2008

Electrical Engineering Curriculum

International Overview

Escola Tècnica Superior d'Enginyeria de Telecomunicació de Barcelona

Josep Miquel Jornet, Eduard Alarcón, Elisa Sayrol
International Affairs Office and Dean's office – Telecom BCN
UPC
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I. Overview of the Electrical Engineering Curriculum in some of the main universities in North America

Massachusetts Institute of Technology

http://www.eecs.mit.edu/ug/brief-guide.html#bach
http://www.eecs.mit.edu/ug/primer.html#intro
http://www.eecs.mit.edu/ug/programs.html

These are the degrees related to Electrical Engineering and Computer Science offered at MIT:

Bachelors' Degrees

- **Course VI-1/VI-1A**: A four-year accredited program leading to the **S.B.** degree *Bachelor of Science in Electrical Science and Engineering.*
- **Course VI-2/VI-2A**: A four-year accredited program which permits a broad selection of subjects from electrical engineering and computer science leading to the **S.B.** degree *Bachelor of Science in Electrical Engineering and Computer Science.*
- **Course VI-3/VI-3A**: A four-year accredited program leading to the **S.B.** degree *Bachelor of Science in Computer Science and Engineering.*

Masters' Degrees

- **Course VI-P / VI-PA**: A five-year program leading to the **M.Eng.** degree *Master of Engineering in Electrical Engineering and Computer Science* and simultaneously to one of the three S.B.'s. This degree is available only to M.I.T. EECS undergraduates. It is an integrated undergraduate/graduate professional degree program with subject requirements ensuring breadth and depth. Students write a single 24-unit thesis, which is to be completed in no more than three terms.
- **S.M.**: A one- or two-year program, beyond the bachelors, leading to the **S.M.** degree *Master of Science in Electrical Engineering and Computer Science.* This degree is available only to students who were not MIT EECS undergraduates. The entire program, including the thesis, is to be completed in no more than four terms.

Electrical Engineering

Electrical Engineering at MIT is a very broad field. <u>The curriculum is intensive and very theoretical</u>. The <u>emphasis on theory</u> separates MIT from most schools. The Institute produces engineers who are capable of applying knowledge over a broad range of problems and creating rapid advances in technology. The <u>ability to keep from falling behind</u> is very important in today's high-tech industry. The program starts with basic circuit theory, and moves into systems, physics of electronic devices, and quantum mechanics. The math requirement includes probability theory and complex variable calculus.

Research here includes a variety of interesting topics. Some are:

- Power system engineering;
- High voltage research;
- Chip manufacturing and design techniques (VLSI);

- The modeling of the ear as an electrical system in order to study hearing for speech perception;
- Optics (lasers, fiber optics);
- Digital and analog electronics design;
- Image processing;
- Data, computer, and audio and video communication networks;
- Fusion related magnetic research;
- The relation of electrical engineering to biology and medical applications;
- Systems to control things electronically.

MIT faculty and department members believe that students in any field should learn to write prose that is clear, organized, and eloquent, and to marshal facts and ideas into convincing written and oral presentations.

Concentrations

- Communication, Control, and Signal Processing.
- Devices, Circuits and Systems.
- Electrodynamics and Energy Systems.
- Bioelectrical Engineering.

Academic Performance

Immediately after the end of the Fall and Spring Terms, Grades Meetings and then the Committee on Academic Performance (C.A.P.). Meetings are held to determine which students should be placed on Warning status, and which should be required to withdraw from MIT.

The Registrar's Office prepares listings called Term Summaries which include every Course VI students' grades for the term just passed. A "flag" is generated on the these Summaries beside certain students' names, to identify those students who may be in academic difficulty. The flag is generated if any of the following conditions exist:

Term rating less than or equal to 3.0;
Term load less than 36 units;
Term record includes more than 12 units of I.

This "flag" serves to alert the Department to review the student's record and prepare recommendations to the Committee on Academic Performance.

All students should be aware that action (or NO action) by the C.A.P. depends in large part on the Department's recommendation and, if trouble is anticipated, the student should be in contact with his or her advisor. For M.Eng students, any term rating below 4.0 is unacceptable. Warning letters and even revocation from the M.Eng. program may (in egregious cases) result.

Add/Drop Procedures

If any student anticipates adding a subject by the Add Date or dropping a subject by the Drop Date, it is imperative that the advisor be contacted in advance of the deadline so that approval can be obtained. All advisors should try to be available on these days (particularly on Drop Date) so that they can handle inevitable last-minute requests. Students should understand, however, that it will not always be possible for advisors to be in their offices on those dates.

Some advisors do not permit faculty in the Undergraduate Office or Headquarters to sign cards for them. An advisor is NOT compelled to sign an Add/Drop Card if the proposed action is not approved. Note that failure to meet the Drop Date deadline may lead to failure in the subject that was to be dropped. Petitions to the C.A.P. to drop subjects after the Drop Date are more likely to be turned down than approved.

It is the student's responsibility to act sufficiently in advance of deadlines to avoid the possibility that there may be no one available to endorse the Add/Drop Card on the Drop Date; but in that event, they should come to the Undergraduate Office in 38-476 on the Drop Date.

UROP: The Undergraduate Research Opportunities Program

This is an MIT-wide program that enables undergraduates to work with faculty and research staff on a current research topic, for either money OR credit. UROP is what makes MIT really great for undergraduates. Hundreds of students do UROPs every term and over the summer. Other schools have tried to copy UROP, but their scale is minute compared to MIT's UROP Program. The advantages of working on the cutting edge of technology and the contacts with brilliant, top researchers are priceless. Many students use topics from UROPs as background for Senior Projects. The added and reinforced knowledge is very helpful in your studies. Your faculty and staff contacts can be extremely useful later in life. Even freshmen can often find UROPs! A UROP project is obtained by contacting the faculty in person. You can learn all about the program from displays the week before classes start in the fall. You can also ask upperclassmen. Almost all have participated in this excellent program.

The UAP Requirement

All Course VI undergraduates must complete 6.UAP, a six-unit one term capstone supervised independent project, which is usually done in the senior year, for which the MEng thesis proposal can be used. The only prerequisite is 6.UAT, the six-unit professional technical communications class required of all Course VI majors. Students are encouraged to take 6.UAT earlier than senior year, because it precedes 6.UAP, and 6.UAP may also be completed in the junior or senior year, after 6.UAT, if the project is sufficiently challenging. Both of these subjects are graded on a letter-grade, not a Pass/Fail, basis.

The UAP provides an exciting opportunity for students to build on and reinforce their classroom and laboratory learning. It gives students the chance to work both more independently and more directly with a research supervisor on a project demanding intellectual rigor, design and quantitative skills, as well as interpersonal and communication skills.

University of California, Stanford

http://www-ee.stanford.edu/

Electrical Engineering

The mission of the Department of Electrical Engineering is to offer an EE undergraduate program that augments the liberal education expected of all Stanford undergraduates and imparts a basic understanding of electrical engineering built on a foundation of physical science, mathematics, computing, and technology.

Graduates of the undergraduate program should possess knowledge of electrical engineering fundamentals and at least one specialty area. They are expected to have the basic experimental, design, and communication skills to be prepared for continued study at the graduate level or entry level positions that require basic knowledge of electrical engineering, science, and technology.

The Departmental Requirements for a BS degree in Electrical Engineering include a core set of courses required of every major and a set of specialty areas from which one sequence must be chosen. Each program of study is also expected to include physics as part of science, and calculus, linear algebra, and ordinary differential equations as part of mathematics. The math requirement also includes a course in basic probability and statistics. Specific math and science requirements for EEs are listed below. Other program requirements detailed below include Technology in Society (one course) and one and one half years of Engineering Topics (68 minimum required; also called Engineering Science and Design units), which include Engineering Fundamentals and Depth, which in turn includes a selection of electrical engineering core courses, a specialty sequence, electrical engineering electives, and a design course from an approved list.

There are currently seven specialty sequences for undergraduates: circuits and devices, communications and signal processing, computer hardware, computer software, control systems, fields and waves, and solid state and photonic devices. The specialty sequences consist of 3 courses related to one of these areas. These specialty sequences feed into the capstone design class, whose goal is to synthesize knowledge from the specialty area based on an open-ended project. However, students are not restricted to take a capstone design course coupled to their specialty area, and in the past there were many specialty sequences without a related capstone design class.

