ECE Undergraduate Handbook

Offering the
Bachelor of Science in Electrical Engineering
Bachelor of Science in Computer Engineering

Fall 2012-Spring 2013

UNM | Electrical &
Computer Engineering

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I. Welcome to the UNM Department of Electrical & Computer Engineering

Welcome from the Department Chair,

The Electrical & Computer Engineering Department (ECE) at the University of New Mexico welcomes you as an undergraduate student. Our faculty and staff stand ready to assist you in exploring the ECE experience and in learning more about this exciting and demanding discipline. Both the electrical engineering and computer engineering programs are ABET accredited and are continually monitored and updated for content and quality. As a graduate of the UNM ECE program, you can expect to be prepared for the nation's best graduate schools or to pursue a career in industry, research, the national labs, or academia. Regardless of what you choose to do with your ECE Bachelor's degree, you can be assured that you will be prepared to lead others, conceive creative solutions to technical problems, and design the next generation of cutting-edge technology.

The undergraduate handbook is meant as an informal starting point, but I encourage you to consult regularly with your academic advisor and the ECE undergraduate office. At ECE we promise to provide you with a first-rate engineering education and student-friendly advisement. Please never hesitate to give us your feedback on how we are doing as we help you chart an exciting career.

Professor Luke F. Lester
ECE Department Chair

Welcome from the Undergraduate Program Director,

Below is a picture of the National Academy of Engineering (http://www.nae.edu) Engineering's Grand Challenges (http://www.engineeringchallenges.org). You can see that inter-, multi- and transdisciplinary collaboration is needed to address these complex areas. In addition, the challenges announced by the United Nations Millennium Project, the World Bank, the Organization for Economic Co-operation and Development (OECD). Engineering is at the core for innovative solutions to the challenging problems and in the generation of wealth. UNM's Electrical and Computer Engineering Department (ECE) is aware of the importance in educating the engineers of tomorrow and maintaining its programs accredited by ABET.

We strive to provide the breath and depth needed to be a successful Electrical and/or Computer Engineer. Mobility, sustainability and global social awareness are another important aspects of today's education and we encourage our students to explore opportunities in other countries. Travel opens new perspectives and enhances retention. We want our graduates to "act locally but think globally", that is, to become entrepreneurs (social or business), be part of a generation of new leaders. Please let us know how we can improve. This is your department!!!
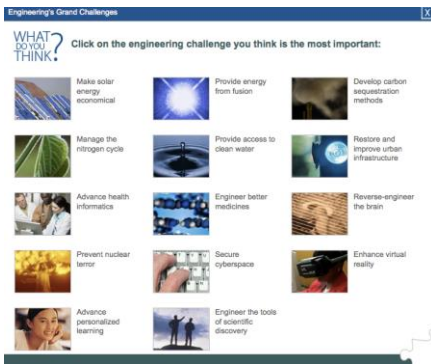
Associate Professor Ramiro Jordan
ECE Associate Chair and
Undergraduate Program Director

Overview of the
Electrical & Computer Engineering Department
at the University of New Mexico

Educational Objectives

The objectives of the ECE undergraduate programs in electrical and computer engineering are to educate students to become resourceful practitioners of engineering who:

- Are capable of utilizing their engineering skills in industry, nonprofit organizations, and national laboratories, or in the pursuit of graduate education;

- Are knowledgeable of the professional responsibilities and social context associated with being an engineer; can work in teams and effectively communicate the results of their work;

- Will develop their knowledge and skills throughout their careers; and,

- Function well in a diverse environment.

The undergraduate degrees offered by UNM's Electrical & Computer Engineering Department (ECE) are the Bachelor of Science degree in Electrical Engineering (EE) and the Bachelor of Science degree in Computer Engineering (CompE). ECE also has a program that enables EE and CompE undergraduate students to earn a Master's degree in Business Administration (MBA) in just one year from UNM's Anderson School of Business (see pages 29-31).

ECE's vision represents its longstanding commitment to providing excellent, world-class-quality undergraduate and graduate programs in a vibrant academic environment. In doing this, we serve our varied constituents: our students; local, national and international industry; the federal research laboratories; local, national, and international graduate and professional schools; the state of New Mexico; and our alumni.

Both ECE's Electrical Engineering Program and its Computer Engineering Program are accredited by the Engineering Accreditation Commission (EAC) of the Accreditation Board for Engineering and Technology (the acronym ABET used in this handbook refers to the EAC of ABET). Because technologies in both the electrical engineering and computer engineering fields change rapidly, the curricula in both programs stress fundamental concepts as well as current application methods.

Earning a degree from UNM's Electrical & Computer Engineering Department opens the doors to a wide variety of career opportunities. ECE's graduates move on to positions in industry, nonprofits, government agencies or national labs and may seek licensing as professional engineers, or they pursue doctoral degrees that open the doors to academic or
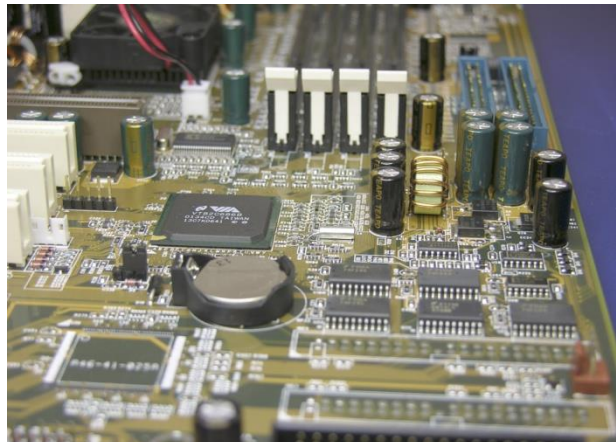
research positions.

The Baccalaureate Degree Program

The principal goal of the baccalaureate programs in the ECE Department is to provide students with the fundamentals of electrical or computer engineering so that they have an excellent base for a successful engineering career. This includes building a sufficient reading knowledge and analytical capability so that the graduate can continue to expand their knowledge as their field of interest, and the scope of the electrical and computer engineering fields, changes. ECE's core courses provide a broad base so that those who complete their formal education with the bachelor's degree can continue to learn and expand their skills. Likewise, the base provides insight into fields that students may choose to study at the graduate level. This goal is met by a curriculum in which there is a progression in course work, and in which fundamental knowledge of earlier years is applied in later engineering courses.

Because design is the heart of engineering, design is integrated throughout the programs, starting with ECE 101, Introduction to ECE, and moving on to circuits and laboratory courses, ECE 203, ECE 213, and ECE 206L. Design continues in computer-related courses, ECE 238L and ECE 344L, in electronics, and in other courses throughout the program. The design process culminates with a capstone Senior Design sequence that includes ECE 419 and ECE 420. The goals of this design experience are to provide a team-based project experience that enables students to apply the fundamentals of electrical and computer engineering to identifying, formulating and solving engineering problems related to a significant and realistic project.
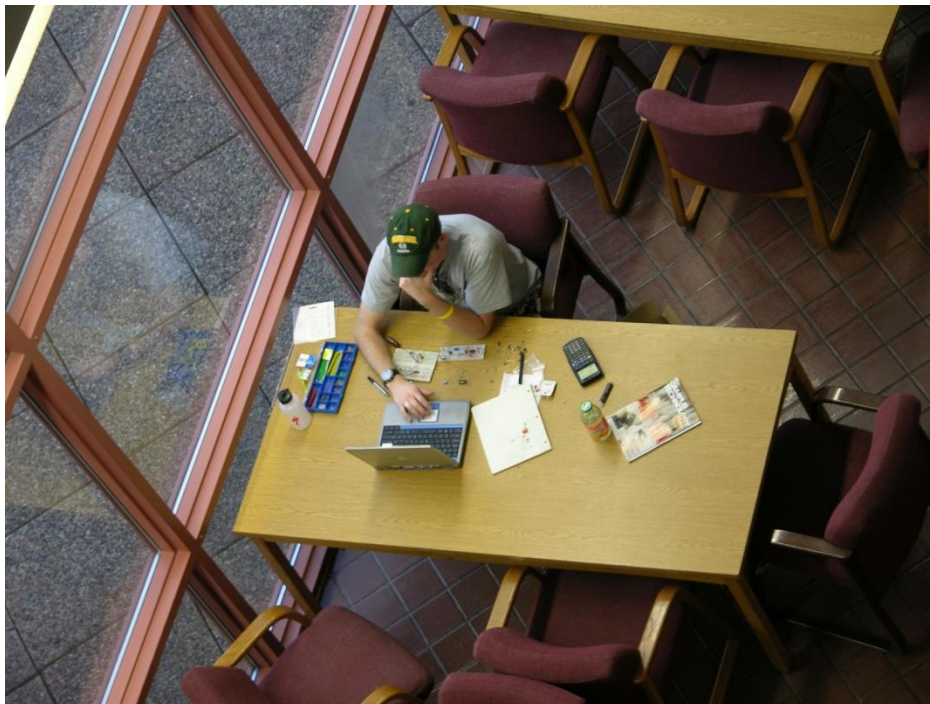
About the Computer and Electrical Engineering Fields

Both computer and electrical engineering have been and continue to be dynamic fields that provide exciting and excellent career opportunities. Computer engineers and electrical engineers use mathematics, physics, and other sciences together with computers, electronic instrumentation, and other tools to create a range of systems including integrated circuits, telecommunication networks, wireless personal communication systems, diagnostic medical equipment, robotic probes, radar systems, electrical power distribution networks, hardware and software systems, operating systems, computer organization and data structures, and computer networks.

These fields have changed the way we live and work. The continuous need to improve and discover new systems makes computer and electrical engineering professionals more sought after than ever before. The Bachelor of Science programs in computer engineering and electrical engineering in ECE at UNM provide students with the skills necessary to compete in such a rapidly changing discipline.

