations can be used to satisfy the open elective if the student either:

- 1) prepares a poster on some aspect of the work experience for a Senior Design Expo, or
- 2) writes a paper describing the impact of the Co-op experience on the student's professional development.

Three credits of Physical Education or three credits of Band, ROTC, or Chorus may also be used to fulfill the open elective requirement.

Undergraduate Seminar

The Electrical Engineering Undergraduate Seminar presents topics that are not discussed in regular courses but are of importance to the academic and professional development of undergraduate students. Examples of these topics include curriculum planning, how and where engineers work, methods for career development, ethical concerns, and opportunities for engineers in medicine, law, and other professions. Speakers from within and outside the University community provide different perspectives on these issues that are critical to the professional success of students. The Seminar meets for one hour per week during each fall and spring term. Students are required to enroll in and attend the seminar each fall and spring term that they are on campus.

Graduation Requirements

To be recommended for graduation a student must fulfill all of the following requirements.

1. Complete, including transfer credits, the Electrical Engineering curriculum as discussed above.
2. Complete at least 26 credits of the senior year at the University of Pittsburgh.
3. Have a minimum overall cumulative QPA of 2.00.
4. Have a minimum Electrical Engineering QPA of 2.00.
5. Complete an Application for Graduation before the deadline date. (Forms are available in the Engineering Administration Office, Room 253, Benedum Hall, and should be returned there.)

The University Statute of Limitations policy requires that these requirements be completed within a period of 12 years.

Students are encouraged to discuss their progress, course selections, and options with their academic advisors each term before registration. They are reminded, however, that the individual student is ultimately responsible for being sure that all graduation requirements are met. An individual "Curriculum Sheet," with the grades for the courses completed, may be obtained from the Undergraduate Office upon request of the student. In addition, these sheets are distributed to students at the Undergraduate Seminar each fall term approximately 2 weeks before registration.

To receive Graduation Honors, the student must have earned at least 68 credits at the University of Pittsburgh and must meet the following criteria.

- Cum Laude - requires a minimum overall cumulative QPA of 3.25.
- Magna Cum Laude - requires a minimum overall cumulative QPA of 3.50.
- Summa Cum Laude - requires a minimum overall cumulative QPA of 3.75

Areas of Concentration

Optional Areas of Concentration have been defined within the Electrical Engineering Undergraduate Program to allow a student to develop strength in a particular area of interest. Students satisfying the requirements of an Area of Concentration will have that fact noted on their transcripts. Area of Concentration requirements are primarily in the form of restrictions on the Design and EE elective courses to be selected by the student, as described below. In some cases, courses are specified that can be used to satisfy Technical elective requirements. Courses used to satisfy Area of Concentration requirements are also used to satisfy requirements for the Bachelor of Science in Electrical Engineering degree.

Areas of Concentration that are currently available and their requirements include:

Computers

The EE electives must include EE/COE 1186 and EE 1238.

Two courses from the Design group (rather than 1), selected from EE/COE 1160, EE/COE 1161, EE/COE 1192, EE/COE 1193, EE/COE 1896, must be completed. One of the design courses can be used to satisfy an EE elective requirement, and the second will satisfy the Design elective requirement.

One Technical elective must be CS 0401 (Introduction to Java) and one must be CS 1550 (Introduction to Operating Systems).

The third technical elective must be selected from the group CS 0445, CS 1501, CS 1520.

Electronics (Circuits and Devices)

The EE electives must include EE 1238 and EE 1266. They must also include 2 courses from the group: EE 1232, EE 1236, and EE 1286.

The Design elective must be either EE/COE 1192 or EE/COE 1896.

Telecommunications/Signal Processing

The EE electives must include EE 1472, EE 1473, EE 1562, and EE 1266. One EE elective must be either EE 1232 or EE 2523.

The Design elective must be EE 1523 or EE/COE 1896.

Two technical electives must be from the following TELCOM graduate courses: TELCOM 2120, TELCOM 2222, TELCOM 2225 or TELCOM 2310.

Undergraduate Electrical Engineering Course Descriptions

EE/COE 0031 LINEAR CIRCUITS AND SYSTEMS 1 (3 credits)

The analysis of linear circuits. Electric variables and circuit elements, Kirchoff's and Ohm's Law, mesh and node equations, Thevenin and Norton equivalent circuits. First and second-order circuits, time domain analysis.

Prerequisites: PHYS 0175, MATH 0230.

EE/COE 0041 LINEAR CIRCUITS AND SYSTEMS 2 (3 credits)

Sinusoidal steady-state analysis, network functions, real and reactive power, three-phase circuits, Laplace transform method, two-port networks, and Fourier series.

Prerequisite: EE/COE 0031.

EE/COE 0132 DIGITAL LOGIC (3 credits)

Introduction to digital systems, Boolean algebra, minimization of logic functions, combinational and sequential circuit design.

Prerequisite: PHYS 0175.

EE/COE 0142 COMPUTER ORGANIZATION (3 credits)

Digital computer data representation, instruction formats, control, memory and input-output units, microprocessors, minicomputers.

Prerequisite: EE/COE 0132.

EE 0257 ANALYSIS AND DESIGN OF ELECTRONIC CIRCUITS (3 credits)

Diode circuits, power supply design, analysis and design of bipolar junction transistor and field effect transistor amplifiers, bias stability analysis, power amplifiers, ideal operational amplifiers, CMOS inverters.