The main goals of the curriculum are as follows:

1. “Hook” students into EE early on.
2. Make lower division requirements more relevant to the major.
3. Make core classes parallel and complementary, with labs for each class.
4. Offer comprehensive specialty sequences and multiple options for capstone design courses.

To fulfill these goals, we recommended the following changes to the undergraduate curriculum:

1. Add freshman seminars to generate interest in the EE major early on.
2. Increase flexibility in the lower division requirements.
3. Increase flexibility in the Electromagnetics requirement.
4. Build a set of three 2-quarter required core classes that can be taken in any order.
5. Improve the specialty sequences offered around the core.
6. Significantly expand the number and type of capstone design courses.

Freshman seminars

The purpose of these courses is to introduce freshman (and sophomores) to exciting topics within a given discipline area through a small group setting working closely with faculty. These seminars are extremely popular and also serve as a recruiting tool for many departments. The EE freshman seminars have been very rewarding for both students and faculty, have brought additional funding into the department, and are now considered an important component of our undergraduate curriculum.

Undergraduate research program

This program allows undergraduates to spend a summer in a research lab under the supervision of a faculty member, with on-campus housing in the Summer Research College and a stipend.

University of California, Berkeley

http://www.eecs.berkeley.edu/Programs/ugrad/UgradResearch/index.html
http://www.eecs.berkeley.edu/Courses/Data/131.html
http://research.berkeley.edu/ResProgMatrix.html

Electrical Engineering

The department offers two programs: Electrical and Computer Engineering (ECE), and Computer Science and Engineering, (CSE), both of which are accredited by ABET. We have designed a set of courses of study for these programs, called options. Students working for the B.S. degree select an option within their program and are then assigned an appropriate advisor on the basis of their selection.

The ECE and CSE programs have the following broad objectives:

1. Preparing graduates to pursue post-graduate education in engineering or other professional fields.
2. Preparing graduates for success in technical careers related to electrical and computer engineering (computer science and engineering).
3. Preparing graduates to become leaders in fields related to electrical and computer engineering (computer science and engineering).

To achieve these objectives, both programs attempt to provide students with the following:

1. An ability to configure, apply test conditions, and evaluate outcomes of experimental systems.
2. An ability to design systems, components, or processes that conform to given specifications and cost constraints.
3. An ability to work cooperatively, respectfully, creatively, and responsibly as a member of a team.
4. An ability to identify, formulate, and solve engineering problems.
5. An understanding of the norms of expected behavior in engineering practice and their underlying ethical foundations.
6. An ability to communicate effectively by oral, written, and graphical means.
7. An awareness of global and societal concerns and their importance in developing engineering solutions.
8. An ability to independently acquire and apply required information, and an appreciation of the associated process of life-long learning.
9. A knowledge of contemporary issues.
10. An in-depth ability to use a combination of software, instrumentation, and experimental techniques practiced in circuits, physical electronics, communication, networks and systems, hardware, programming, and computer science theory.

Entering freshmen are normally allowed eight semesters to graduate. Entering junior transfers are normally allowed four semesters to graduate.

After graduation, engineers are usually required to participate in projects that are not limited to their area of specialization. This fact necessitates a basic understanding of the fundamentals in many subfields of EECS. Moreover, changes in technology and the economy frequently require engineers to shift their area of specialization to avoid losing their jobs, so it is important to acquire the fundamentals of more than one area of EECS.

Sample Curriculum for Option V: General

Year	V: General	
	Fall	Spring
Freshman	Math 1A (4 units)	Math 1B (4 units)

	Science (4 units)	Physics 7A (4 units)
	CS 61A (4 units)	CS 61B (4 units)
	Humanities (4 units)	Humanities (4 units)
Sophomore	Math 53 (4 units)	Math 54 (4 units)
	Physics 7B (4 units)	Physics 7C (4 units)
	EECS 20N (4 units)	EECS 40 (4 units)
	Humanities (4 units)	Humanities (4 units)
Junior	EE 105 (4 units)	EE 126 (4 units)
	EECS 120 (4 units)	EE 140 or 141 (4 units)
	CS 61C (4 units)	EECS 150 (5 units)
	E 190 (3 units)	
Senior	EE 117 (4 units)	EE 143 (4 units)
	EE 130 (4 units)	CS 152 (5 units)
	CS 162 (4 units)	Humanities (4 units)
	Humanities (4 units)	

1. CS 61A: The Structure and Interpretation of Computer Programs.
2. CS 61B: Data Structures.
3. EECS 20N: Structure and Interpretation of Systems and Signals.
4. EECS 40: Introduction to Microelectronic Circuits.
5. EE 105: Microelectronic Devices and Circuits.
6. EECS 120: Signals and Systems.
7. CS 61C: Machine Structures.
8. EE 126: Probability and Random Processes.
9. EE 140: Linear Integrated Circuits.
10. EECS 150: Components and Design Techniques for Digital Systems.
11. EE 117: Electromagnetic Fields and Waves.
12. EE 130: Integrated-Circuit Devices.
13. CS 162: Operating Systems and System Programming.
14. EE 143: Microfabrication Technology.
15. CS 152: Computer Architecture and Engineering.

Majors

1. Electronics.
2. Communications, networks and systems.
3. Computer Systems.
4. Computer Science.
5. General.
6. Double major programs available.

Undergraduate Research

Undergraduate research is important to:

- Form personal relationships with faculty
- Excellent experience and preparation for graduate school
- Gain motivation and confidence
- Apply classroom theory to practice and products
- Create new knowledge
- Develop oral and written communication skills
- Meet and interact with graduate students
- Make better informed decisions about your future career

Freshman seminars

This seminar is intended as an "attractor" for students to electrical engineering. The objective is to stimulate curiosity and interest of students in understanding the principles on which electronics are designed and built by allowing them to see what's inside today's popular consumer electronics products.

The topics covered include basic operating principles of common electronic devices such as laptop computers, cell phone, personal digital assistant, portable music player, optical disk drive, magnetic disk drive, inkjet and laser printer, liquid crystal display, projection display, digital camera.

Each student must prepare a short presentation on the basic operating principles of one electronic device. Students work together in small teams to disassemble electronic devices in order to discover how they are constructed and to identify the critical components in their make-up.

Capstone courses

Design project courses for seniors, which usually incorporate hardware and software design, which try to minimize new topic coverage, but to show instead how fundamental principles taught in other classes are actually applied.
Course includes a written project proposal and progress report, as well as a final oral report on lessons learned from design and construction. Students work in teams of 2 or 3 , which can include EE, CS, or mechanical engineering students. Each team builds an autonomous robot vehicle which can follow an embedded wire at high speed. The path includes crossings and a sharp jog segment.

Examples: mechatronics design laboratory, digital systems design project.

Columbia University

http://www.ee.columbia.edu/pages/academics/undergraduate/index.html

Electrical Engineering

Our department offers in undergraduate programs in Electrical Engineering and, jointly with the Computer Science Department, Computer Engineering. Both programs are designed to prepare students for a career in industry or further study by providing a thorough foundation of the fundamental concepts and analytical tools of the field. In either program, a wide range of elective courses permits the student to emphasize specific disciplines while still maintaining breadth. Undergraduates in either program have an opportunity to learn about current research activities by participating in research projects with the faculty.

The main objectives of the department include:

1. Produce graduates with a strong foundation in the basic sciences and mathematics that will enable them to identify and solve electrical engineering problems.
2. Provide our students with a solid foundation in electrical engineering that prepares them for life-long careers and professional growth in fields of their choice.
3. Provide our students with the basic skills to communicate effectively and to develop the ability to function as members of multi-disciplinary teams.
4. Provide our students with a broad-based education so that they can appreciate diversity of opinion, better understand ethical issues, and develop a perspective of our profession.
5. Provide our students with a relevant engineering design experience that is integrated across the four year curriculum. Through these experiences, our students will develop an understanding of the relationship between theory and practice

Depth areas

1. Photonics, Solid-State Devices, and Electromagnetics
2. Circuits and Electronics
3. Signals and Systems
4. Communications and Networking

University of Wisconsin-Madison

http://www.wisc.edu/pubs/ug/study.html#improving
http://www.engr.wisc.edu/ece/

The Electrical Engineering undergraduate curriculum provides broad elective freedom, while maintaining some requirements common to all EE students. The program 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 seven classroom courses and five 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.