Career Opportunities

The present demand for computer and electrical engineers is strong and the employment rate for UNM graduates has been high. Demand is expected to remain strong, with continued expansion especially in the areas of microelectronics, optoelectronics, communications, bio-engineering, and computers and digital systems. Both computer and electrical engineers are employed by large corporations as well as by small companies, in various governmental agencies and laboratories, by universities and research institutes, and as private consultants. The career work is varied and includes research, product design and development, production, sales, and management. It also provides opportunities for interaction with other engineering disciplines and people working in sciences such as chemistry, physics, and mathematics.

Contact Information

For information about the undergraduate degree programs at the Electrical & Computer Engineering Department, please contact:

Professor Ramiro Jordàn, Undergraduate Program Director
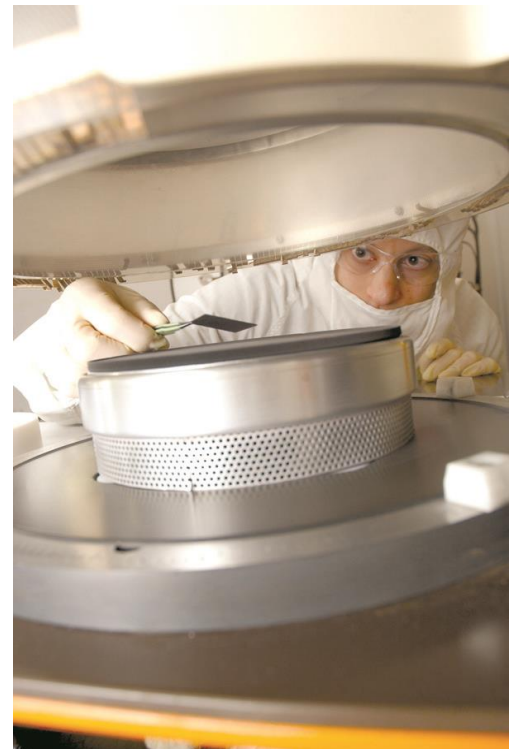rjordan@ece.unm.edu; (505) 277-2630,
or
Christina Garcia, Undergraduate Academic Advisor
cgarcia@ece.unm.edu; (505) 277-1435

Mailing address:
MSC01 1100
1 University of New Mexico

II. Getting Admitted

Admission to UNM

Students are responsible for making sure that they understand and fulfill all applicable requirements for their degree and that they comply with UNM, School of Engineering, and ECE Department regulations. The staff and faculty in ECE, the School of Engineering, and at UNM are available to help all along the way.

The current issue of the UNM Catalog describes UNM's degree requirements and regulations. Students may graduate under the conditions in that issue of the catalog in effect on the date they are admitted to the School of Engineering.

Entering students should especially read the sections of the UNM Catalog that pertain to UNM's general academic regulations, the regulations of the School of Engineering, the requirements of the Electrical & Computer Engineering Department, and the course descriptions, including the required prerequisites and co-requisites.

UNM adopted a core curriculum in fall 2003 for all undergraduate students, as described in the UNM Catalog, and a minimum grade of C (not C-) is required in all courses applied toward a baccalaureate degree in the Electrical & Computer Engineering Department.

Admission to the School of Engineering

High school students intending to pursue a degree in electrical or computer engineering at UNM are encouraged to take four full years of high school English, mathematics, and science. High school chemistry and physics are important for engineering, and high school math should include at least two years of algebra, one year of geometry and one year of pre-calculus. High school courses in calculus and computer programming are recommended, and students are encouraged to take enriched, honors, or AP classes in math and the sciences.

Freshmen admitted to UNM who declare engineering as a major and who meet all three of the following criteria are eligible for enrollment in the School of Engineering in a pre-major status: *1) ACT Math score 25 or higher; 2) ACT English and Science scores 19 or higher; and 3) ACT Reading score 18 or higher.* These students' academic records will be maintained by the school's Engineering Student Services office. These requirements, as well as admission requirements for students who do not initially meet these criteria or who wish to transfer to the school, are outlined in the UNM Catalog.

Although the UNM Catalog is updated yearly, changes to department rules and curricula occur more frequently. If there is a discrepancy between the information provided in this Undergraduate Handbook and the information in the UNM Catalog, the information in this handbook takes precedence.

Because each student's situation is unique, academic advising is mandatory each semester for all students in the School of Engineering. Students may not register for classes in any semester until after being advised. Students in their first year of pre-major status are advised in the school's Engineering

Student Services office. More advanced pre-major students and students admitted to ECE are advised by ECE's undergraduate academic advisor. Once a student is admitted to the Electrical & Computer Engineering Department, their academic records are maintained by ECE.

This Undergraduate Handbook outlines the curricula for the degree programs offered in the Electrical & Computer Engineering Department. Students are encouraged to examine the information in this handbook carefully and to consult with ECE's undergraduate academic advisor if any questions arise.

Admission to an ECE Program

Students must be admitted to UNM and must have completed approximately one year of the appropriate freshman-year subjects before an application can be processed for admission to one of ECE's baccalaureate programs. Applicants must consult ECE's undergraduate academic advisor for evaluation of academic work before admission can be completed, and approval of the application by ECE is required.

There are three minimum requirements for admission to undergraduate study in the Electrical Engineering or Computer Engineering program.

1. Completion of at least 26 semester hours applicable to the degree, with a minimum GPA of 2.20 out of a possible 4.3 and a minimum grade of C for every course. If more than 26 hours applicable to the degree have been completed, the minimum GPA of 2.20 also applies to those hours.

2. Completion of at least 18 semester hours of freshman-year technical subjects, with a minimum GPA of at least 2.50 and a minimum grade of C for every course. Courses must include Math 162, Math 163, ECE 101, ECE 131, Physics 160, 161/161L, and:
     • for the Electrical Engineering Program: Chemistry 121 and Chemistry 123L
     • for the Computer Engineering Program: ECE 203 and ECE 231
   and additional courses selected from the following:
     • for the Electrical Engineering Program: math, chemistry, physics
     • for the Computer Engineering Program: basic science, physics

3. Completion of English 101 or its equivalent with a minimum grade of C.

For transfer students, admission to an ECE program depends upon evaluation of the student's transcripts by the ECE Admissions Committee through the department's chair and the associate chair for Undergraduate Programs.

English Proficiency

A uniform graduation requirement of UNM is that students demonstrate English proficiency. Evidence of this is a grade of "C" or better in English 102. An equivalent English writing course may be transferred from a regionally accredited institution. A "C" or better in English 101 is required for admission to the Electrical & Computer Engineering Department and for study of English 102. *English 102 must be completed with a grade of "C" or better before taking ECE 206L.* All laboratory courses that have ECE 206L in the chain of prerequisites must necessarily have English 102 as a prerequisite. This applies to ECE 419, ECE 420, ECE 491, ECE 493 and ECE 494. A student may be dropped from any of these courses for not having the proper prerequisites or may not receive credit in the course if English 102 is not completed with a grade of "C" or better before entering one of these

courses. Technical proficiency and laboratory performance alone are not sufficient for credit in the laboratory courses: students must demonstrate proficiency in oral and written communication, including formal reports. Also see the Eight-Hour Rule.

A student who receives an ACT score of 25 or higher (prior to October 1989), an ACT score of 29 or higher (after October 1989), an SAT score of 570 or higher (prior to April 1995), or an SAT score of 650 or higher (after April 1995) has met the English writing proficiency requirement and does not need to take English 101 or English 102. Students must have at least 128 acceptable credit hours to receive a bachelor's degree from UNM, so students exempted from English 101 and 102 may have to take additional hours to bring their total to 128.

Mathematics Placement and Prerequisites

Students are given math placement exams during Lobo Orientation when they first arrive on campus to determine what level of mathematics they can register for. Placement in mathematics courses at UNM is determined by the student's ACT and SAT quantitative scores. In general, to enroll in Math 162 (Calculus I) the student must have an ACT math score greater than 25 or an SAT quantitative score greater than 640. If the student has not yet completed Math 123 (trigonometry), which is a prerequisite for Math 162, he/she must take the trigonometry exam offered at the UNM Testing Division in the Office of Undergraduate Studies or else enroll concurrently in Math 123.

The lowest-level math course in the ECE curriculum is Math 162. Prerequisite courses must be satisfied with a grade of C or better in accordance with UNM's core curriculum.