Pre- or Corequisite: EE/COE 0041. (Previously listed as EE 1257)

EE/COE 0501 DIGITAL SYSTEMS LABORATORY (3 credits)

This course and laboratory introduce students to the basic concepts of digital circuits, simulation and instrumentation. Systems composed of discrete devices, logic gates, combinatorial and sequential circuits are designed, simulated, built and tested.

Prerequisite: EE/COE 0132.

EE/COE 1150 INTRODUCTION TO COMPUTER NETWORKS (3 credits)

This course will cover solving problems on interconnected computers where potential methods of interconnection are fundamental to the system design. Interconnection will include serial point to point and multiple access serial/parallel methods and protocols. There will be an emphasis on mathematical fundamentals related to networked systems. The student will learn the operation of LAN networks such as 10Base2, 100BaseT, Token Ring, as well as USB and other standard protocols.

Prerequisite: EE/COE 0142 or COE/CS 0447.

EE/COE 1170 SPECIAL TOPICS: COMPUTERS (3 credits)

An undergraduate course dealing with special topics of current interest in computers.

EE/COE 1185 COMPUTER SYSTEM INTERFACING (4 credits)

A course and lab on microprocessor systems with particular emphasis on interfacing. The course is centered around the 80x86 series of processors and will use the PC as example platforms for development and as system components. It is expected that the student will become familiar with 80x86 assembly language through homework and specific examples. Interface examples will include the processor/memory/i-o, serial, parallel and networks using standard hardware available for a PC platform. The course brings together the various concepts of development, software, hardware, and standards.

Prerequisite: EE/COE 0142

EE/COE 1186 SOFTWARE ENGINEERING (4 credits)

This course and laboratory introduce classical and object-oriented software engineering. Software requirements, specification, object-oriented analysis, design, implementation, integration, and maintenance are covered. Each of these phases is examined on a practical level through a semester long, formal design project that involves the creation of a java-based internet application. Additional java-related topics are taught, including java applets, custom networking, remote database access, SQL, and multimedia extensions.

Prerequisite: EE/COE 0142

EE/COE 1192 INTRODUCTION TO VLSI DESIGN (4 credits)

Introduction to the concepts and techniques of modern integrated circuit design. Use of computer-aided design (CAD) tools for circuit design and simulation. Senior design course. Includes a laboratory.

Prerequisite: EE/COE 0142.

EE/COE 1193 ADVANCED VLSI DESIGN (3 credits)

This course is organized as a full semester project in conjunction with a small amount of lecture material on advanced CMOS digital design techniques, as well as the group design process itself. Students form groups of 3 to 5 per group that design and implement different VLSI projects which are then fabricated by MOSIS and returned for testing.

Focus is on teamwork with frequent oral/written reports.

Prerequisite: EE/COE 1192

EE 1201 ELECTRONIC MEASUREMENTS AND CIRCUITS LABORATORY (3 credits)

Electronic measurements and circuits including experiments on use of electronic test equipment, a variety of linear circuits, non-linear device characteristics, operational amplifier basics, and transistor amplifier characteristics and design. Time and frequency domain methodologies are covered.

Pre- or Corequisites: EE/COE 0041, EE 0257

EE 1212 ELECTRONIC CIRCUIT DESIGN LABORATORY (3 credits)

An electronic circuits laboratory experience with emphasis on circuit applications and design. Topics include multi-stage amplifier design, operational amplifier applications, analog-digital conversion applications, active filters.

Prerequisites: EE 0257, EE 1201

EE 1232 INTRODUCTION TO LASERS AND OPTICAL ELECTRONICS (3 credits)

Introduction to and application of basic laser and optical electronic principles, optical modulation and detection systems.

Prerequisites: EE 0041 and EE 1259.

EE 1236 ELECTRONIC DESIGN WITH INTEGRATED CIRCUITS (3 credits)

Basic concepts of integrated circuit design, designing with off-the-shelf linear and digital integrated circuits.

Prerequisite: EE 0257.

EE 1238 DIGITAL ELECTRONICS (3 credits)

Switching behavior of semiconductor devices, logic circuit families (DTL, TTL, Schottky, ECL, CMOS, I²L), regenerative logic circuits, semiconductor memories, SPICE circuit simulation.

Prerequisites: EE/COE 0132, EE 0257.

EE 1240 PHOTONICS I (3 credits)

The overall aim of the two-course series is to present the essential theory of modern photonics methods as actually used in industry and research labs today. This course will focus on the basic theory of optics in anisotropic and nonlinear media and the basic methods of modulating and controlling light.

Prerequisite: EE 1259

EE 1241 PHOTONICS II (3 credits)

The overall aim of the two-course series is to present the essential theory of modern photonics methods as actually used in industry and research labs today. This course will focus on the application of photonics techniques to modern devices and materials characterization. Prerequisite: EE 1240

EE 1247 SEMICONDUCTOR DEVICE THEORY (3 credits)

Electrical properties of solids, energy levels, semiconductor theory, diodes, bipolar junction transistors, field effect transistors.

Prerequisites: PHYS 0175, EE/COE 0041. (Previously listed as EE 0247)

EE 1248 PHOTONICS SEMINAR (1 credit)

The overall aim of the course is to expose students to work on the cutting edge of photonics.