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.

Undergraduate Research

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.

Introduction to EE

The College of Engineering puts considerable resources into first-year opportunities for students to explore engineering to ensure that it is a good fit for them. Research has shown that new students who take part in an "introduction to engineering" experience are more likely to graduate with an engineering degree than those that do not. Several such opportunities exist. In each case, credits earned can be applied to the BSEE degree. Although participation in these courses is not mandatory, it is strongly encouraged.

Georgia Institute of Technology

http://www.ece.gatech.edu/academics/undergrad/degree_require.html
http://www.ece.gatech.edu/academics/abet/index.html

School of Electrical and Computer Engineering

Three programs are available:

Bachelor of Science in Electrical Engineering: This undergraduate degree program is built around a strong basic core of mathematics, physics, and engineering science. These fundamentals are followed by intermediate courses in electrical engineering topics such as signal processing, digital design, circuit analysis, microelectronic circuits, and electromagnetics. Teamwork, communication skills, and an interdisciplinary approach to problem solving are integrated into the senior elective sequence, including a senior design seminar and capstone design course.

Bachelor of Science in Computer Engineering: This undergraduate degree program is designed to provide students with a strong background in mathematics, physics, and engineering science. The curriculum includes courses in computer architecture and operating systems, advanced digital design, electromagnetics and microelectronic circuits, and advanced digital design. Courses throughout the program, especially those in the junior and senior years, emphasize an open-ended, design-oriented approach to solving engineering problems. Teamwork, communication skills, and an interdisciplinary approach to problem solving are integrated into the senior, computer engineering design courses.

Joint B.S./M.S. Degree: This program allows students to receive either the bachelor of science in electrical engineering or bachelor of science in computer engineering and a master's degree in electrical and computer engineering within a five-year time frame.

The Joint B.S./M.S. degree program affords undergraduate electrical or computer engineering majors the opportunity to broaden their studies and improve their career prospects. Interested students should apply as juniors during the term that they are completing ECE 3040 Microelectronic Circuits, but no later than drop day of the next term enrolled after completing ECE 3040.

In our highly technical and globally competitive society, an M.S. degree is frequently viewed as the "working degree" for many engineers. The M.S. degree is a valuable tool, which takes undergraduate studies to a deeper and broader level of understanding. Engineers who have completed the M.S. degree generally enter the work force with higher starting salaries and a wider range of career opportunities from which to choose. They also tend to be promoted sooner than those who have not completed graduate level degrees.

While earning the M.S. degree, students can choose to participate in programs such as Georgia Tech Lorraine and the Practice-Oriented M.S. to further enhance their graduate level experience and to broaden their education and their career opportunities. The elective hours and required minor classes taken in the M.S. program can also be a starting point for entry into M.B.A. and other non-engineering degree programs.

Undergraduate Research

The Undergraduate Research Opportunities Program at the Georgia Institute of Technology allows undergraduates to obtain real world research experience in a field of interest related to their majors. Students may also gain credit by participating in the UROP program.

Capstone Courses

All undergraduate degree programs include a capstone course, usually done in the senior year, which integrates teamwork, communication skills and an interdisciplinary approach to problem solving. Usual capstone projects are related to robotics and mechatronics, as both are able to relate electronics, mechanics and communication knowledge.

California Institute of Technology (Caltech)

Electrical Engineering Department

http://www.ee2.caltech.edu/Academics/academics.html

The main objective of the electrical engineering program is to prepare its students for either graduate study or research and development work in government or industrial laboratories. This objective is consistent with the institutional mission "To train the creative type of scientist or engineer urgently needed in our educational, governmental, and industrial development." It accomplishes this by building on the core curriculum to provide a broad and rigorous exposure to the fundamentals (e.g., math, science and engineering) of electrical engineering. EE's other program educational objectives are multiple. The program strives to maintain a balance between classroom lectures and laboratory and design experience, and emphasizes the problem formulation, system design and solving skills that are essential to any engineering discipline. The program also strives to develop in each student's self-reliance, creativity, team work ability, professional ethics, communication skills, and an appreciation of the importance of contemporary issues and life-long intellectual growth.
Electrical Engineering at Caltech emphasizes both electronics and systems. Closely allied with Computation and Neural Systems, Applied Physics, Computer Science, and Control and Dynamical Systems, it offers students the opportunity for study and research, both theoretical and experimental, in a wide variety of subjects, including wireless systems, quantum electronics, modern optics, lasers and guided waves, solid-state materials and devices, power electronics, control theory, learning systems, computational finance, signal processing, data compression, communications, parallel and distributed computing, fault-tolerant computing, and computational vision.

Electrical Engineering Majors

Communications and Signal Processing
Control
Electronic Circuits
Microwave and Radio Engineering
Optoelectronics
Solid-State Electronics

In addition, the Independent Studies Program allows students to design, with faculty advice, a customized course of study to investigate topics not covered by any of the traditional options.

Undergraduate Program

Caltech offers a four-year undergraduate course with options available in applied and computational mathematics; applied physics; astrophysics; biology; business economics and management; chemical engineering; chemistry; computer science; economics; electrical engineering; engineering and applied science; English; geobiology; geochemistry; geology; geophysics; history; history and philosophy of science; independent studies; mathematics; mechanical engineering; philosophy; physics; planetary science; and political science. Each leads to the degree of Bachelor of Science. All options require students to take courses in biology, chemistry, humanities, mathematics, physics, and the social sciences. Course work is rigorous and students are encouraged to participate in research. The undergraduate program is thus designed to provide an intensive exposure to a wide spectrum of intellectual pursuits.

Near the end of the first year, students select an option, and during the second year they begin to specialize. However, the major concentration in chosen fields and professional subjects occurs during the third and fourth years. Caltech also encourages a reasonable participation in extracurricular activities, which are largely managed by the students themselves. Three terms of physical education are required, and intercollegiate and intramural sports are encouraged. In short, every effort is made to provide undergraduate students with well-rounded, integrated programs that will not only give them sound training in their professional fields, but that will also develop character, intellectual breadth, and physical well-being.

Student Retention and Persistence Rates

Most undergraduates enter Caltech at the freshman level. Of the 234 freshmen enrolled during the 2005–06 academic year, 225 reenrolled in the first term of the 2006–07 academic year and are progressing, yielding a persistence rate of 96 percent. Of the 205 freshmen enrolled during the 2000–01 academic year, 182 graduated by June 2006, yielding a graduation rate for this group of 89 percent.

McGill University

http://www.mcgill.ca/ece/undergrad/information/ee/

Electrical Engineering

Through a challenging 4-year curriculum, students in the McGill Faculty of Engineering acquire a strong foundation in science and technology and develop valuable interpersonal and teamwork skills. All programs provide a strong background in math, basic sciences, engineering science, design and complementary studies. The first year of the program for students entering the Faculty of Engineering from outside Quebec constitutes a full year of basic science courses (mathematics, physics and chemistry).

A graduate of this program is exposed to all basic elements of electrical engineering and can function in any of our client industries. This breadth is what distinguishes an engineer from, say, a computer scientist or physicist.

In addition to technical complementary courses, students in all three programs take general complementary courses in social sciences, administrative studies and humanities. These courses allowed students to develop specific interests in area such as psychology, economics, management or political science.

Final Project

During the last undergraduate year, a laboratory design project undertaken with close supervision by a staff member is mandatory. The course is divided in two parts. The first part consists of defining an engineering problem, reviewing relevant background and literature, and seeking the solution through numerical simulation and/or experimental investigation. A literature review, written project proposal, and seminar presentation are required. The second part consists of carrying out the project plan developed in ECSE 474 Design Project 1 producing a report summarizing the results, and a seminar presentation.