Math and Science Requirements
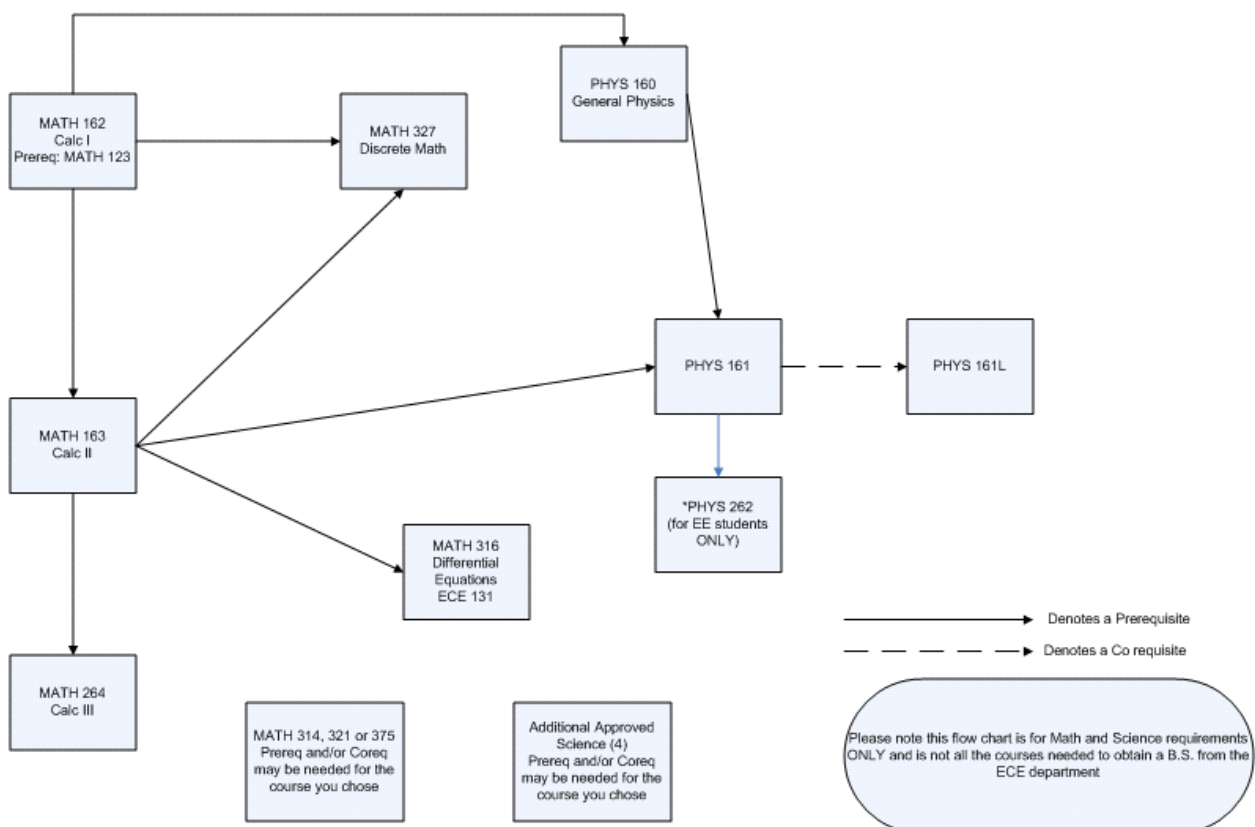
Engineering Mathematics Sequence:

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                                      )-->264
          120--->150--->162-->163     )-->314
                                      )-->316
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Transfer from Other Institutions

Students transferring from another institution to the University of New Mexico, from another college within the university to the School of Engineering, or from one program to another within the School of Engineering must comply with the academic requirements in effect at the time of the transfer. For additional UNM policies, see the UNM Catalog section titled "Graduation Requirements."

A transfer student from another university who does not meet the requirements for admission to the School of Engineering may be eligible to enroll in other UNM units until the admission requirements have been met. If such a transfer student is ineligible to enroll in other UNM units, the student should seek advising in the School of Engineering's Engineering Student Services office.

III. Navigating Your Degree Program

Academic Advising

When you are admitted to ECE, you are assigned a faculty member who will provide you with formal advising twice a year –in November and April. This mandatory advising will help you with questions or problems you may encounter related to your studies. All students in the ECE Department are required to attend this advising session before they are allowed to register for the next term: the department places a hold on each student's records each semester that is not removed until the student has seen their faculty advisor.

Each student receives an e-mail from their faculty advisor inviting them to sign up electronically for an advising date and time. This session is scheduled for the week prior to preregistration for the coming semester, and it is imperative that students make and keep their appointments during the scheduled week. If a student is not able to attend during that week, it is the student's responsibility to locate their faculty advisor to schedule another time.

Student's Responsible for Reading Letters and e-Mail

It is your responsibility to do both. Neither the academic advisor nor the faculty advisor can take responsibility should you miss an important deadline – such as when to drop classes with or without receiving a grade, paying tuition, when to apply for scholarships, and other important deadlines – if you neglect to read these notices.

Earning Course Credits

Students may earn course credit not only by taking courses in ECE but also by transferring credits from another institution, meeting a certain score on ACT or SAT exams, or by taking certain College Level Examination Program (CLEP) subject exams before earning 26 hours of college work. UNM collaborates with New Mexico's community colleges so that students may take a number of courses in electrical engineering and computer engineering at a community college and then apply those credits toward a degree at UNM. Grades earned are not used in calculating your GPA.

Please consult with ECE's undergraduate academic advisor about details and options for earning course credit.

Students may satisfy the requirement for English 101 and English 102 by scoring 29 or higher on the ACT or 650 or higher on the SAT written portion. In that case, the number of semester hours required for the Bachelor of Science degree is reduced by six but may not fall below 128. High ACT or SAT scores in other subjects do not convey semester-hour credits.

UNM also participates in the Advanced Placement Program of the College Entrance Examination Board (CEEB). Credits that are applicable to the Bachelor of Science degree may be granted. Prospective students are encouraged to read the UNM Catalog for details. It is possible for students to obtain credit for certain mathematics, physics, chemistry, computer science, English, humanities, and social science courses.

Note also that credit for prerequisite courses taken in the past does not guarantee that a student will be successful with succeeding courses. Occasionally a student must make a comprehensive review of prerequisite course material or retake courses if it has been a long time since these subjects were studied. Instructors will assume that students are proficient in the areas covered by prerequisite science, mathematics, and computer engineering courses.

Challenge Exams

Challenge examinations may be administered to students who wish to establish credit for courses required in the Electrical Engineering or Computer Engineering program. This process is subject to restrictions described in the UNM Catalog. A student may not challenge a course that he/she has taken previously at UNM, including courses with W, WP and WF grades. A course can be challenged only once. For students who were exposed to nontransferable similar material at another institution, the amount of effort required to review for a challenge examination is a major consideration. Frequently, the effort required to review for a challenge examination may be comparable to that required for taking the course. The procedure for challenging a course is:

1. An Electrical Engineering or Computer Engineering professor reviews a student's background and recommends a course challenge to the Undergraduate Program associate chair.

2. The associate chair reviews the recommendation of the professor and suggests an appropriate professor to administer the challenge examination.

3. The student obtains the necessary UNM form from the School of Engineering Dean's Office and pays the appropriate fees for the course challenge. The authorization form is then signed by the associate chair and by the associate dean of the School of Engineering.

4. The student takes the challenge examination and receives a credit or no-credit grade from the examiner.

5. The professor sends the form to the UNM Records & Registration Office (Office of the Registrar in Enrollment Management) to be recorded officially on the student's transcript.

There is no fixed format for a challenge exam. For a lecture course, a challenge may require that a student take a special comprehensive final examination. Alternatively, for example, the examiner may require that the student take the periodic examinations of a section of her/his course during an academic session and then take the final examination. The intent of the challenge is to determine whether the student knows the course material and whether the student's knowledge and experience is equivalent in all respects to the course content as described in the UNM Catalog and as reported to ABET. Challenges of laboratory courses must demonstrate proficiency in oral and written communication, in related theory, and in laboratory practice, and must satisfy any design requirements.

Departmental Honors

Students in their junior year who have a degree grade point average of 3.5 or above are invited by letter to apply for departmental honors. If the student wishes to complete the two courses required for these honors – ECE 493 and ECE 494 – he/she should pick up the application for honors from the undergraduate academic advisor (pg 50 of this handbook). The student completes both courses with the same professor in two consecutive terms, and the project is determined by the professor and the student.

Scholarships

UNM's School of Engineering has a number of scholarships that it awards to engineering students. Students apply for scholarships in the spring semester, and the scholarships are awarded for the next academic year and run for the full year. Some scholarships are designated for specific degree programs, such as Electrical Engineering or Computer Engineering, or for minorities, women, and others. An effort is made to distribute undesignated scholarships as widely as possible, so some awards are small.

Students are encouraged to make an application on a relatively simple and short form. Application forms are available from the School of Engineering Scholarships program manager, located in the Centennial Engineering Center, Pre-Major Office, Room 2080, or on the Engineering Student Services website, www.soe.unm.edu/ess. Application forms are available in early spring each year. Additional scholarship notices are sent out periodically by e-mail from the academic advisor, so it is important for a student to read his or her e-mail and to read hard-copy letters that are sent from the ECE Department to their home address.

Eight-Hour Rule

With the exception of Math 316, students do not enroll for 300-level courses and above unless they are within eight hours of completing their first- and second-year requirements and they are enrolled for the remaining first- and second-year courses.

Credit/No-Credit Option

An Electrical Engineering or Computer Engineering student may choose a maximum of nine (9) credit/no-credit hours from the humanities, social science, fine arts, and second language elective categories. All other courses in the ECE program must be taken for a grade.

Grades of C-, D or F, and Replacing Grades

Beginning in spring 2005, ECE will not accept grades of C- or lower.

A student is allowed to replace twelve (12) hours of D or F grades. This action is not automatic: a form available at the UNM Records & Registration Office or in ECE Room 115 must be completed and submitted to the Records Office before such a replacement can take effect.

In addition, the School of Engineering prohibits granting a Bachelor of Science degree in any branch of engineering if thirty (30) or more semester hours applicable to a degree program have grades of D, F, WF or NC.

Three-Attempts Rule

Students admitted to the Electrical & Computer Engineering Department for or after the fall 2003 semester must complete all coursework required for graduation in a School of Engineering degree program within three (3) attempts. This includes courses offered by other departments at UNM, such as mathematics and physics. An attempt includes receiving any letter grade (A through F), WP, WF, W, WNC, CR, NC, I, or Audit. For purposes of this requirement, coursework taken at other institutions is treated the same as UNM coursework.

Probation, Dismissal or Suspension

The School of Engineering uses two probationary procedures:

1. A student enrolled in the School of Engineering will be placed on academic probation when the cumulative grade point average of all work taken at UNM falls below 2.5.

2. A student enrolled in the School of Engineering will be placed on Engineering School Probation under any of the following conditions:

    a) When in a pre-major status, a cumulative grade point average, based on work taken at UNM and
        applicable to a particular School of Engineering program leading to a bachelor of science degree, falls below 2.5, or below 2.00 in the most recent semester;
    b) When in a department degree status, a cumulative grade point average based on work taken at UNM and accepted toward a particular School of Engineering program leading to a bachelor of science degree, falls below a 2.5, or below 2.0 in the most recent semester; or
    c) When, in either pre-major status or department degree status, the student is making unsatisfactory progress toward a School of Engineering degree.