EE 1259 ELECTROMAGNETICS (3 credits)

Vector calculus, gradient curl, divergence theorem and Stokes' theorem, Coulomb's law, Gauss's law, Laplace equation, Poisson equation, dielectrics, Biot-Savart law, vector potentials, Ampere's law, Faraday's law, inductance, magnetic materials, Lorentz force, Maxwell's equations, electromagnetic radiation.

Prerequisites: PHYS 0175, MATH 0240.

EE 1266 APPLICATIONS OF FIELDS AND WAVES (3 credits)

Plane waves, the wave equation, Poynting vector, transmission lines, wave guides, antennas and radiation applications.

Prerequisites: EE 1259 or PHYS 0960, Pre- or Corequisite: EE/COE 0041.

EE 1270 SPECIAL TOPICS: ELECTRONICS (1 to 3 credits)

An undergraduate course dealing with special topics of current interest in electronic devices, lasers and optical electronics.

EE 1286 ANALYSIS AND DESIGN OF ANALOG INTEGRATED CIRCUITS (3 credits)

Introduction to Spice. Multiple transistor circuits, internal structure of operational amplifier. Current sources and current steering circuits, active loads. Frequency response of directly coupled, capacitively coupled, and tuned amplifiers. Analysis and design of multistage amplifiers. Feedback and frequency compensation in operational amplifiers.

Prerequisite: EE 0257.

EE 1390 INTRODUCTION TO IMAGE PROCESSING/COMPUTER VISION (3 credits)

Introductory subjects in image processing, including image spaces and image representation, image enhancement, edge detection, edge and region based segmentation, and feature extraction and object recognition. Spatial domain approaches will be emphasized. Several homework problems will be solved on the computer in the c-programming language.

Prerequisite: Senior status or permission of instructor.

EE 1391 PROJECTS IN COMPUTER VISION (3 credits)

A set of full-term group projects attacking problems in image processing and computer vision. Projects will typically involve the development of problem solutions on computer vision workstations in the c-programming language.

Prerequisite: EE 1390

EE 1472 ANALOG COMMUNICATION SYSTEMS (3 credits)

An analysis of modern analog communication systems, including the theory underlying their design and practical implementation issues. Various forms of amplitude and angle modulation. Amplifiers, mixers, detectors, phase-lock loops, and the design of transmitters and receivers. Probability, random signals, optimal receivers, noise and performance analysis. Case studies including telephone, commercial radio, and television.

Prerequisite: EE 1552; Pre- or Corequisite: ENGR 0020

EE 1473 DIGITAL COMMUNICATION SYSTEMS (3 credits)

An analysis of modern digital communication systems, including the theory underlying their design and practical implementation issues. Baseband digital signaling; PAM, PCM, quantization, ISI, and multiplexing. Modulation formats: ASK, FSK, BPSK, QPSK, QAM. Probability, information channel capacity, random signals, optimal receivers and performance analysis. Case studies include modems, satellite systems, and cellular telephones.

Prerequisite: EE 1552; Pre- or Corequisite: ENGR 0020

EE 1523 DIGITAL FILTER DESIGN (3 credits)

Applications of digital signal processing, including the discrete Fourier transform, fast Fourier transform (fft), one and two sided z-transform, circular convolution, design of finite impulse response filters and infinite impulse response filters, and implementation considerations. Concepts are applied to a specific application for a term project.

Prerequisite: EE 1552.

EE 1552 SIGNALS AND SYSTEMS ANALYSIS (3 credits)

Signal representation, continuous-time systems, Fourier series, Fourier transforms, Laplace transforms, discrete-time systems, Fourier analysis of discrete-time systems, z-transforms, the discrete Fourier transform.

Prerequisite: EE/COE 0041.

EE 1562 DIGITAL AND ANALOG FILTERS (3 credits)

Active filter design, operational amplifier circuits, cascade design with first-order and biquad circuits, Butterworth and Chebyshev lowpass filters, sensitivity and frequency transformations. Digital filter design, IIR filter design using bilinear transformation, window design of FIR filters, realization of IIR and FIR filters.

Prerequisite: EE 1552.

EE 1563 SIGNAL PROCESSING LABORATORY (2 credits)

Data acquisition and computer-based measurements. Recursive and FIR filters. Frequency response and filter implementation using the fast Fourier transform.

Prerequisite: EE 1552.

EE 1570 SPECIAL TOPICS: SIGNALS AND SYSTEMS (1 to 3 credits)

An undergraduate course dealing with special topics of current interest in control, signal and image processing, speech processing, and telecommunications.

EE 1580 BIOMEDICAL APPLICATIONS OF SIGNAL PROCESSING (3 credits)

The nature of biological signals and noise, including appropriate physiological background, digital filtering, spectral analysis, automated interpretation of signals. Examples drawn from current problems in clinical medicine and research.

Prerequisite: EE 1552 or BIOENG 1410.

EE 1673 LINEAR CONTROL SYSTEMS (4 credits)

Introduction to feedback control systems, mathematical models, second order systems response and identification, system types, steady-state errors, root locus analysis and design, Bode plots, Nyquist theory and frequency domain compensation techniques. Includes a laboratory.

Prerequisite: EE/COE 0041.

EE 1680 BIOMEDICAL APPLICATIONS OF CONTROL (3 credits)

Applications of control system modeling and design to selected medical problems, such as control of artificial organs and modeling of the vestibular system. Root locus, frequency response, and state-variable approaches to compensator design, fuzzy logic controllers, selection of control criteria and evaluation of designs.