Undergraduate Research

Research is the cornerstone of an undergraduate education. The McGill Faculty of Science's Office for Undergraduate Research seeks to expand research opportunities for qualified and interested students. The Office coordinates research opportunities across the Faculty, in particular building on the NSERC undergraduate research program. The office will create bridges across units, linking units with fewer students to those with a higher student-professor ratio.

The academic goal is that students should participate in laboratory research and research projects from the start of their degree, and should continue to conduct research as part of their program requirements. The Office for Undergraduate Research will increase the number of undergraduate students involved in research, exposing them to the process and products of scholarship, and enhancing the undergraduate research experience.

Plagiarism

If any part of a document you submit for credit towards your degree is not entirely your own work and you do not make it clear in the document that this is the case, then you have committed plagiarism and, if discovered, will be punished. The following are some specific points you should take note of:

1. If ideas are taken from other sources, you must make it clear by citing the source, e.g. a journal paper, a book, another report. This must be done even if the ideas are re-written in your own words. If you include unpublished ideas from a colleague then you should make reference to an "unpublished communication" and give credit to your colleague.

2. If actual phrases or sentences are copied from another source, you must place them in quotes or use some other mechanism to show that the words are not your own. It is NOT enough just to cite the source.
3. If measured or computed results (e.g. numbers, graphs, tables) included in your document were not obtained entirely by you, you must say so and give the source of the results.
4. If your document asserts or implies that results were obtained with something you have built on your own, and this is partially or entirely untrue, then you have committed plagiarism. This applies to both hardware and software. For example, if you copied or modified a computer program written by someone else, you must make this clear in your document.
5. Any parts of your document that are the result of collaboration with another person must be clearly indicated.
6. It is generally acceptable (in fact, desirable) to have another person (or a computer) proofread your document and correct spelling, grammar and typographical errors. If that person does more than make minor corrections, however, he or she must be duly credited in the document, e.g. if someone rewrites whole sentences or translates your report from another language into English.

University of Toronto

Electrical Engineering

The Department of Electrical and Computer Engineering at the University of Toronto has recently revised its undergraduate program. The new curriculum significantly enhances the students' learning experience and gives students the flexibility to take courses in other areas of Engineering and other Faculties. The new curriculum was initiated in September 2003.

Ours is the first ECE program in the country to allow a new kind of flexibility: in the first two years, you will take a specific set of fundamental courses in engineering design and communication, mathematics, digital systems, electronics, communication systems, computer architecture and software. This includes a novel introductory seminar series, ECE 101, in which different professors give a description of the many ECE sub-disciplines. The new flexibility arrives in the third and fourth years -- you will choose from a broad array of courses in six general areas:

- photonics & semiconductor physics
- software
- electromagnetics & energy systems
- analog & digital electronics
- control, communications & signal processing
- computer hardware & networks

Our ECE department is unique in it's ability to provide courses from such a wide array of sub-disciplines of ECE. The program's new flexibility also permits you to take a minor from the U of T's Faculty of Arts & Science calendar, in addition to several new engineering minors including bioengineering and a business-oriented minor.

First Year Program

The new first year curriculum is an innovative and exciting program. There is a new software course, a new seminar series introducing students to the broad field of ECE, and a new sequence of courses in engineering design -- Engineering Strategies and Practice I and II.

The Fall Term:

- Structure, Materials & Design
- Computer Fundamentals
- Calculus I
- Discrete Mathematics
- Engineering Strategies & Practice I
- Introduction to ECE – weekly seminar

ECE Seminar Series
Last year the topics for the ECE Seminar Series included:

- Smart cards in the Tokyo subway system
- How digital music works
- Why writing software is hard
- What computer hardware and doing laundry fast have in common

The Spring Term:

- Dynamics
- Programming Fundamentals

- Calculus II
- Electricity & Magnetism
- Engineering Strategies & Practice II

Second Year

The second year of the new curriculum features a new engineering design course and will continue to introduce students to the fundamentals of electrical and computer engineering. The third and fourth years contain no "required" courses, permitting students to choose from a wide range of options, both technical and non-technical.

In the new curriculum, students can package their program to suit them personally. You can take courses outside ECE -- business, robotics, biological sciences, music, languages – to name a few. This is the most flexible undergraduate program in electrical and computer engineering in Ontario. ECE continues to offer its students the widest range of upper year options and state-of-the-art equipment in its laboratories.

After you graduate

An education in an ECE program is a springboard from which you can launch an engineering career, become an entrepreneur, a doctor or a lawyer. It gives you training in critical thinking and just getting things done.

Electrical and computer engineers work in robotic design, aerospace engineering, software design and development, biomedical engineering, communication systems design, computer systems design and renewable energy systems -- among many other areas. Many ECE graduates can be found in the banking and finance sectors as well as business management, where their knowledge of technology and their problem-solving, time-management, communication and team-building skills are highly valued.

Electrical and computer engineers create special effects for the movie industry, design computer games, as well as build database software for large companies. They are heavily involved in robotics and other control systems used in industry and by government agencies like NASA. Many ECE graduates pursue graduate studies to obtain advanced degrees in these same areas. They can be found at schools like MIT and other prestigious universities and institutes. An ECE degree from U of T is respected internationally and can open many doors.

Summer Student Research Program

Through their internationally renowned work in research, ECE professors can offer students the most up-to-date engineering education. ECE also gives students the opportunity to get directly involved in research projects. In our Summer Student Research Program, undergraduates work on state-of-the-art research projects in the summer. Over 100 ECE students typically participate in summer research projects.

II. Overview of the Electrical Engineering Curriculum in some of the main universities in Asia and Oceania

The University of Auckland

http://www2.ece.auckland.ac.nz/

The University has a responsibility to ensure that all of its students, undergraduate and postgraduate, gain the maximum benefit from their contact with a research-based teaching and learning environment that is intellectually diverse and rich.

- Student-focused teaching and learning environment.
- Review regularly the academic curriculum.
- Retain a core commitment to research-based teaching and enhancing scholarship through clearly lining research, professional practice, creative work and teaching.

All students who begin their first undergraduate degree at the University of Auckland from 2006 will be required to include General Education courses in their programs. The General Education component is designed to provide opportunities for students to broaden their study, to expose them to a more diverse range of teaching and learning experiences and to assist in producing graduates who possess the attributes expressed in the University's graduate profile.

The University expects its graduates to have an ability to access, identify, organize and communicate knowledge effectively in both written and spoken English.

In 2004 Summer School enrolments reached 6028, representing a 415% growth in enrolments since Summer School's pilot year. Summer School courses are offered at undergraduate and postgraduate level, although the majority continues to be offered at stage one and two. In 2004 the number of courses offered in Summer School was 153.

The University is committed to promoting interdisciplinarity in teaching and research, while it also supports strong disciplinary study. However, enabling interdisciplinary teaching and research has not been easy, and this is not a problem unique to this University. The University needs to find better incentives for inter- and cross-disciplinary collaborations and to lower the barriers to this work.
The University is committed to providing its academic staff with the opportunity to become excellent teachers and leading scholars and researchers in their fields, and to developing their managerial, leadership and technical abilities. Its strategies for achieving these goals include the provision of staff-development programs and high quality professional development advice and support.

Electrical Engineering

Four parts, four years, covering:
- Power Systems.
- Power Electronics.
- Communications.
- Radio Systems.
- Digital Signal processing.
- Computer Systems.

The pace of change in this field is so rapid that it is not advantageous to attempt covering all aspects of current technology in a four-year course. Instead the degree provides a broad foundation of basic science, engineering science, electrical engineering, and selected fields of current technology, which the professional engineer can build on throughout his or her career.

In Part II fundamental strands of Electrical and Electronic Engineering are introduced, including electrical materials and electronic devices; circuit theory; software design; and mathematical modeling tools. An introduction to engineering electromagnetics and computer systems is also provided, and the course's present-day relevance is strengthened by investigating how engineering fits into the wider context of human social and cultural development. In the second semester students take part in practical design exercises. Part II strands are dovetailed into the core program at Part III so that those completing Part III have been exposed to all modern Electrical and Electronic Engineering concepts in the final year.

Part IV is essentially elective, with a selection of subjects allowing students to go with their preferences and skills. A final-year project is due, which has the weighting of more than 25% of the year's work and represents the culmination of the Engineering design strand.