Students on probation are subject to suspension from UNM or dismissal from the School of Engineering if their UNM GPA is below a 2.0. See the UNM Catalog for the pertinent regulations.

ECE students may be placed on probation for noncompliance with academic regulations – such as the Eight-Hour Rule (see above) and prerequisite requirements – and in general taking courses that are not contributing to progress toward obtaining their degree. Repeated violations will result in dismissal from the department.

Returning to the Department after Dismissal

Readmission to the ECE Department after dismissal from the School of Engineering is not automatic. A student is usually eligible to go back to University College or be accepted at the College of Arts & Sciences and take non-ECE courses during the semester in which they have been dismissed from the ECE Department. If they have a good semester and receive at least a 2.5 on the courses taken in University College or Arts & Sciences, they are eligible to reapply to the ECE Department by filling out the admissions form, which is subject to the review of the associate chair for Undergraduate Programs. There is no guarantee that a student will be readmitted after being dismissed. It is suggested that a student who has been dismissed consider a different major.

For re-admission, the student may be required to complete an Academic Success Plan. This plan states which courses the student may take, and they must maintain a GPA of 2.5. Successful completion of this plan is an indication that an Electrical Engineering or Computer Engineering major is a good fit for the student. On successful completion of the specified courses with the requisite grades, a student can be readmitted to ECE.

Cooperative and Part-Time Study Programs

Electrical & Computer Engineering students may participate in the Cooperative Education Program. This program alternates periods of school with periods of practical work experience in a technical job.

Many companies inside and outside of New Mexico participate in this program, and it has two advantages. First, it enables students to earn money. Second, it provides first-hand engineering experience and motivation for study.

Credit may be earned toward the degree by taking the co-op courses Engr 109, 110, etc., and writing a report based on work experience. The ECE co-op advisor sets guidelines for writing these reports. For information about what co-op jobs are available, see the engineering director of Cooperative Education, who is the associate dean of the School of Engineering. The School of Engineering also sponsors part-time study programs.

For uniformity in meeting ABET accreditation requirements, co-op credits can be applied as one technical elective only if a student has completed three (3) engineering co-op work phases and has completed the corresponding three (3) engineering co-op evaluation phases. The engineering co-op evaluation phase entails writing a paper detailing the previous semester's work experience. If a student receives three (3) one-hour credits from three (3) engineering co-op evaluation phases, these three credits may take the place of the one (1) required technical elective in the program. Students must maintain a minimum 2.50 degree GPA and be in good standing to participate in the co-op program.

Minor Studies

Since spring 1995, the School of Engineering permits undergraduates to complete and receive recognition for study in a minor. Students wishing to complete a minor:

1. Must meet the combined program requirements of their major and the minor at the time of graduation;
2. Are subject to all current UNM core curriculum requirements; and
3. Are not permitted to count any courses specifically required by the major degree toward the minor.

Students desiring to pursue a minor should see their academic advisor to get the application form. Students should be aware that pursuing a minor may extend the time of graduation.

Seniors Planning for Graduate Study

The Electrical & Computer Engineering Department offers programs of study toward the Master of Science and Doctorate of Philosophy degrees. Consult the graduate programs sections of the UNM Catalog and contact the ECE Department's graduate coordinator for detailed information.

Senior students with a GPA of 3.0 or greater who are within 10 semester hours of completing the baccalaureate degree may obtain graduate credit for a maximum of nine semester hours, provided that they meet the requirements specified in the graduate sections of the UNM Catalog. Students may receive graduate credit only for 400-level ECE courses marked by an asterisk (*). Non degree students taking 400-level courses must obtain permission from the course instructor to obtain graduate credit.

Application for Degree

During the second semester of a student's junior year, or prior to enrollment in the 100th credit hour for the degree, a student is required to file the "Application for an Undergraduate Degree" with the Undergraduate Academic Advisor. This form may be obtained on pg 49 of this book or from the academic advisor in ECE Room 115. Failure to complete this form may delay graduation.

Alumni Connections

All ECE students are given the opportunity to assess the department, including but not limited to an exit survey. ECE is committed to maintaining a lifelong relationship with its graduates and always welcomes feedback during all phases of students' academic and post-academic careers. The department continually expands the means for maintaining this connection, including traditional correspondence as well as online social media.

ECE faculty and staff do whatever they can to help students and alumni, and they appreciate alumni doing the same by offering feedback and insights. By helping ECE become a better department, alumni also increase the value and prestige of the degree that they earned from ECE.

University of New Mexico
Core Curriculum

Effective fall 2003 for both Electrical and Computer Engineering students
37 hours of specific courses necessary to graduate from UNM; grades of C (not C-) or better are required

Writing and Speaking (9 hours)
English 101, 102, and 219
Already covered in the ECE degree program

Mathematics (3 hours)
Already covered in all School of Engineering degree programs

Physical/Natural Sciences (7 hours)
Already covered in all School of Engineering degree programs

Social and Behavioral Sciences (6 hours)
Three hours covered in the ECE degree program
(ECON 105 or 106)
Other three hours see list on next page

Humanities (6 hours)
See list on next page

Second Language (3 hours)
See list on next page

Fine Arts (3 hours)

UNM requires every student to complete its core curriculum. The ECE Department curriculum provides for satisfying those requirements.

This 2003 core curriculum applies to students admitted to UNM for the fall 1999 semester or later, either as freshmen, transfer students, or as re-entering students after an absence from UNM of three or more sessions, including summer. There are individual exceptions, including second-degree students.

This 2003 core curriculum does not apply to students who were enrolled in UNM prior to fall 1999 unless they were re-admitted after an absence of three or more sessions.

Students have the option of graduating according to the core curriculum into which they were initially admitted or according to the core curriculum that is current at the time of their graduation.

Core Electives for
Electrical and Computer Engineering Students
Effective in or after fall 1999

Social and Behavioral Sciences

▪ Economics 105 or 106

One course chosen from among the following:

▪ American Studies 182 or 185
▪ Anthropology 101 or 130
▪Economics 105 or 106
▪ Geography 102
▪ Linguistics 101
▪ Political Science 110 or 200
▪ Psychology 105
▪ Sociology 101
▪ Engr-F 200 - Technology in Society

Humanities
Two courses chosen from among the following:

▪ American Studies 186
▪ Classics 107, 204, or 205
▪ Comparative Literature and
      Cultural Studies 223 or 224
▪ English 150, 292, or 293
▪ Foreign Languages (M Lang) 101
▪ History 101, 102, 161, or 162
▪ Philosophy 101, 201, or 202
▪ Religious Studies 107

Second Language
One course chosen from any of the lower division non-English-language offerings of the departments of Linguistics, Spanish & Portuguese, and Foreign Languages & Literature. Students with knowledge of a second language equivalent to four semesters of study are deemed to have satisfied this requirement. CLEP and AP credits can be used for placement, but unless the student has demonstrated knowledge equivalent to four semesters of study, an additional semester of a second language must be taken.

Fine Arts
One course chosen from among the following:

▪ Art History 101, 201, or 202
▪ Dance 105
▪ Media Arts 210
▪ Music 139 or 140
▪ Theater 122

Students may instead elect to take one three-credit studio course in the departments of Art & Art History, Music, Theater & Dance, or Media Arts to fulfill this requirement.

IV. The Undergraduate Program in Electrical Engineering

This handbook describes two electrical engineering curricula, one for students who entered the EE program in or after the fall 2005 semester (found on pg 42) and the other for students who entered in or after fall 2009. A few changes were made in 2007 that are incorporated into the 2005 sheet. The EE curriculum for students entering in or after the fall 2005 semester is used for most students admitted to ECE before fall 1999.

The prerequisite flow chart shows the sequence in which these courses should be taken. If the recommended sequence is not followed, the student may be unprepared for some courses, which can extend the number of semesters needed to graduate. The flow chart is not a substitute for the UNM Catalog.

The EE program is divided into several areas of concentration, or tracks: Digital Systems, Electromagnetics, Microelectronics, Optics, Power/Energy Systems, Signals and Systems, and Systems and Controls. A Power and Energy track is the most recent addition, reflecting the sustainability and "green" objectives of today's engineering disciplines.

A grade of C or better is required for all courses, including the UNM Core Curriculum courses, prerequisite courses, and courses required to obtain a Bachelor of Science degree in electrical or computer engineering.