Prerequisite: EE/COE 0041

EE 1769 POWER SYSTEMS ANALYSIS 1 (3 credits)

An introduction to modern power systems and methods of analysis. Transmission lines, network representations, network solutions, balanced and unbalanced faults, real and reactive load flow study techniques, and basic concepts in stability and economic dispatch.

Prerequisite: EE/COE 0041.

EE 1861 CREATIVE ENGINEERING DESIGN (3 credits)

The development of creative design capabilities using the problems of today's society. The material demonstrates the design process, decision making in design, the creative process, reliability of designs, and analysis and verification of performance. Senior design course.

Prerequisite: EE/COE 0041.

EE 1865 ELECTRIC VEHICLE TECHNOLOGY AND DESIGN (3 credits)

This is a project course in which students participate in the design and construction of a fully functional electric vehicle. The design process entails determining the parameters of a power system necessary to achieve performance goals such as top speed and range, and selection of components that achieve the design. Construction includes installation of the power system, as well as fabrication of hardware necessary to mount the various electrical components. Students also engage in a variety of other activities necessary to realize the project goals, including project planning, research in EV technology and components, schematic layout of the power system, interfacing with the vehicle's electrical accessories, fundraising, purchasing, publicity, and project documentation. Students prepare a poster each semester describing their accomplishments. Senior Design Course.

EE/COE 1885 DEPARTMENTAL SEMINAR (0 credits)

Seminars are designed to acquaint the student with aspects of engineering that are not normally encountered in classes and school activities and include a wide range of topics such as the significance of engineering as a profession, ethical problems in engineering, and skills required for a successful engineering career.

EE/COE 1896 SENIOR DESIGN PROJECT (3 credits)

A full-term engineering project involving definition, literature search, prototype design, construction, with written and oral reports. Senior design course.

EE/COE 1898 ENGINEERING PROJECT (1 to 6 credits)

An investigation of an approved engineering subject under the supervision of a faculty monitor. Must be approved in advance by the faculty monitor and the department chair.

ADMINISTRATIVE PROCEDURES

Quality Point Average Calculation

The overall cumulative Quality Point Average (QPA) is calculated using the total credits and quality points on the transcript for all courses taken at the University of Pittsburgh used to satisfy degree requirements, except as described in the following paragraph. The overall cumulative QPA must be at least 2.00 to graduate.

Students are permitted to repeat any course resulting in a grade of C- (C minus) or lower. The grade earned by repeating the course will then replace the previous grade earned (in calculating the QPA), however, the original grade will not be erased from the transcript. No sequence course may be repeated for credit after a higher-numbered sequence course has been passed with a C or higher. No course may be repeated more than twice. For the purposes of this rule, grades of W, N, or R do not count as repeats. Students have one academic year to repeat a course under this program. Approval of a course-repeat completed after the one-year period has expired cannot be guaranteed.

The Electrical Engineering Quality Point Average (EEQPA) is calculated using only the highest grade received for every EE required and EE elective course taken by the student. The EEQPA must be at least 2.00 to graduate.

Cross Registration

The purpose of cross registration through the Pittsburgh Council of Higher Education (PCHE) is to provide opportunities for enriched educational programs by permitting undergraduate full-time students at any of the 10 participating colleges and universities to take courses at any other PCHE institution. The PCHE Institutions include Carlow College, Carnegie-Mellon University, Chatham College, Community College of Allegheny County, Duquesne University, LaRoche College, Pittsburgh Theological Seminary, Point Park College, Robert Morris College, and the University of Pittsburgh. Although this is a University wide program, Engineering School Policy does not permit Engineering Students to register for courses at any Community College.

A student may normally enroll in only one course off campus and in only one institution in a given term. Enrollment is constrained by the space and prerequisite limitations of the host institution. Students who cross register pay the University of Pittsburgh tuition for the given term. They are, however, responsible for paying any course or laboratory fee(s) to the host institution.

The student should refer to the University Time Schedule and discuss the issue with his/her academic advisor before cross registering. The University Time Schedule lists the guidelines for cross registration.

A student who wishes to cross register at any institution other than those listed above should discuss this registration with his/her advisor. The transfer of such courses will follow the guidelines for transfer credits given elsewhere in this document.

Grade Options

Credit/No Entry - Courses completed on the Credit/No Entry Option will not be accepted in any department or program in the School of Engineering.

H/S/U Grades - Electrical Engineering Undergraduate Courses, required or elective, may not be taken using the H/S/U Satisfactory-Unsatisfactory Option. Any other course used to fulfill the requirements of the degree may be taken using the H/S/U grade option provided that such course is offered with this option.

Audit Option - Undergraduate electrical engineering students may not audit any course that is to be used to fulfill requirements for the EE degree.

Withdrawal - A student may withdraw from any course up to the last day for Monitored Withdrawal (a published date for each term). After that date, the student must receive the approval of the Associate Dean for Academic Affairs. If a student whose name appears on the Grade Roster never attends a course, the instructor may issue a G grade, then change it to a W grade when the grades are returned from the Office of the Registrar.

Advanced Standing Exams

The Advanced Standing Exam is a procedure that allows a student to take a comprehensive examination on the material associated with a particular course. If the student successfully passes the exam, the student is given advanced standing credit, but no grade, for the course. Electrical Engineering Students are not permitted to use this examination procedure for an Electrical Engineering Course, required or elective, where the student has already received a failing grade in the course.