Hong Kong University

http://www.polyu.edu.hk/cpa/polyu/program_admission/academic_e.php
http://www.eie.polyu.edu.hk/EIE%20Homepage/Home.html

Electrical Engineering

The degrees offered are two:

1. BS in Electronic and Information Engineering
2. BS in Internet and Multimedia Technologies

There are different "modes" in which the students can pursue these degrees:

A. Full-time mode

Under the Full-time mode, the students will normally pursue their study by going through Year 1, Year 2, and Year 3 in full time and then graduate at the end of Year 3 after having satisfied all program requirements.

B. Sandwich mode

Under the Sandwich mode, the students will pursue Year 1 and Year 2 study in full time, and then engage in industrial training in Year 3. During the industrial training year, the students may choose to study one subject each semester. After the industrial training year, the students will pursue study in Year 4 in full time again. Normally the students will graduate at the end of Year 4 after having satisfied all program requirements.

C. Cooperative Education Scheme mode

Under the CES mode, the students will pursue Year 1 and Year 2 of study in full time. From Semester 3 of Year 2 up to Semester 1 of Year 4, the students will engage in industrial training while concurrently pursuing study in the University in day-release mode (one day leave per week) given by the employer. In the "Track 1" route of the CES mode, the students will also undertake a job-related Honors project during the industrial training period. Normally the students will graduate at the end of the first semester of Year 4 after having satisfied all program requirements. Should the students prefer to take the Honors project after Year 3, he/she will study in the "Track 2" route and will normally graduate at the end of Year 4.

D. Double Degree mode

After Year 1, students may choose to embark on the Double Degree mode of study. Due to limited quota, students will be selected into the Double Degree mode according to their suitability. The normal duration of the Double Degree mode is four years. The first three years will be UGC-funded while the fourth year will be self-financed. On successful completion of the Double Degree mode of study, the students will obtain two awards, namely Bachelor of Engineering (Honors) in Electronic and Information Engineering and Bachelor of Science (Honors) in Engineering Physics. In case the students choose to terminate their study after Year 3, they will normally obtain the Major in Electronic and Information Engineering and Minor in Engineering.

E. Double Degree Sandwich mode

The normal duration of the Double Degree Sandwich mode is five years. Students enter the Double Degree mode of study in Year 2. After Year 2, students engage in industrial training for one year and then return to the Program to study for the remaining two years to obtain the double degrees. During the industrial training year, students may choose to study one subject each semester. In case the students choose to terminate their study in Year 4 (i.e. the year after training), they will normally obtain the Major in Electronic and Information Engineering and Minor in Engineering Physics awards.

Aims, objectives and outcomes

The followings are the aims and objectives of the Program:

- This program aims at producing graduates with the professional knowledge and skills that are relevant for a professional engineer to contribute to the electronic and information engineering profession.

- The curriculum enables the students to develop a deep understanding of sound scientific principles, and to gather experience in practical applications.
- The learning and teaching environment is flexible and relevant to support both professional and all-rounded developments of the students.
- The graduates will be able to develop abilities in effective communication, problem-solving, inquisitiveness, critical and creative thinking, and life-long learning.
- The graduates are expected to be equipped with professional competence, all-rounded attributes and transferable skills, and be able to meet challenges from the rapidly changing engineering profession.

On successful completion of the BS in Electronic and Information Engineering Program, students will be able to:

Category A: Professional/academic knowledge and skills

1. Meet the academic requirements for Corporate Membership of the Hong Kong Institution of Engineers (HKIE).
2. Practice as a professional engineer in the field of electronic and information engineering with the necessary professional knowledge, skills, ability and attitude.
3. Identify and apply fundamental principles in the electronic and information engineering profession.
4. Apply mathematical and scientific foundations in the electronic and information engineering profession and in further study.
5. Design solutions to real-life problems in electronic and information engineering while taking into consideration of practical constraints.
6. Recognize responsibility, ethics, and environment issues when practicing as a professional engineer in the field of electronic and information engineering.
7. Communicate effectively to meet the standard required for the electronic and information engineering profession.

Category B Attributes for all-roundedness

1. Have a sense of global outlook, and be able to recognize local and international technological development in electronic and information engineering.
2. Think critically and creatively.
3. Recognize social and national responsibility.
4. Pursue life-long learning and continual professional development.
5. Have a sense of entrepreneurship, and be able to recognize market needs and product development requirements in the electronic and information engineering profession.
6. Work in a team collaboratively.
7. Exercise leadership when working in a team.

Assessment Methods

- Students' performance in a subject shall be assessed by continuous assessment and/or examinations. Where both methods are used, the weighting of each in the overall subject grade shall be clearly stated in the definitive program document.
- Continuous assessment may include tests, assignments, projects, laboratory work, field exercises, presentations and other forms of classroom participation. The contribution made by each student in continuous assessment involving a group effort shall be determined and assessed separately.
- Assessment methods and parameters of subjects shall be determined by the subject offering department.
- At the beginning of each semester, the subject teacher should inform students of the details of the methods of assessments to be used within the assessment framework as specified in the definitive program document.

Korea Advanced Institute of Science and Technology

http://www.ee.kaist.ac.kr/education/undergraduate.asp

The educational objective of the department is to foster men of talents who will be leaders in electrical engineering. The Bachelor of Science program emphasizes the fundamentals of modern electrical engineering; the Masters of Science program emphasizes professional skills that the industry demands and the doctor of philosophy program encourages creative research that will be beneficial to all human kinds.

The operational objective is to produce future leaders with vision, creativity and communication skills through research and education which will have dramatic effect on our future world.

The curriculum characterized by diverse cooperation with industrial agencies, understanding of theory and concepts by experimental verifications, and variety of group seminars is organized so that the students can fully enhance their technical knowledge and develop their ability to put their knowledge into practice.

In the undergraduate program, the courses related to electrical and electronic engineering are offered with emphasis on cultivating practical ability and creativity through pragmatic education. The program has been reinforced with Electronic Engineering Labs and Project Lab, which are provided in order to enhance the design capabilities.

Course sequences

1. Communications and networks.
2. Control and system.
3. Nano devices and integrated systems.
4. Computer and system-on-chip design.
5. Information systems.
6. Wireless and lightwave.

Description of the elective course on Communication Skills

For engineers doing research and development work for new technologies and products based on the market demand, not only professional skills but also communication skills is a must to have to fully exploit the professional skills. This course covers important principles and skills in presentations, lectures, dialogue, group discussions, negotiations, both technical and nontechnical.

III. Overview of the Electrical Engineering Curriculum in some of the main universities in Europe

Technische Unversität München

http://portal.mytum.de/welcome

Electrical engineering and information technology are among the most important areas of business life today. Numerous German firms research, produce and sell electrical engineering and information technology systems, and their achievements in the field enjoy an international reputation. For this reason, Electrical Engineering and Information Technology graduates go on to work at home and abroad in positions in the industrial sector (research, development, production, project design and sales), at public authorities and state-owned companies, and at railway and postal organizations, radio and television stations, independent research and technical institutes, universities, and other establishments of higher education. They also find employment as consulting engineers, and with additional training, as patent engineers

Majors

1. Power Engineering.
2. Information and Communication Engineering.
3. Electronics.
4. Automation Engineering.
5. Mechatronics.

Duration

6 semesters (180.0 credits)

Structure

Vertiefungsmodule – 42 Credits
- **Wahlmodule** – 30 Credits
- **Bachelor Thesis** – 12 Credits

Grundlagen – 120 Credits
- **Elektrotechnik** – 39 Credits
- **Informationstechnik** – 15 Credits
- **Mathematik** – 30 Credits
- **Physikalische Grundl.** – 18 Credits
- **Signale & Systeme** – 18 Credits

FIQ – Soft Skills – 6 Credits

Ingenieurpraxis – 12 Credits

Technical University of Denmark (DTU)

http://shb.dtu.dk/Default.aspx?educationId=250&Language=en-GB&lg=&version=2007/2008

The B.Eng. studies have always emphasized applied engineering, and they have by tradition included integrated project work and design-build activities. We see the adoption of CDIO as a means to maintain and develop these characteristics in a changing organizational environment, and as a means to create a stronger awareness for learning objectives and how to achieve these.