Electrical Engineering Course Sequence
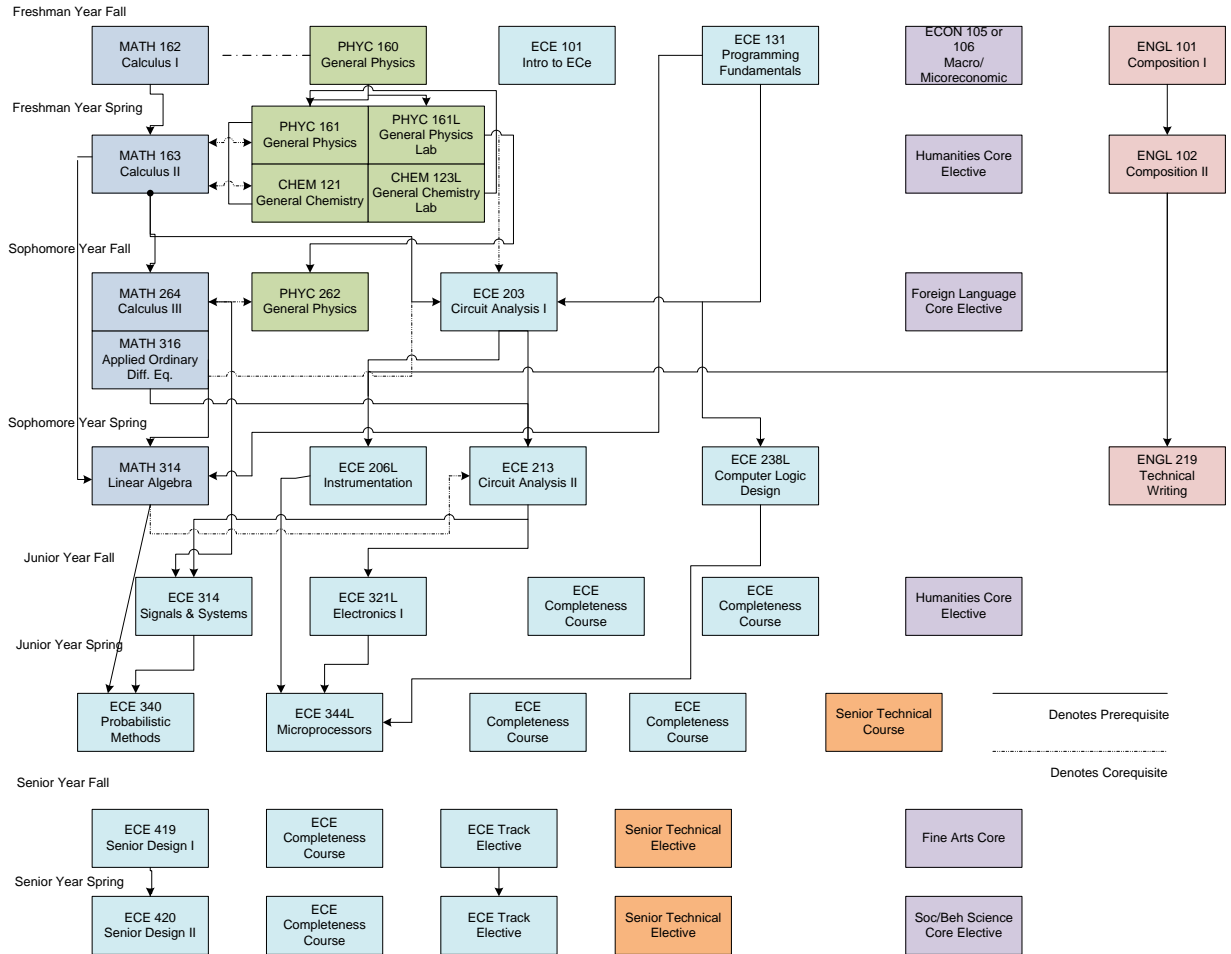
Figure 2: Flow chart of Electrical Engineering Program courses

BS Electrical Engineering Graduation Requirements
Effective Fall 2009
Total credit hours: 129; All grades must be C or better
For more information, see the other pages in this Undergraduate Handbook, available online at
www.ece.unm.ede/classes/underGrad.html

General Education Component

Written Communication (9 credit)

Engl 101♦, 102 Composition I, II (6)
Engl 219 Technical Writing (3)

Area of Knowledge (18 credits)

Core Social/Behavioral Science Elect. (3)
Econ 105 or 106 (Social & Beh. Science) (3)
Core Humanities Elective (6)
Core Fine Arts Elective (3)
Core Second-Language Elective (3)

Mathematics & Sciences Component

Mathematics (18 credits)

Math 162♦, 163♦, 264 Calculus I, II, III (12)
Math 316 Differential Equations (3)
Math 314 Linear Algebra (3)

Science (14 credits)

Phys 160*, 161*, 161L*, 262* General Physics   (10)
Chem 121 and Chem 123L* General Chemistry (4)

Electrical Engineering Component

Required (36 credits)

ECE 101 Introduction to ECE (1)
ECE 131 Programming Fundamentals (3)*
ECE 203 Circuit Analysis I (3)*
ECE 206L Instrumentation (2)
ECE 213 Circuit Analysis II (3)
ECE 238L Computer Logic Design (4)
ECE 314 Signals & Systems (3)
ECE 321L Electronics I (4)
ECE 340 Probabilistic Methods (3)
ECE 344L Microprocessors (4)
ECE 419 Senior Design I (3)
ECE 420 Senior Design II (3)

EE Completeness (19 credits)

ECE 322L Electronics II (4)
ECE 345 Intro to Control Systems (3)
ECE 360 Electromagnetic Fields & Waves (3)
ECE 371 Materials & Devices (3)
ECE 341 Intro to Communication Systems (3)
ECE 381 Intro to Power Systems (3)

Track Electives (6 credits - depth)

Two courses from six tracks (6). The available tracks are:
- Digital Systems
- Electromagnetics
- Microelectronics
 - Optics
 - Power/Energy Systems
 - Signals and Systems
 - Systems and Controls

Technical Electives (9 credits - breadth)

ECE technical elective (9)
Approved 300-level and above courses may include ECE 231,
    Intermediate Programming (3). Consult with the

Eighteen hours of prerequisite technical courses must be completed prior to applying to the department. A GPA of 2.50 or better on prerequisite coursework is required for admission into the department, and a student's overall GPA must not fall below 2.0
♦ Denotes required prerequisites that must be completed prior to applying for admission to ECE.
* Ten additional hours of prerequisite course work must be chosen from these courses

BS Electrical Engineering Curriculum

Effective **Fall 2009** (129 hours)
UNM Core Curriculum, Fall 1999

FRESHMAN YEAR					
FALL SEMESTER			**SPRING SEMESTER**		
Course #	core	Cr	*Course #*	core	Cr
MATH 162: Calculus I		4	MATH 163: Calculus II		4
ECE101: Intro to ECE		1	CHEM 121: General Chemistry		3
ECE 131: Programming Fundamentals		3	CHEM 123L: General Chemistry Lab		1
PHYC 160: General Physics		3	PHYC161: General Physics		3
ENGL 101: Composition I		3	PHYC161L: General Physics Lab		1
ECON 105 or 106 * Macro/Microeconomics	***SB**	3	*ENGL 102: Composition II*		3
			Humanities Core Elective *	***HU**	3
Total		17	Total		18
SOPHOMORE YEAR					
FALL SEMESTER			**SPRING SEMESTER**		
Course #	core	Cr	Course #	core	Cr
ECE 203: Circuit Analysis I		3	ECE 206L: Instrumentation		2
MATH 264: Calculus III		4	ECE 213: Circuit Analysis II		3
MATH 316 Applied Ordinary Diff. Eq.		3	ECE 238L: Computer Logic Design		4
PHYC 262:General Physics		3	MATH 314: Linear Algebra		3
Foreign Language Core Elective *	***FL**	3	ENGL 219:Technical Writing		3
Total		16	Total		15
JUNIOR YEAR					
FALL SEMESTER			**SPRING SEMESTER**		
Course #	core	Cr	Course #	core	Cr
ECE 314: Signals and Systems [Fall Only]		3	ECE 340: Probabilistic Methods [Spring Only]		3
ECE 321L: Electronics I [Fall Only]		4	ECE 344L: Microprocessors		4
ECE Completeness Course♦(345, 371, or 381)		3	ECE Completeness Course♦(322L, 341, or 360)		3 or 4
ECE Completeness Course♦(345, 371, or 381)		3	ECE Completeness Course♦(322L, 341, or 360)		3
Humanities Core Elective *	***HU**	3	Senior Technical Elective***		3
Total		16	Total		16 or 17
SENIOR YEAR					
FALL SEMESTER			**SPRING SEMESTER**		
Course #	core	Cr	Course #	core	Cr
ECE 419: Senior Design I [Fall Only]		3	ECE 420: Senior Design II [Spring Only]		3
ECE Completeness Course♦(345, 371, or 381)		3	ECE Completeness Course♦(322L, 341, or 360)		3 or 4
ECE Track Elective**		3	ECE Track Elective**		3
Senior Technical Elective***		3	Senior Technical Elective***		3
Fine Arts Core Elective *	***FA**	3	*Soc/Beh Science Core Elective*	***SB**	3

	Total		15		Total		15 or 16

◆EE Completeness courses ONLY offered in fall are ECE 345 (3), ECE 371 (3), and ECE 381 (3).
◆EE Completeness courses ONLY offered in spring are ECE 322L (4), ECE 341 (3), and ECE 360 (3).
*See approved list of core electives in the ECE Undergraduate Handbook.
**Six hours (two courses) must be from a listed tract. ***Nine hours of technical electives are required. They must be approved by your faculty advisor and must be 300-, 400- or 500-level course (*ECE 231: Intermediate Programming is only exception)
No grades below a 'C' are allowed in the Electrical Engineering Program.
NOTE: If enough students petition for a course to be offered in the summer any "Fall or Spring" only course will be offered.   Updated May 6, 2011

Electrical Engineering
Track and Technical Electives, Fall 2009
(electives effective in or after the fall 2005 semester are listed on a later page)

There are six hours of track electives in the Electrical Engineering program. Students select a track (area of specialization) from the following:

◆Signals and Communications
◆ Microelectronics
◆ Electromagnetics
◆ Systems and Controls
◆Digital Systems
◆ Energy/Power Systems
◆ Optoelectronics

The courses required for each track are listed on the following pages. In addition to the two track electives, students choose three technical electives. Approved 300-level and above courses may include ECE 231, Intermediate Programming.

Students may design their own tracks in consultation with their advisor as long as the two courses chosen present a coherent sequence. A custom track must be approved by the student's advisor and the associate chair of the department.

Note that while all of the required courses in the Electrical Engineering Program are given every semester, most of the technical electives are only offered every other semester, so some planning is essential to ensure that you get the course you want when you want it.