Probation & Dismissal

Probation - Each engineering student record is reviewed at the end of each term. A student who has a term or cumulative quality point average of less than 2.00 is considered to be NOT in satisfactory standing and is placed on probation.

Dismissal - Students are subject to dismissal if the cumulative quality point average is below 2.00 for two consecutive terms.

Academic Integrity

The Faculty of the Department of Electrical Engineering expects all students to conduct their academic work with the high ethical standards of the engineering profession. Every student must submit only his or her own work for credit. Every student must neither give nor receive assistance on examinations. Violations of these Standards of Academic Integrity will result in appropriate disciplinary action such as a failing grade on an assignment, failure in the course, probation, suspension, or dismissal from the University.

Academic Misconduct

The following procedure is to be used in those cases where a student is suspected of a violation of the Standards of Academic Integrity.

1. The instructor has a conference with the suspected student to discuss the issue.
2. If the student admits academic misconduct and accepts the disciplinary action, the instructor will complete the "Summary of Disciplinary Action" Form and forward it to the Chairman. Either the instructor or the Undergraduate Coordinator implements the disciplinary action.
3. If the student does not admit academic misconduct and/or does not accept the recommended disciplinary action, the instructor must bring the incident to the attention of the Undergraduate Coordinator. A conference will then be held between the student, the instructor, and the Undergraduate Coordinator. If the case is resolved, the "Summary of Disciplinary Action" is forwarded to the Chairman. If the case cannot be resolved, the matter is referred to the Chairman.

Electrical Engineering Administration

Chairman's Office

Dr. Joel Falk, Professor and Chairman
349 Benedum Hall
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falk@ee.pitt.edu

Departmental Secretary
348 Benedum Hall
412-624-8000

Undergraduate Office

Dr. J. Robert Boston, Professor and Associate Chairman
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boston@ee.pitt.edu

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School of Engineering Administration Office

Ms. Betty Victor, Director
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412-624-9800

Appendix

- i. Curriculum Chart For Students Entering the EE program after March 2002
- ii. Curriculum Chart Concentration in Telecommunications
- iii. Curriculum Chart Concentration in Electronics
- iv. Curriculum Chart Concentration in Computers
- v. Sample Curriculum Sheet of an incoming sophomore
- vi. Special Projects Form

Electrical Engineering Curriculum Chart						
For students entering the program after March 2002						
Fresh 1 Term 1 Fall (17)	ENGR 0011 (3) Intro to Engineering Analysis	CHEM 0960 (3) Chemistry 1		PHYS 0174 (4) Physics 1	MATH 0220 (4) Calculus 1	Hum/SS Elective (3)
Fresh 2 Term 2 Spring (17)	ENGR 0012 (3) Intro to Engineering Computing	CHEM 0970 (3) Chemistry 2		PHYS 0175 (4) Physics 2	MATH 0230 (4) Calculus 2	Hum/SS Elective (3)
Soph 1 Term 3 Fall (16)	EE/CoE 0031 (3) Circuits 1 (pre Math 0230, Phys 0175)		EE/CoE 0132 (3) Digital Logic (pre Math 0230, Phys 0175)	Hum/SS Elective (3)	MATH 0240 (4) Calculus 3	Communication Skills Elective (3)
Soph 2 Term 4 Spring (16)	EE/CoE 0041 (3) Circuits 2 (pre EE 0031)	EE/CoE 0501 (3) Digital Laboratory (pre EE 0132)	EE/CoE 0142 (3) Computer Organization (pre EE 0132)	EE 0257 (3) Electronic Circuits (CoRe EE 0041)	MATH 0250 (4) Differential Eq & Lin Alg	
Junior 1 Term 5 Fall (15)	EE 1552 (3) Signals & Systems (pre EE 0041)	EE 1201 (3) Electronic Meas and Circuits Lab	EE 1259 (3) Electromagnetics (pre Phys 0175, Math 0240, EE 0041)	EE 1247 (3) Semiconductor Device Theory (pre Phys 0175)		Hum/SS Elective (3)
Junior 2 Term 6 Spring (15)	EE 1563 (3) Signal Processing Laboratory (pre EE 1552)	EE 1212 (3) Electronic Circuit Design Lab (pre EE 1201)	EE Elective (3)		Technical Elective (3)	Hum/SS Elective (3)
Senior 1 Term 7 Fall (16)	EE Design Elective (3)	ENGR 0020 (4) Probability and Statistics for Engineers (pre Math 0240)	EE Elective (3)	EE Elective (3)	Technical Elective (3)	
Senior 2 Term 8 Spring (15)	EE Elective (3)		Open Elective (3)	EE Elective (3)	Technical Elective (3)	Hum/SS Elective (3)

Approved Design Electives: EE/CoE 1896, 1160, 1161, 1192, 1193; EE: 1391, 1523, 1865

1. Each student must complete at least one (1) EE Design Elective.
2. Each student must complete at least five (5) EE Electives.
3. Every student must attend the Undergraduate Seminar, EE 1885, each term (except summer) that they are on campus.
4. The Communications Skills Elective, Technical Electives, Humanities/Social Science Electives, and the Open Elective may be chosen from the appropriate lists of acceptable electives for each category. At least one of these should include a substantial writing component (WRIT). Of the total requirement of 6 Hum/SS courses, courses should be selected from at least three departments and at least 2 must be from the same discipline (i.e. 2 English courses or 2 Economics courses, etc.).