The following models may be used for the cross disciplinary projects:

- An independent 5 ECTS project course.
- A part of a larger 10-15 ECTS multidisciplinary course.
- Embedded in a number of courses and evaluated as part of these courses. Requires careful cross-course coordination.

DTU graduates are renowned for their technical skills and creativity. This reflects our three key goals:

1. Excellence in research.
2. Research-based education.
3. Commitment to innovation and industry partnerships.

The core of the BS in Electrical Engineering is shared among the different majors:

Basispakke			kontakt: Lars Drud Nielsen	
01005Matematik 1 inkl. 01008 (del 1)	1. halvår	E5 + E3B	10 p.	
31002Digital elektronik	1. halvår	E4	10 p.	
31013Ingeniørarbejde	1. halvår	E1B + jan.	10 p.	
01005Matematik 1 inkl. 01008 (del 2)	2. halvår	F5 + F3B	10 p.	
31004Analog elektronik	2. halvår	F4	10 p.	
02102Indledende programmering	2. halvår	F3A	5 p.	
30010Programmeringsprojekt	2. halvår	juni	5 p.	
01035Matematik 2	3. halvår	E2B	5 p.	
10024Fysik 1 (del 1)	3. halvår	E5A	5 p.	
31400Elektromagnetisme	3. halvår	E1	5 p.	5 p.
	3. halvår	plads til tilvalg:	10 p.	
10024Fysik 1 (del 2)	4. halvår	F5A	5 p.	
31605Signaler og lineære systemer i kontinuert tid	4. halvår	F3A	5 p.	
31015Fagprojekt	4. halvår	F2A + juni	10 p.	
	4. halvår	plads til tilvalg:	10 p.	
31606Signaler og lineære systemer i diskret tid	5. halvår	E1B	5 p.	
	5. halvår	plads til tilvalg:	25 p.	
26027Grundlæggende kemi	6. halvår	F5A	5 p.	
42610Ingeniørfagets videnskabsteori	6. halvår	F3A	5 p.	
Bachelorprojekt	6. halvår		15-20 p.	
	6. halvår	plads til tilvalg:	5 p. ?	

Royal Institute of Technology – KTH

BS: http://www.kth.se/studies/swedish-programmes/2.1450/1.7627?l=en
Structure of education: http://www.kth.se/studies/2.1856?l=en

Information and Communication Technology Program (180 credits)

This program leads to a Bachelor of Science in engineering degree. This is an internationally recognized degree that will enable graduates to continue their studies or to apply for well-qualified jobs anywhere within the EU. Students will develop the technology for future communication and information systems. Probable professional fields include systems where electronics, computers, communications networks and software interact in order to offer new, advanced services. Graduates will access a broad job market within, for example, computer game construction, mobile services, tele and data communications, medical engineering, the vehicle industry or product development. Possible roles include technical specialist, consultant or product developer.

This program offers the opportunity to study IT engineering even if the student has not previously studied natural sciences at upper secondary school level. The first courses provide an insight into technical project work and a course in Mathematics builds a good groundwork for the rest of the program. In addition, the first two years provide important knowledge and tools within mathematics, programming, electronics, computer systems and communications engineering. Elective courses allow individual course design for 15 weeks of full time study in Year 3. There are two specializations to choose from: Information and Communications Engineering provides a broad basis as well as more in-depth studies of the most important technologies in modern IT services. Simulation and Computer games includes advanced computer graphics for visualization and simulations.

Year 1

In Year 1 students gain insight into their future professional role as well as basic knowledge within Mathematics, Programming and Communications Engineering on which the rest of the course is based. In the introductory course – Engineering Skills - students are immediately faced with practical engineering problems. They learn to work together with others in a project and to document their results. At the same time an introductory course in Mathematics will be given in preparation for the rest of the KTH Mathematics courses. The following Engineering Science courses are Object-Oriented Programming and Algorithms and Data Structures in which programming and basic concepts within datalogy such as data structures, algorithms and simple calculation models are covered. Engineering Science is concluded with Networks and Communications and Database Technology.

Mathematics runs parallel with the engineering courses. Mathematics is a vital tool for the professional role which enables activities in, for example, advanced computer graphics, simulations and models of communications systems.

Year 2

Courses in Year 2 provide basic knowledge on how electronic products and systems are built up and programmed. At the end of the year this knowledge is applied in a larger-scale practical project aimed at building a prototype. The Digital Design course includes the theoretical bases of analysis and construction of digital electronics plus the various design and construction phases used to construct simple combinatory and sequential digital systems. Basic knowledge from Year 1 is followed up through Mathematical Statistics which provides basic knowledge in probability theory and statistical inference. The course is also intended to give understanding for, and skills in, their application to practical problems.

The spring term is dominated by a Project (15 credits), in which the technical elements are fetched from the engineering science courses Object-Oriented Programming, Algorithms and Data Structures, Programming Paradigms and Models, Digital Design and Networks and Communications. For a few, intensive weeks, students work full time on their projects in groups of 8–10, supported by agile project methodology. The aim is for students to work with a larger scale problem in a structured manner and to learn to use some of the tools available for this.

The specialist courses in Information and Communications Engineering deal with computer technology and computer security. Computer technology concerns how computers and computer systems are built up and how they work. Examples of such systems are personal computers or mobile phones. Computer security concerns how to protect systems and applications against attacks from viruses or unauthorized access. In the Simulation and Computer Games specialization, computer graphics and the use of physics to represent simulated processes in a computer are covered.

Year 3

In Year 3 specialized studies are continued and content may be independently designed to a certain degree through elective courses.

Specializations

- Information and Communications Engineering
- Simulation and Computer Games

Degree Project

The program is concluded with a degree project worth 15 credits (equivalent of approximately 10 weeks of full time study). The aim of this project is to test the knowledge acquired during the course in a realistic project. The degree project is intended to prepare students for their future professional role and/or their continued studies at master's level.

Telecom Paris Tech

http://www.telecom-paristech.fr/en/engineering/programme/paris_1st.php

Engineering Degree Program (1st Year)

The Engineering Degree Program begins with a common curriculum: compulsory introductory courses *(BCI - base des connaissances indispensables)*. It lasts the whole year for *Concours Commun* students (recruited after competitive entrance exams) and transfer students (first degree graduates from other institutions). It teaches the basic knowledge that is essential to any student, within the school's sectors of application, whatever the student's future choice of specialization.

The fields are:

1. Information technology, networks and telecommunications.
2. Electronics, electromagnetic wave propagation.
3. Signal, communications and mathematics for engineers.
4. Economics and society.
5. Projects.

Graduate School (2nd and 3rd years)

The students admitted through double degree or bilateral agreement join the Graduate School. This one includes the whole of the 2nd and 3rd years. The students choose their classes from the teaching units catalogue (electives), and/or the project they want to present.

It is important to know that there are always 3 aspects developed in TELECOM ParisTech teaching, no matter what year or track:

1. The scientific and technological aspect.
2. The foreign languages and cultures aspect.
3. The personal skills and human relations aspect.

We believe that all three are just as important when entering the world of engineering today. One has to be aware of the new challenges in the industry at every level, and seeing as ou future engineers will be working with people from all around the world, it is important that they are prepared to do so. Thus, foreign languages and cultures are a very important aspect of our teaching, as they enable to understand and accept more easily different customs, codes and lifestyles; on the other hand, one cannot understand others without knowing oneself -we therefore also have classes based on human relations and communication, and personal skills.

Personal Skills and Social Sciences Course

Becoming an effective engineer, such as a specialist, a researcher, a project manager or an entrepreneur, does not only depend on scientific or technical expertise. It also depends on professional skills and the ability to communicate efficiently in multiple situations, such as working in a team, conducting meetings, writing reports, giving presentations and negotiating.

Good communication, people skills, the ability to listen and to solve problems are qualities that are required in a professional environment. They are acquired through knowing oneself and others around us.

This is why the TELECOM ParisTech has a Personal Skills and Social Sciences course.

Modern Languages and Cultures

To succeed in an increasingly international professional context, TELECOM ParisTech provides students with unsusual and exciting language classes like the English theatre club, debating sessions based on the British parliamentary debate system, bilingual courses, recruiting simulations in foreign languages, etc.