In the 2009 EE Program, the EE tracks with completeness entry courses are listed below:

Signals and Communications:
Completeness Entry Course:
ECE 341 Intro to Communication Systems
Track:
    ECE 439 Introduction to Digital Signal Processing
    ECE 442 Wireless Communications
Technical electives (9 credits): approved 300-level and above courses may include ECE 231, Intermediate Programming

Microelectronics:
Completeness Entry Courses:

Electromagnetics:
Completeness Entry Course:
ECE 360 Electromagnetic Fields and Waves
Track: (Choose two)
    ECE 469 Antennas for Wireless Communication Systems
    ECE 460 Introduction to Microwave Engineering
    ECE 495 Computational Methods for Electromagnetics
    ECE 495 Plasma Physics I
Technical electives (9 credits): approved 300-level and above courses may include ECE 231, Intermediate Programming

Systems and Controls:
Completeness Entry Courses:
ECE 345 Introduction to Control Systems
Track:
    ME 481 Digital Control of Mechanical Systems
    ECE 446 Design of Feedback Control Systems
    Technical electives (9 credits): approved 300-level and above courses may include ECE 231, Intermediate Programming

Digital Systems:
Completeness Entry Courses:
ECE 131 Computer Programming Fundamentals
ECE 238L Computer Logic Design
Track:
    ECE 338 Intermediate Logic Design
    ECE 438 Design of Computers
            - or -
    ECE 231 Intermediate Programming and
        Engineering Problem Solving
    ECE 331 Data Structures and Algorithms
Technical electives (9 credits): approved 300-level and above courses may include ECE 231, Intermediate Programming

Energy/Power Systems:
Completeness Entry Course:
ECE 381 Introduction to Power Systems
Track: (Choose two)
    ECE 482 Electric Drives and Transformers
    ECE 483 Power Electronics
    ECE 484 Photovoltaics
    ECE 488 Future Energies
Technical electives (9 credits): approved 300-level and above

ECE 322L Electronics II
ECE 371 Materials and Devices
Track:
 ECE 474L Microelectronics Processing I
 ECE 471 Materials and Devices II
   - or -
 ECE 421 Analog Electronics
 ECE 424 Digital VLSI Design
 Technical electives (9 credits): approved 300-level and above courses may include ECE 231, Intermediate Programming

courses may include ECE 231, Intermediate Programming

Optoelectronics:
Completeness Entry Course:
ECE 371 Materials and Devices
Track:
 ECE 471 Materials and Devices II
 ECE 475 Optoelectronics
Technical electives (9): approved 300-level and above courses may include ECE 231, Intermediate Programming

V. The Undergraduate Program in Computer Engineering

The Computer Engineering curricula for those students entering the ECE Department in or after fall 2009 are outlined on the following pages. The 2009 curriculum is used for most students admitted to the Computer Engineering Program in or after fall 2009. It is the student's responsibility to fulfill all degree requirements.

The prerequisite flow chart shows the sequence in which these courses should be taken. If the recommended sequence is not followed, the student may be unprepared for some courses, which can extend the number of semesters needed to graduate. The flow chart does not show details about course prerequisites and co requisites and is not a substitute for the UNM Catalog.

The Computer Engineering Program offers three tracks: software, hardware, and digital media. Students must take two classes from the track of their choice. The tracks and appropriate technical electives give the student a broad education in the track of their choice.

Computer engineering is a profession that places the engineer in the middle of an exciting, rapidly growing field with virtually unlimited opportunities in industry, education and government. Computer engineers are involved in design and analysis of a range of systems, including microprocessors and computers, embedded devices and robotics, learning machines, high-performance networking and wireless communications, and high-performance parallel and distributed computing systems. Computer engineers also specialize in algorithm engineering, software engineering, image processing, computer vision, user interface design, knowledge management, instrumentation, visualization, virtual reality, government security, and computer simulations and graphics. The ECE Department, through its Computer Engineering Program, also participates in UNM's Interdisciplinary Film and Digital Media program in collaboration with the College of Fine Arts, the Computer Science Department, the Anderson School of Management, the Department of Communication & Journalism, and the UNM ARTS Lab (Art, Research, Technology and Science).

ECE's Computer Engineering Program is involved in cutting-edge research and offers courses that give students experience with numerous new technologies that are helping to shape today's world.
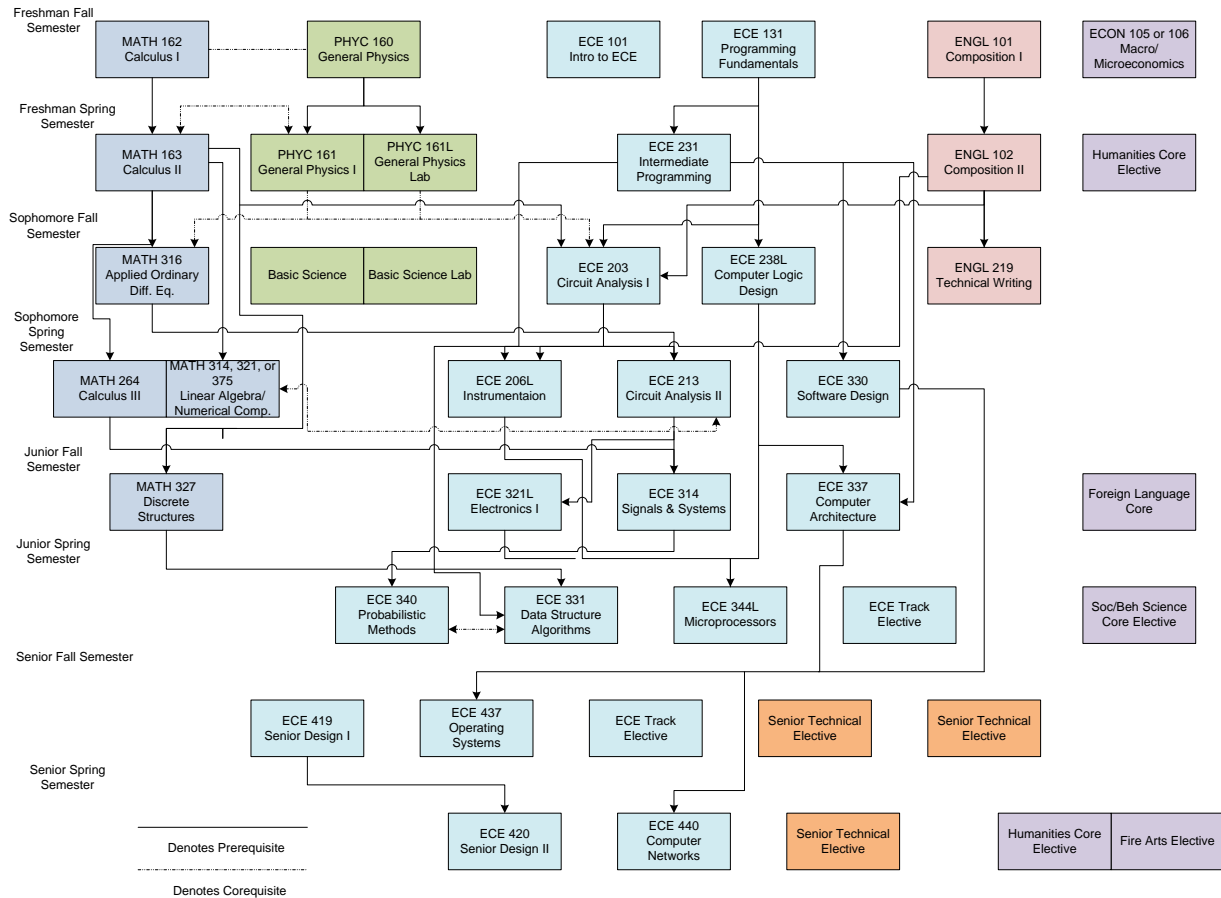
Computer Engineering Course Sequence, 2009

Figure 3: Flow chart of Computer Engineering Program courses

BS Computer Engineering Graduation Requirements
Effective Fall 2009

Total credit hours: 128; All grades must be C or better in the Computer Engineering Program
For more information, see the ECE Undergraduate Handbook at www.ece.unm.edu/classes/undergrad.html

General Education Component

Written Communication (9 credits)

Engl 101♦, 102 Composition I,II (6)
Engl 219 Technical Writing (3)

Area of Knowledge (18 credits)

Core Social/Behavioral Science Elect. (3)
Econ 105 or 106 (Social & Beh. Science) (3)
Core Humanities Elective (6)
Core Fine Arts Elective (3)
Core Second-Language Elective (3)

Mathematics & Sciences Component

Mathematics (21 credits)

Math 162♦, 163♦, 264 Calculus I, II, III (12)
Math 316 Differential Equations (3)
Math 314, 321 or 375
   Linear Algebra or Numerical Computing (3)
Math 327 Discrete Mathematics (3)

Science (11 credits)

Phys 160*, 161*, 161L*, General Physics   (7)
Additional approved basic sciences:* (4)
  (Biol 110 w/112L, 123 w/124L, 201, 202; Chem 121w/
  123L; Phys 262 w/262L; or Astr 270 w/270L, 271
  w/271L)

Computer Engineering Component

Required (54 credits)

ECE 101 Introduction to ECE (1)
ECE 131 Programming Fundamentals (3)*
ECE 231 Intermediate Programming (3)
ECE 203 Circuit Analysis I (3)*
ECE 206L Instrumentation (2)
ECE 213 Circuit Analysis II (3)
ECE 238L Computer Logic Design (4)
ECE 314 Signals & Systems (3)
ECE 321L Electronics I (4)
ECE 330 Software Design (3)
ECE 331 Data Structures & Algorithms (3)
ECE 337 Computer Architecture & Organization (3)
ECE 340 Probabilistic Methods (3)
ECE 344L Microprocessors (4)
ECE 437 Operating Systems (3)
ECE 440 Computer Networks (3)
ECE 419 Senior Design I (3)
ECE 420 Senior Design II (3)

Track Electives (6 credits)

Hardware Emphasis

ECE 338 Intermediate Logic Design (3)
ECE 438 Design of Computers (3)

–or–

Software Emphasis

ECE 335 Integrated Software Systems (3)
ECE 435 Software Engineering (3)

Technical Electives (9 credits)

ECE technical elective (9)
Approved 300-level and above courses developed in
consultation with your faculty advisor.