Courses planned for all terms: EE/CoE 0041, EE/CoE 0142, EE 0257, EE/CoE 0501

Courses planned for fall and spring: EE/CoE 0031, EE/CoE 0132, EE 1552, EE 1563, EE 1201

Courses planned for spring and summer: EE 1212

Courses planned for fall only: EE 1247, EE 1259

Electrical Engineering Curriculum Chart Concentration in Telecommunications (Signal Processing, Communications) For students entering the program after March 2002						
Fresh 1 Term 1 Fall (17)	ENGR 0011 (3) Intro to Engineering Analysis	CHEM 0960 (3) Chemistry 1		PHYS 0174 (4) Physics 1	MATH 0220 (4) Calculus 1	Hum/SS Elective (3)
Fresh 2 Term 2 Spring (17)	ENGR 0012 (3) Intro to Engineering Computing	CHEM 0970 (3) Chemistry 2		PHYS 0175 (4) Physics 2	MATH 0230 (4) Calculus 2	Hum/SS Elective (3)
Soph 1 Term 3 Fall (16)	EE/CoE 0031 (3) Circuits 1 (pre Math 0230, Phys 0175)		EE/CoE 0132 (3) Digital Logic (pre Math 0230, Phys 0175)	Hum/SS Elective (3)	MATH 0240 (4) Calculus 3	Communication Skills Elective (3)
Soph 2 Term 4 Spring (16)	EE/CoE 0041 (3) Circuits 2 (pre EE 0031)	EE/CoE 0501 (3) Digital Laboratory (pre EE 0132)	EE/CoE 0142 (3) Computer Organization (pre EE 0132)	EE 0257 (3) Electronic Circuits (CoRe EE 0041)	MATH 0250 (4) Differential Eq & Lin Alg	
Junior 1 Term 5 Fall (15)	EE 1552 (3) Signals & Systems (pre EE 0041)	EE 1201 (3) Electronic Meas and Circuits Lab	EE 1259 (3) Electromagnetics (pre Phys 0175, Math 0240, EE 0041)	EE 1247 (3) Semiconductor Device Theory (pre Phys 0175)		Hum/SS Elective (3)
Junior 2 Term 6 Spring (15)	EE 1563 (3) Signal Processing Laboratory (pre EE 1552)	EE 1212 (3) Electronic Circuit Design Lab (pre EE 1201)	EE Elective (3) EE 1266 Applications of Fields and Waves		Technical Elective (3)	Hum/SS Elective (3)
Senior 1 Term 7 Fall (16)	EE Design Elective (3)	ENGR 0020 (4) Probability and Statistics for Engineers (pre Math 0240)	EE Elective (3) EE 1562 Analog and Digital Filters (pre 1552)	EE Elective (3) EE 1472 Analog Communication Systems (pre EE 1552)	Technical Elective (3) (Group T)	
Senior 2 Term 8 Spring (15)	EE Elective (3) (EE 1232 or EE 2523)		Open Elective (3)	EE Elective (3) EE 1473 Digital Comm. Systems (pre EE 1552)	Technical Elective (3) (Group T)	Hum/SS Elective (3)

EE Design Electives: EE/CoE 1896, 1192.

Group T "TELCOM" Electives: TELCOM 2120, TELCOM 2222, TELCOM 2225, TELCOM, 2310

1. Each student must complete at least one (1) EE Design Elective.
2. Each student must complete at least two (2) TELCOM Electives and at least five (5) EE Electives including EE 1266, EE 1472, EE 1473, EE 1562 and either EE 1232 or EE 2523.
3. Every student must attend the Undergraduate Seminar, EE 1885, each term (except summer) that they are on campus.
4. The Communications Skills Elective, Technical Electives, Humanities/Social Science Electives, and the Open Elective may be chosen from the appropriate lists of acceptable electives for each category. At least one of these should include a substantial writing component (WRIT). Of the total requirement of 6 Hum/SS courses, courses should be selected from at least three departments and at least 2 must be from the same discipline (i.e. 2 English courses or 2 Economics courses, etc.).

Courses planned for all terms: EE/CoE 0041, EE/CoE 0142, EE 0257, EE/CoE 0501

Courses planned for fall and spring: EE/CoE 0031, EE/CoE 0132, EE 1552, EE 1563, EE 1201