They all contribute to developing communication skills which enable students to interact fully in the context of a foreign culture. Because engineers have to evolve/move in an international context (work within a multicultural team, missions abroad, use a foreign language as a working language), training in foreign languages occupies a significant place in the education of our students.

To obtain the degree, they must have a command of three languages, possibly at different levels, with French and English compulsory.

Internships / Career Orientation

Through compulsory work placements and numerous other activities (e.g. regular briefings, presentations of company projects, company visits, job surveys), students discover the wide spectrum of jobs open to TELECOM ParisTech engineers and develop their knowledge of the professional world.

1st Year Work Placement

This work placement is carried out between the first and second years, and gives students the opportunity to experience life within a company. At the end of the training period the students are brought together in small groups in order to prepare their placement reports with a teacher.

2nd/3rd Year Engineering Internship

The engineering internship is an actual part of the program and lasts for a minimum of 5 months. Its pedagogical aim is to give the student the opportunity to acquire experience of life in a company as an engineer. Thus the student must head, present and bring to fruition a solution corresponding to the company's requirement.

Politecnico di Milano

http://www.polimi.it/english/academics/study_courses/undergraduate/index.php?id_nav=-273&id_corso=123&titolo=TELECOMMUNICATIONS%20ENGINEERING&apri=-300

The communication engineering graduate is an expert with a university background, capable of performing planning, product development, installation, testing and maintenance of systems, management of production divisions as well as supervision, assessment and technical assistance activities, in the field of telecommunication systems, networks and services.

This Course requires a full time attendance and involves classroom and laboratory activities

As specified by the didactic regulations, 180 credits are required to obtain the degree (first level). More specifically, for the basic courses (mathematics, statistics, physics..) 27 credits are required, for courses specific to the degree (communications, electronics, computer sciences, electromagnetic fields) 36 credits are required, for other subsidiary courses (science, engineering, humanities, economic sciences) 90 credits are required; for other activities (laboratories, stages, foreign languages...) 27 credits are required.

A detailed description of each subject can be found in the link above.

ETH Zurich

http://www.ethz.ch/studies/index_EN
http://www.itet.ethz.ch/index_EN
http://www.ee.ethz.ch/

The Bachelor program comprises 180 credit points, corresponding to a study period of six semesters (three years). The Bachelor program always begins in the autumn semester.

Electrical Engineering Department

During the bachelor course, students get the principles of a broad engineering education on a scientific basis.

Solid basic knowledge in the areas of mathematics, physics, computer science, electrical engineering, information technology and other engineering disciplines, as well as methodical scientific thinking and the building up of social competence will qualify the students to succeed in the subsequent, demanding master courses.

Beyond the theoretical and methodical principles of electrical engineering and information technology, subjects in the area of humanities, social and political science (GESS) as well as "man-technology-environment" (MTE) will complement the general education.

The fundamentals of Engineering Sciences will be taught during the first and second year. There will be an exam at the end of the first year. During the second year there will be block exams. The basic education is followed **by** the third year of studies which comprises different specialization subjects. It is mandatory to choose one of them.

First year and second year

During the first four semesters our curriculum focuses on motivation, teamwork and solid scientific basics like math, physics and engineering science courses relevant to Information Technology and Electrical Engineering.

A prominent example of how to get students involved is our PPS (Practical training, Projects and Seminars): The PPS introduces students to teamwork and to assisted but mainly self-directed learning on subjects that are of more general interest.

Furthermore, presentation skills are trained and first experience is gained in how to defend their findings in front of a group of peers and assistants.

The subjects in the scope of PPS encompass on the one hand basic practical skills in circuit design, measurements, microprocessors and computer science as well as the corresponding state-of-the-art analysis, simulation and design tools, and on the other hand curiosity-driven projects with a high degree of freedom regarding content and in-depth knowledge creation by students. The latter category of subjects are closely supervised by PhD students and research staff.

Third year

In the 5th and 6th semester the students must select one out of four specialization areas (Majors) in which we teach the broad basics specific to that area. At this stage of their education we also offer non-technical courses to develop skills relevant to the profession in its social and business environment.

At the end of the first six semesters the students have developed a solid scientific methodical thinking, accompanied by social and business skills in a wider sense.

They have acquired some basic knowledge in design, modeling and systems, and they have been exposed to other disciplines like mechanical engineering, biology and medicine, physics and computer science. They are prepared to continue in-depth studies at the master level at the ETH Zürich or at another University in Switzerland or abroad.

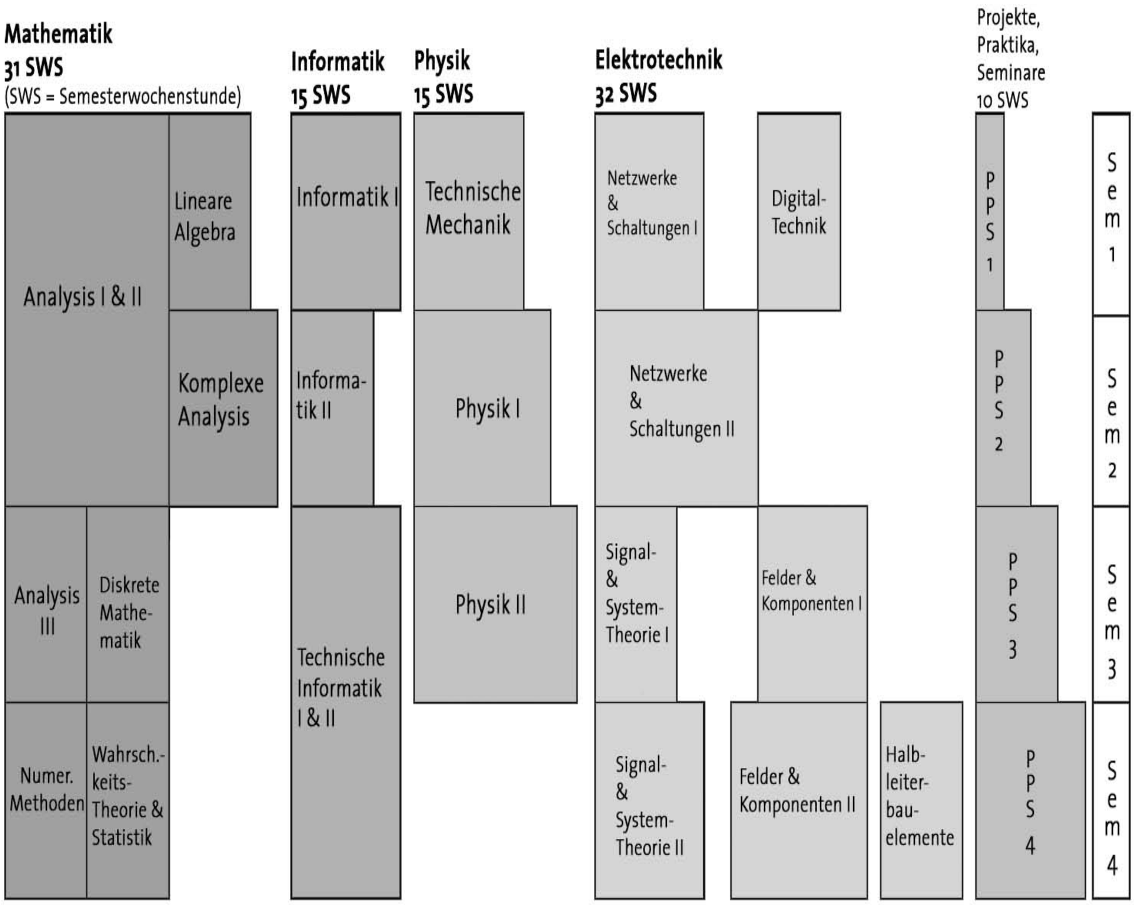
Team project

Students must work in groups in supervised projects for at least 120 hours minimum which may be split in two projects of 60 hours each. The topics of the group work are open and can be technical of specific nature or more general in the context of engineering.

The team projects allow students to study the subjects and content covered in the lectures in more detail. They are generally completed in the sixth semester on one of the subjects the student took in the previous semester or on a subject he/she is taking in the same semester.