....
 ♦ *Denotes required prerequisites that must be completed prior to applying.*
 * *Ten additional hours of prerequisite course work must be chosen from these courses.*
Eighteen hours of prerequisite courses must be completed prior to applying to the department.
A GPA of 2.5 or better on prerequisite coursework is required for admission to the department. A student's overall GPA
must not fall below 2.0.

BS Computer Engineering Curriculum
Effective **Fall 2009** (128 hours)
UNM Core Curriculum, Fall 1999

FRESHMAN YEAR						
FALL SEMESTER				**SPRING SEMESTER**		
Course #	core	Cr		*Course #*	core	Cr
MATH 162: Calculus I		4		MATH 163: Calculus II		4
ECE101: Intro to ECE		1		ECE 231: Intermediate Programming		3
ECE 131: Programming Fundamentals		3		PHYC161: General Physics		3
PHYC 160: General Physics		3		PHYC161L: General Physics Lab		1
ENGL 101: Composition I		*3*		*ENGL 102: Composition II*		3
*ECON 105 or 106 * Macro/Microeconomics*	*SB	3		*Humanities Core Elective **	*HU	3
Total		17		Total		17

SOPHOMORE YEAR						
FALL SEMESTER				**SPRING SEMESTER**		
Course #	core	Cr		Course #	core	Cr
ECE 203: Circuit Analysis I		3		ECE 206L: Instrumentation		2
ECE 238L: Computer Logic Design		4		ECE 213: Circuit Analysis II		3
MATH 316 Applied Ordinary Diff. Eq.		3		MATH 314,321 or 375 Linear Algebra/ Intro to Computing Numbers		3
Basic Science with Laboratory		4		MATH 264: Calculus III		4
ENGL 219: Technical Writing		3		ECE 330: Software Design *(Spring Only)*		3
Total		17		Total		15

JUNIOR YEAR						
FALL SEMESTER				**SPRING SEMESTER**		
Course #	core	Cr		Course #	core	Cr
ECE 321L: Electronics I *(Fall Only)*		4		ECE 340: Probabilistic Methods *(Spring Only)*		3
MATH 327: Discrete Structures		3		ECE 331: Data Structure Alg. *(Spring Only)*		3
ECE 314: Signals and Systems *(Fall Only)*		3		ECE 344L: Microprocessors *(Spring Only)*		4
ECE 337: Computer Architecture *(Fall Only)*		3		ECE Track Elective**		3
*Foreign Language Core Elective **	*FL	3		*Soc/Beh Science Core Elective **	*SB	3
Total		16		Total		16

SENIOR YEAR						
FALL SEMESTER				**SPRING SEMESTER**		
Course #	core	Cr		Course #	core	Cr
ECE 419: Senior Design I *(Fall Only)*		3		ECE 420: Senior Design II *(Spring Only)*		3
ECE 437: Operating Systems *(Fall Only)*		3		ECE 440: Computer Networks *(Spring Only)*		3
ECE Track Elective**		3		Senior Technical Elective***		3
Senior Technical Elective***		3		*Humanities Core Elective **	*HU	3
Senior Technical Elective***		3		*Fine Arts Core Elective **	*FA	3
Total		15		Total		15

*See approved list of core electives in the ECE Undergraduate Handbook.
**ECE track electives consist of ECE 338 and 438, or ECE 335 and 435
***Senior electives are developed in consultation with your academic advisor and can be taken from ECE, computer science, physics, or other engineering-related courses.

No grades below a 'C' are allowed in the Computer Engineering Program.

VI. The 3+2 BS/MBA Program

Beginning with the fall 2003 semester, the ECE Department, in conjunction with UNM's Anderson School of Management, began offering the 3+2 BS/MBA degree program for ECE undergraduates interested in a Master's Degree in Business Administration.

This program is suited for engineers who wish to pursue a management role in a high-technology business, including engineers who aspire to starting their own company or joining an entrepreneurial team.

The 3+2 BS/MBA program enables School of Engineering undergraduates to receive their baccalaureate degree in engineering in four years and then complete requirements for an MBA from UNM's Anderson School of Management (ASM) during a fifth year of study. The program requires completion of some ASM courses during the undergraduate engineering program, and students earn dual credit for some required courses that count toward both the ECE and ASM degrees.

ASM recommends that 3+2 program participants complete Business Calculus and Microeconomics before applying to the program. For the first three years of undergraduate study, the student pursues a normal ECE curriculum. During the junior year (90 hours), the student applies for admission to the MBA program at ASM. ASM directs that students should not take any management classes prior to their acceptance into the program, with the exception of MGMT 113 (Introduction to Management). In the senior year, the student begins the first year of the MBA program and also completes the requirements for a Bachelor of Science degree in EE or CompE. In the fifth year of study the student completes the second year of the MBA program.

3+2 BS/MBA Electrical Engineering Curriculum

FRESHMAN YEAR					
FALL SEMESTER			**SPRING SEMESTER**		
Course #	core	Cr	*Course #*	core	Cr
MATH 162: Calculus I		4	MATH 163: Calculus II		4
ECE101: Intro to ECE		1	CHEM 121: General Chemistry		3
ECE 131: Programming Fundamentals		3	CHEM 123L: Gen Chemistry Lab		1
PHYC 160: General Physics		3	PHYC161: General Physics		3
ENGL 101: Composition I		3	PHYC161L: General Physics Lab		1
ECON 105 or ECON 106 Macro/Microeconomics*	*SB	3	*ENGL 102: Composition II*		3
			Humanities Core Elective *	*HU	3
Total		17	Total		18

SOPHOMORE YEAR					
FALL SEMESTER			**SPRING SEMESTER**		
Course #	core	Cr	Course #	core	Cr
ECE 203: Circuit Analysis I		3	ECE 206L: Instrumentation		2
MATH 264: Calculus III		4	ECE 213: Circuit Analysis II		3
MATH 316 Applied Ordinary Diff. Eq.		3	ECE 238L: Computer Logic Design		4
PHYC 262:General Physics		3	MATH 314: Linear Algebra		3
Foreign Language Core *	*FL	3	ENGL 219:Technical Writing		3
Total		16	Total		15

JUNIOR YEAR					
FALL SEMESTER			**SPRING SEMESTER**		
Course #	core	Cr	Course #	core	Cr
ECE 314: Signals and Systems *(Fall Only)*		3	ECE 340: Probabilistic Methods *(Spring Only)*		3
ECE 321L: Electronics I *(Fall Only)*		4	ECE 344L: Microprocessors		4
ECE Completeness Course◆(345, 371, or 381)		3	ECE Completeness Course◆(322L, 341, or 360)		3 or 4
ECE Completeness Course◆(345, 371, or 381)		3	ECE Completeness Course◆(322L, 341, or 360)		3
*Soc/Beh Science Core Elective *	*SB	3	*Humanities Core Elective* *	*HU	3
Total		16	Total		16 or 17

SENIOR YEAR					
FALL SEMESTER			**SPRING SEMESTER**		
Course #	core	Cr	Course #	core	Cr
ECE 419: Senior Design I *(Fall Only)*		3	ECE 420: Senior Design II *(Spring Only)*		3
ECE Completeness Course◆(345, 371, or 381)		3	ECE Completeness Course◆(322L, 341, or 360)		3 or 4
MGMT 506 Organizational Behavior & Diversity	TE	3	MGMT 508 Eth, Soc, Pol, & Leg Environment	STE	3
MGMT 511 Tech. Commercial. & Global Env.	TE	3	MGMT 502 Accounting & Mngmt. Info. Sys. I	STE	3
MGMT 504 Microeconomics for Managers	STE	3	*Core Fine Arts*	*FA	3
Total		15	Total		15 or 16

GRADUATE YEAR					
FALL SEMESTER			**SPRING SEMESTER**		
Course #	core	Cr	Course #	core	Cr

MGMT 522 Marketing Management		3	MGMT 598 Strategic Management		3
MGMT 520 Operations Management		3	MGMT 526 Financial Management		3
MGMT 500- Level Elective		3	MGMT 500-Level Elective		3
MGMT 500- Level Elective		3	MGMT 500-Level Elective		3
MGMT 500- Level Elective		3	MGMT Elective		3
MGMT Elective		3			
Total		18	Total		15

129 hours B.S. plus 33 hours MBA, fall 1999 – May 2, 2011

No grades below a 'C' are allowed in the Electrical Engineering Program.