Courses planned for spring and summer: EE 1212

Courses planned for fall only: EE 1192, EE 1247, EE 1259, EE 1562, EE 1472

Courses planned for spring only: EE 1232, EE 1266, EE 1473

Electrical Engineering Curriculum Chart Concentration in Electronics For students entering the program after March 2002						
Fresh 1 Term 1 Fall (17)	ENGR 0011 (3) Intro to Engineering Analysis	CHEM 0960 (3) Chemistry 1		PHYS 0174 (4) Physics 1	MATH 0220 (4) Calculus 1	Hum/SS Elective (3)
Fresh 2 Term 2 Spring (17)	ENGR 0012 (3) Intro to Engineering Computing	CHEM 0970 (3) Chemistry 2		PHYS 0175 (4) Physics 2	MATH 0230 (4) Calculus 2	Hum/SS Elective (3)
Soph 1 Term 3 Fall (16)	EE/CoE 0031 (3) Circuits 1 (pre Math 0230, Phys 0175)		EE/CoE 0132 (3) Digital Logic (pre Math 0230, Phys 0175)	Hum/SS Elective (3)	MATH 0240 (4) Calculus 3	Communication Skills Elective (3)
Soph 2 Term 4 Spring (16)	EE/CoE 0041 (3) Circuits 2 (pre EE 0031)	EE/CoE 0501 (3) Digital Laboratory (pre EE 0132)	EE/CoE 0142 (3) Computer Organization (pre EE 0132)	EE 0257 (3) Electronic Circuits (CoRe EE 0041)	MATH 0250 (4) Differential Eq & Lin Alg	
Junior 1 Term 5 Fall (15)	EE 1552 (3) Signals & Systems (pre EE 0041)	EE 1201 (3) Electronic Meas and Circuits Lab	EE 1259 (3) Electromagnetics (pre Phys 0175, Math 0240, EE 0041)	EE 1247 (3) Semiconductor Device Theory (pre Phys 0175)		Hum/SS Elective (3)
Junior 2 Term 6 Spring (15)	EE 1563 (3) Signal Processing Laboratory (pre EE 1552)	EE 1212 (3) Electronic Circuit Design Lab (pre EE 1201)	EE Elective (3) EE 1238 Digital Electronics (pre EE 0257)	EE Elective (3)	Technical Elective (3)	
Senior 1 Term 7 Fall (16)	EE Design Elective (3)	ENGR 0020 (4) Probability and Statistics for Engineers (pre Math 0240)	EE Elective (3)		Technical Elective (3)	Hum/SS Elective (3)
Senior 2 Term 8 Spring (15)	EE Elective (3) EE 1266 Applications of Fields and Waves (pre EE 1259)		Open Elective (3)	EE Elective (3)	Technical Elective (3)	Hum/SS Elective (3)

Group A "Design" Electives: EE/CoE 1896, 1160, 1161, 1192, 1193, EE 1391.

1. Each student must complete at least one (1) EE Design Elective from Group A.
2. Each student must complete at least five (5) EE Electives including EE 1238, EE 1266 and two from the group EE 1232, EE 1236 or EE 1286.
3. Every student must attend the Undergraduate Seminar, EE 1885, each term (except summer) that they are on campus.
4. The Communications Skills Elective, Technical Electives, Humanities/Social Science Electives, and the Open Elective may be chosen from the appropriate lists of acceptable electives for each category. At least one of these should include a substantial writing component (WRIT). Of the total requirement of 6 Hum/SS courses, courses should be selected from at least three departments and at least 2 must be from the same discipline (i.e. 2 English courses or 2 Economics courses, etc.).

Courses planned for all terms: EE/CoE 0041, EE/CoE 0142, EE 0257, EE/CoE 0501

Courses planned for fall and spring: EE/CoE 0031, EE/CoE 0132, EE 1552, EE 1563, EE 1201

Courses planned for spring and summer: EE 1212

Courses planned for fall only: EE 1247, EE 1259, EE 1236

Courses planned for spring only: EE 1232, EE 1238, EE 1266, EE 1286

Electrical Engineering Curriculum Chart Concentration in Computers For students entering the program after March 2002						
Fresh 1 Term 1 Fall (17)	ENGR 0011 (3) Intro to Engineering Analysis	CHEM 0960 (3) Chemistry 1		PHYS 0174 (4) Physics 1	MATH 0220 (4) Calculus 1	Hum/SS Elective (3)
Fresh 2 Term 2 Spring (17)	ENGR 0012 (3) Intro to Engineering Computing	CHEM 0970 (3) Chemistry 2		PHYS 0175 (4) Physics 2	MATH 0230 (4) Calculus 2	Hum/SS Elective (3)
Soph 1 Term 3 Fall (16)	EE/CoE 0031 (3) Circuits 1 (pre Math 0230, Phys 0175)		EE/CoE 0132 (3) Digital Logic (pre Math 0230, Phys 0175)	Hum/SS Elective (3)	MATH 0240 (4) Calculus 3	Communication Skills Elective (3)
Soph 2 Term 4 Spring (16)	EE/CoE 0041 (3) Circuits 2 (pre EE 0031)	EE/CoE 0501 (3) Digital Laboratory (pre EE 0132)	EE/CoE 0142 (3) Computer Organization (pre EE 0132)	EE 0257 (3) Electronic Circuits (CoRe EE 0041)	MATH 0250 (4) Differential Eq & Lin Alg	
Junior 1 Term 5 Fall (15)	EE 1552 (3) Signals & Systems (pre EE 0041)	EE 1201 (3) Electronic Meas and Circuits Lab	EE 1259 (3) Electromagnetics (pre Phys 0175, Math 0240, EE 0041)	EE 1247 (3) Semiconductor Device Theory (pre Phys 0175)		Hum/SS Elective (3)
Junior 2 Term 6 Spring (15- 16)	EE 1563 (3) Signal Processing Laboratory (pre EE 1552)	EE 1212 (3) Electronic Circuit Design Lab (pre EE 1201)	EE Elective (3) Group COE		Technical Elective (3-4) Group COE	Hum/SS Elective (3)
Senior 1 Term 7 Fall (16)	EE Design Elective (3) Group COE Design	ENGR 0020 (4) Probability and Statistics for Engineers (pre Math 0240)	EE Elective (3) Group COE	EE Elective (3)	Technical Elective (3) Group COE	
Senior 2 Term 8 Spring (15)	EE Design Elective (3) Group COE Design		Open Elective (3)	EE Elective (3)	Technical Elective (3) Group COE	Hum/SS Elective (3)

Group COE "Design" Electives: EE/COE 1896, EE/COE 1160, EE/COE 1161, EE/COE 1192, EE/COE 1193.