The lecturer of the subject the project is related to determine how much time students must spend on the group projects and how their work should ultimately be presented. It is perfectly possible for the students to suggest subjects in particular areas.

The projects are completed by a written report and will be graded.



In jedem der ersten vier Semester sind stundenplantechnisch 26 Wochenstunden Präsenzzeit eingeplant. Es wird vorausgesetzt, dass für die Aufarbeitung der Vorlesungen weitere 16 bis 20 Stunden pro Woche eingeplant werden.
Die Basisprüfung findet nach dem zweiten Semester statt. Die Fächer im zweiten Studienjahr werden auf drei Blockprüfungen aufgeteilt, die ab dem dritten Semester absolviert werden können.

Helsinki University of Technology (TKK)

http://www.tkk.fi/en/
http://www.tkk.fi/en/studies/bachelor-s_level_studies.html
http://www.tkk.fi/en/studies/general_study_information/course_information.html

TKK has changed over to a new, two-cycle degree structure, together with other Finnish universities, on the 1st of August, 2005. Students who begin their studies after this date are to first complete a Bachelor of Science in Technology/Architecture degree, and only after that the Master of Science in Technology, Architecture or Landscape Architecture degree. A person with a Bachelor's degree can be admitted to study only towards Master's degree.

The change in degree structure is connected to the "Bologna process", in which 40 European countries participate in order to create an internationally competitive European area of higher education by 2010. The aim is to increase student mobility and employment opportunities as well as to improve the transparency and comparability of degrees.

Planning one's studies is an important part of studying. Each student takes their personal road through their studies with choices from the very beginning of the studies to graduation.

Education shall be organized in such a way that a full-time student can graduate in three academic years. The studies leading to the Bachelor's degree shall consist of 1) the scientific, mathematical and other basic studies needed for the degree program (80 cr); 2) the general studies module for the Bachelor's degree (20 cr); 3) three modules, at least one of which shall be a level 2 module in the student's own degree program (20 + 20 + 20 cr); 4) elective studies (at least 10 cr), and 5) the Bachelor's seminar and thesis (total of 10 cr).

Practical training is an important part of the studies and functions as a link to the industry. The study guides of the degree programs contain more details on the work experience recommended for each individual degree program. Students are personally responsible for obtaining their trainee posts, but assistance is given at the Career Services by the Practical

IV. Summary

University	Study Plan									Methodology		Quality	
	Options					Structure	EE Introduction	Capstone Course	Undergrad. Research	Engineering Skills	Comm. Skills	Assessment	Program Quality Tracking
	Comm.	Networks	Electronics	Image and Video	Other								
MIT	YES	YES	YES	NO		BS(4), BS+MS(5), MS(2)	YES	YES	YES	CDIO	4 courses	Warning flag	Permanent revision
Stanford	YES	YES	YES	NO	Independent study program	BS(4), MS(2)	YES	YES	YES	CDIO	Not explicitly	Withdrawing courses	Every 5 years
Berkeley	YES	YES	YES	NO	Independent study program	BS(4), BS+MS(5), MS(2)	YES	YES	YES	CDIO	Not explicitly	Withdrawing courses	Students' feedback
Columbia	YES	YES	YES	NO		BS(4), MS(2)	NO	YES	NO	CDIO	Not explicitly		
Wisconsin-Madison	YES	YES	YES	NO		BS(4), MS(2)	Optional	YES	YES	CDIO	Communication Skills Certificate		
Georgia Tech	YES	YES	YES	NO	Independent study program	BS(4), BS+MS(5), MS(2)	YES	YES	YES	CDIO	Not explicitly		
McGill	YES	YES	YES	NO		BS(4), MS(2)	NO	Final Project	YES	Research-based learning	Not explicitly		
Toronto	YES	YES	YES	NO		BS(4), MS(2)	YES	YES	YES				

University	Study Plan									Methodology		Quality	
	Options					Structure	EE Introduction	Capstone Course	Undergrad. Research	Engineering Skills	Comm. Skills	Assessment	Program Quality Tracking
	Comm.	Networks	Electronics	Image and Video	Other								
Auckland	YES	YES	YES	NO		BS(4), MS(2)	2nd Year	Final Project	NO	Research-based learning	Not explicitly	Teaching assessment	Permanent revision
Hong Kong Polytechnic	YES	YES	YES	NO		BS(4), MS(2)	NO	Final Project	NO	CDIO	Not explicitly	Continuous evaluation	
KAIST	YES	YES	YES	NO		BS(4), MS(2)	YES	Final Project			Elective courses		
TU München					General	BS(3), MS(2)	NO	Final Project	NO	CDIO	Not explicitly		
RWTH Aachen					General	BS(3-4), MS(2)	NO	Final Project	NO				
DTU						BS(3.5), BS+MS(5), MS(2)	NO	At the end of each term	NO	CDIO		ECTS criteria	
KTH	YES	YES	YES	YES		BS(3), BS+MS(5), MS(1,2)	NO	YES + Final Project	NO		Elective courses		
Telecom Paris					General	BS(3), MS(2)	NO	Industry Internship	NO	CDIO	2 courses		
Politecnico di Milano	YES	YES	YES	NO		BS(3), BS+MS(5), MS(2)	NO	Final Project	NO		Not explicitly		
ETH Zurich	YES	YES	YES	NO	Micro and opto electronics	BS(3), MS(2)	NO	Final Project	YES	CDIO	Not explicitly		

Appendix 1: QS World University Rankings 2007 - Technology

Rank	School Name	Country	Score
1	MASSACHUSETTS Institute of Technology	United States	100.0
2	University of California, BERKELEY	United States	94.5
3	STANFORD University	United States	84.7
4	CALIFORNIA Institute of Technology	United States	80.0
5	University of CAMBRIDGE	United Kingdom	75.6
6	Imperial College LONDON	United Kingdom	72.1
7	CARNEGIE MELLON University	United States	71.0
8	GEORGIA Institute of Technology	United States	68.0
9	University of TOKYO	Japan	65.1
10	National University of SINGAPORE	Singapore	63.8
11	University of TORONTO	Canada	60.4
12	University of OXFORD	United Kingdom	60.2
13	ETH Zurich	Switzerland	59.6
14	PRINCETON University	United States	59.2
15	HARVARD University	United States	58.3
16	TSINGHUA University	China	58.2
17	DELFT University of Technology	Netherlands	57.7
18	University of CALIFORNIA, Los Angeles	United States	57.4
19	University of ILLINOIS	United States	57.3
20	CORNELL University	United States	56.7
21	University of MELBOURNE	Australia	54.1
22	TOKYO Institute of Technology	Japan	53.8
23	HONG KONG University of Science & Techno...	Hong Kong	53.6
24	PURDUE University	United States	53.3
25	TECHNION - Israel Institute of Technolog...	Israel	53.1
26	NANYANG Technological University	Singapore	53.1
27	MCGILL University	Canada	52.8
28	University of NEW SOUTH WALES	Australia	52.5
29	KYOTO University	Japan	50.7
30	University of TEXAS at Austin	United States	50.5
31	University of BRITISH COLUMBIA	Canada	50.5
32	University of MICHIGAN	United States	50.4
33	Indian Institute of Technology Bombay (I...	India	49.4
34	ÉCOLE POLYTECHNIQUE	France	48.5
35	University of WATERLOO	Canada	48.4
36	PEKING University	China	48.2
37	Indian Institute of Technology Delhi (II...	India	47.3
38	University of CALIFORNIA, San Diego	United States	47.0
39	AUSTRALIAN National University	Australia	46.4
40	Technische Universität MÜNCHEN	Germany	44.7
41	TEXAS A&M University	United States	44.5
42	The University of SYDNEY	Australia	44.5
43	University of MANCHESTER	United Kingdom	43.9
44	MONASH University	Australia	42.8
45	Virginia Polytechnic Institute (VIRGINIA...	United States	42.7
46	YALE University	United States	41.7
47	Ecole Polytechnique Fédérale de LAUSANNE...	Switzerland	41.6
48	KAIST - Korea Advanced Institute of Scie...	Korea, South	41.3
49	University of Science and Technology of ...	China	40.8
50	RENSSELAER Polytechnic Institute	United States	40.6