Group COE Electives: COE 0401, COE 0445, COE 1185, COE 1186, COE 1501, COE 1520, COE 1550, COE 1541, COE 1170

1. Each student must complete at least two (2) CoE Design Electives from Group COE Design.
2. Each student must complete at least five (5) CoE Electives from the Group COE Electives.
3. Every student must attend the Undergraduate Seminar, EE 1885, each term (except summer) that they are on campus.
4. The Communications Skills Elective, Technical Electives, Humanities/Social Science Electives, and the Open Elective may be chosen from the appropriate lists of acceptable electives for each category. At least one of these should include a substantial writing component (WRIT). Of the total requirement of 6 Hum/SS courses, courses should be selected from at least three departments and at least 2 must be from the same discipline (i.e. 2 English courses or 2 Economics courses, etc.).

Courses planned for all terms: EE/CoE 0041, EE/CoE 0142, EE 0257, EE/CoE 0501, EE/COE 1896

Courses planned for fall and spring: EE/CoE 0031, EE/CoE 0132, EE 1552, EE 1563, EE 1201, EE/COE 1185, EE/COE 1186

Courses planned for spring and summer: EE 1212

Courses planned for spring only: EE/COE 1161, EE/COE 1193

Courses planned for fall only: EE 1247, EE 1259, EE/COE 1160, EE/COE 1192

Sample Curriculum Sheet of an Incoming Sophomore

University of Pittsburgh Electrical and Computer Engineering

Thursday, January 30, 2003

Typical A Student
309 Sandy Lane
Pittsburgh PA 15261
Phone: (412) 123-4567
email: abc123@pitt.edu

SSN: 000-00-0000
Program: ee
Area:
Advisor:
Grad Term:

total credits: 28 PITT QPA: 3.51
PITT credits: 24 Xfer QPA: 4.00
Xfer credits: 4 Prog QPA: 0.00
COOP: Standing: N/A

Req#	title	Dept	num	P	X	grade	term	sp	ind	Req#	title	Dept	num	P	X	grade	term	sp	ind		
1	calc 1	MATH	0220	0	4	A	03-1			33	tech elect2										
2	calc 2	MATH	0230	4	0	B+	03-2			34	tech elect3										
3	calc 3									35	comm skil										
4	calc 4									36	hss 1										
5	phys 1	PHYS	0174	4	0	A-	03-1			37	hss 2										
6	phys 2	PHYS	0175	4	0	B	03-2			38	hss 3										
7	phys 3									39	hss 4										
8	chem 1	CHEM	0960	3	0	A	03-1			40	hss 5										
9	chem 2	CHEM	0970	3	0	B-	03-2			41	hss 6										
10	enr 11	ENGR	0011	3	0	A	03-1			42	open elect										
11	enr 12	ENGR	0012	3	0	A	03-2			95	coop										
12	prob&stat									97	seminar	ENGR	0081	0	0	S	03-1				
13	circuit 1									98	seminar	ENGR	0082	0	0	S	03-2				
14	circuit 2																				
15	dig logic																				
16	compt org																				
17	signls&sys																				
18	semicon dev																				
19	electronics																				
20	electromag																				
21	electr lab1																				
22	electr lab2																				
23	signals lab																				
24	Digital Lab																				
25	design																				
26	EE elect 1																				
27	EE elect 2																				
28	EE elect 3																				
29	EE elect 4																				
30	EE elect 5																				
31	old elect req																				
32	tech elect1																				

This grade report is to assist the student in evaluating his or her progress towards the Bachelor of Science degree. It is not an official University transcript. Transfer grades are not included in the PITT QPA or Program QPA.

PROJECT APPROVAL FORM

Term/year of Enrollment Fall _____ Spring _____ Summer _____

Course Number :

Course requirement met by this project

(check one):

____ EE 1865 PEV

Design Elective*

____ EE/CoE 1896 Senior Design Project

EE or CoE Elective

____ ENGR 1050/1051 Product Realization

Technical Elective

____ EE/CoE 1898 Engineering Project

Open Elective

(1898: form with advisor's approval *must* be submitted PRIOR to registration)

Other (explain) _____

Project Title _____

Brief Description _____

***The EE/COE design requirement is intended to provide students with a significant and complete design experience, including problem definition, investigation of the state-of-the-art, prototype design, implementation, and evaluation. In order to fulfill the design requirement, the project must include a proposal, a project schedule, and a final report in written and oral form. Students are also required to present at least one design project at the Senior Design Expo held at the end of the fall or spring semester. The Expo presentation must include a poster and oral presentation. Design projects completed in the summer term may be presented at a fall or spring term Expo.**

Student Name _____

Student Signature _____ date _____

Faculty Project Supervisor Name _____

Faculty Project Supervisor Signature _____ date _____

NOTE: If this is a team project, there must be a separate approval form for each student member of the design team. Please indicate the names of your team members: _____

Previous Project(s): None _____

Term: _____ Course: _____ Project Title: _____

Term: _____ Course: _____ Project Title: _____

Term: _____ Course: _____ Project Title: _____