**TE: Track Electives   ***STE: Senior Technical Electives

3+2 BS/MBA Computer Engineering Curriculum

128 hours B.S. plus 33 hours MBA, fall 1999 – May 2, 2011

FRESHMAN YEAR					
FALL SEMESTER			**SPRING SEMESTER**		
Course #	core	Cr	*Course #*	core	Cr
MATH 162: Calculus I		4	MATH 163: Calculus II		4
ECE101: Intro to ECE		1	ECE 231: Intermediate Programming		3
ECE 131: Programming Fundamentals		3	PHYC161: General Physics		3
PHYC 160: General Physics		3	PHYC161L: General Physics Lab		1
ENGL 101: Composition I		3	*ENGL 102: Composition II*		3
ECON 105 or ECON 106 * Macro/Microeconomics	**SB*	3	*Humanities Core Elective**	**HU*	3
Total		17	Total		17
SOPHOMORE YEAR					
FALL SEMESTER			**SPRING SEMESTER**		
Course #	core	Cr	Course #	core	Cr
ECE 203: Circuit Analysis I		3	ECE 206L: Instrumentation		2
ECE 238L: Computer Logic Design		4	ECE 213: Circuit Analysis II		3
MATH 316 Applied Ordinary Diff. Eq.		3	MATH 314, 321, or 375 Linear Algebra/ Intro to Numerical Computing		3
BASIC SCIENCE W/LAB		4	MATH 264: Calculus III		4
ENGL 219: Technical Writing		3	ECE 330 Software Design		3
Total		17	Total		15
JUNIOR YEAR					
FALL SEMESTER			**SPRING SEMESTER**		
Course #	core	Cr	Course #	core	Cr
ECE 314: Signals and Systems *(Fall Only)*		3	ECE 340: Probabilistic Methods *(Spring Only)*		3
ECE 321L: Electronics I *(Fall Only)*		4	ECE 344L: Microprocessors		4
ECE 337: Computer Architecture *(Fall Only)*		3	ECE 331 Data Structure Algorithms *(Spring Only)*		3
MATH 327: Discrete Structures		3	*Foreign Language Core**	**FL*	3
Soc/Beh Science Core Elective	**SB*	3	*Humanities Core Elective**	**HU*	3
Total		16	Total		16
SENIOR YEAR					
FALL SEMESTER			**SPRING SEMESTER**		
Course #	core	Cr	Course #	core	Cr
ECE 419: Senior Design I *(Fall Only)*		3	ECE 420: Senior Design II *(Spring Only)*		3
ECE 437: Operating Systems *(Fall Only)*		3	ECE 440: Computer Networks		3
MGMT 506 Organizational Behavior & Diversity	**TE**	3	MGMT 508 Eth, Soc, Pol, & Leg Environment	**STE**	3
MGMT 511 Tech. Commercial. & Global Env	**TE**	3	MGMT 502 Accounting & Mngmt. Info. Sys. I	**STE**	3

MGMT 504 Microeconomics for Managers	STE	3
Total		15

Core Fine Arts	*FA	3
Total		15

GRADUATE YEAR					

FALL SEMESTER		
Course #	core	Cr
MGMT 522 Marketing Management		3
MGMT 520 Operations Management		3
MGMT 500- Level Elective		3
MGMT 500- Level Elective		3
MGMT 500- Level Elective		3
MGMT Elective		3
Total		18

SPRING SEMESTER		
Course #	core	Cr
MGMT 598 Strategic Management		3
MGMT 526 Financial Management		3
MGMT 500-Level Elective		3
MGMT 500-Level Elective		3
MGMT Elective		3
Total		15

No grades below a 'C' are allowed in the Computer Engineering Program.
**TE: Track Electives   ***STE: Senior Technical Electives

Addendum #1

Faculty and Their Research Interests
at the
UNM Department of
Electrical & Computer Engineering

Electrical & Computer Engineering Department Faculty and their Research Interests

Department Chairs

Luke Lester, Professor, Interim Department Chair; Ph.D., Cornell, 1992. RF photonics, solar cells, semiconductor lasers, and quantum dot devices.

Nasir Ghani, Associate Professor, Associate Chair/Director of Graduate Programs; Ph.D., University of Waterloo, 1997. High-speed networking, cyber-infrastructures, protocols and architectures, traffic engineering, routing, network virtualization, optical and access networks, TCP/IP enhancements, performance evaluation, survivability, network simulation, stochastic modeling.

Ramiro Jordan, Associate Professor, Associate Chair/Director of Undergraduate Programs; Founder and Special Advisor to the President, Ibero American Science & Technology Consortium; Ph.D., Kansas State, 1987. Communications, wireless sensor networks, multidimensional signal processing and embedded systems.

Professors

Chaouki T. Abdallah, Professor, Provost; Ph.D., Georgia Tech., 1988. Control systems, control of computing systems, reconfigurable systems and networks

Ganesh Balakrishnan, Assistant Professor; Ph.D. University of New Mexico, 2006. Semiconductor device development including epitaxy and characterization, high-power vertical-external-cavity surface-emitting lasers, novel semiconductor material development for mid-infrared lasers.

Steven R. J. Brueck, UNM Distinguished Professor; IEEE Fellow; Ph.D., MIT, 1977. Laser-material interactions, electro-optic devices, laser spectroscopy Nanoscale lithography and nanofabrication with applications to nanophotonics, nanofluidics, and nanoscale epitaxial growth and sources/detectors; tunable infrared lasers; ultrahigh resolution optical microscopy.

Vince D. Calhoun, Professor; Ph.D., University of Maryland, 2002. Biomedical engineering, psychiatric neuroimaging, functional and structural magnetic resonance imaging (MRI), multimodal data fusion, neuroimaging genetics, medical image analysis.; Director, Image Analysis and MR Research at the Mind Research Network; joint appointments with Yale University Dept. of Psychiatry and UNM departments of Neuroscience and Computer Science.

Thomas P. Caudell, Professor; Ph.D., University of Arizona, 1980. Computational cognitive neurosciences, neural networks theory and simulation, virtual reality and visualization, art/science collaborations, evolutionary computation, high-performance computing, autonomous robotics.

Christos Christodoulou, Professor; IEEE Fellow; Ph.D., North Carolina State University, 1985. Modeling of electromagnetic systems, smart antennas, reconfigurable antennas, machine learning applications in electromagnetics, RF/photonics.

Rafael Fierro, Associate Professor; Ph.D., University of Texas at Arlington, 1997. Cooperative control of multi-agent systems, cyber-physical systems, mobile sensor and robotic networks, motion planning under sensing/communication constraints, optimization-based multivehicle coordination.

Charles B. Fleddermann, Professor; School of Engineering Associate Dean for Academic Affairs; Ph.D., Illinois at Urbana-Champaign, 1985. Plasma processing, physical electronics, photovoltaics.

Mark A. Gilmore, Associate Professor; Ph.D., University of California at Los Angeles, 1999. Plasma physics and diagnostics, magnetic confinement fusion, microwave circuits and systems, turbulence, complex systems.

Edward D. Graham, Research Professor/Lecturer; Ph.D., North Carolina State University. Semiconductor devices and circuits, noise theory, and statistical analysis and probabilistic considerations.

Majeed M. Hayat, Professor; Ph.D., University of Wisconsin-Madison, 1992. Statistical communication theory, signal and image processing, algorithms for infrared spectral sensors and imagers, novel avalanche photodiodes, optical communication, cooperative distributed sensing and computing, algorithms for synthetic aperture radar, applied probability and stochastic processes.

Gregory L. Heileman, Professor, Associate Provost for Curriculum ; Ph.D., University of Central Florida, 1989. Data structures and algorithmic analysis; theory of information, security and computing; machine learning and pattern recognition.

Mani Hossein-Zadeh, Assistant Processor; Ph.D., University of Southern California at Los Angeles, 2004. Electrooptics, microwave-photonic devices and systems, ultra-high-Q optical microresonators, optomechanical interaction in UH-Q optical resonators, optical communication, photonic sensors, optofluidics and plasmonics.

Daryl O. Lee, Lecturer; Ph.D., Southern Methodist University. Software Engineering, Real-Time Software and Computer Control Systems.

Ravinder K. Jain, Professor; Fellow of APS, OSA, IEEE LEOS, SPIE; joint appointment with UNM Physics & Astronomy Dept.; Ph.D., Berkeley, 1974. Quantum electronics, optoelectronics, electro-optics, experimental solid-state physics.

Sudharman K. Jayaweera, Assistant Professor; Ph.D., Princeton University, 2003. Wireless communications, statistical signal processing, network information theory, cognitive radios, cooperative communications, information theoretic aspects of networked control systems, smart-grid communications and control, wireless mobile sensor networks.

Sanjay Krishna, Professor and Associate Director, CHTM; 2007 Chief Scientist Award, Defense Intelligence Agency; Ph.D., University of Michigan, Ann Arbor, 2001. Investigation of nanostructured semiconductor materials for mid infrared lasers, detectors, and thermophotovoltaic cells; nanoscale materials consisting of self-assembled quantum dots, strain-layer superlattices for next generation bio inspired sensors.

Olga Lavrova, Assistant Research Professor/Lecturer; Ph.D., University of California at Santa Barbara, 2001. Photovoltaics and nano-scale semiconductor structures for photovoltaic applications, Smart Grid and emerging energy generation, distribution and storage technologies.

Meeko Mitsuko Oishi, Assistant Professor, Ph.D., Stanford, 2004. Cyber-physical systems, hybrid control theory, nonlinear dynamical systems, verification of human-automation interaction, assistive technologies, control-based modeling of Parkinson's disease.

Marek Osinski, Professor; Ph.D., Warsaw, 1979. Magnetic nanoparticles, nanotechnology, colloidal nanocrystals, nuclear radiation detectors, semiconductor lasers, optoelectronic devices and materials, integrated optoelectronic circuits, group-III nitrides, degradation mechanisms and reliability, computer simulation, biomedical applications of nanocrystals.

Marios S. Pattichis, Associate Professor; joint appointment, UNM Radiology Department; Ph.D., University of Texas-Austin, 1998. Biomedical image and video processing and communications, medical imaging, dynamically reconfigurable systems, general methods for image and video analysis.

Fernando Perez-Gonzales, Professor; Ph.D., Universidad de Vigo in Spain; UNM Prince of Asturias Endowed Chair - Information, Science and Technology. Information forensics and security, digital watermarking, cognitive radio, digital communications, adaptive algorithms.

James Plusquellic, Associate Professor, Ph.D., University of Pittsburgh, 1997. IC Trust, design for manufacturability, defect-based and data-driven VLSI test, small delay faulty test, model-to-hardware correlation and IC fabrication process monitors.

L. Howard Pollard, Assistant Professor; Ph.D., Illinois at Urbana-Champaign, 1983. Computer architecture, digital design, fault tolerance, microprocessors, FPGA systems, space electronics.

Balu Santhanam, Associate Professor; Ph.D., Georgia Institute of Technology, 1998. Digital signal processing, statistical communication theory, adaptive filtering, time-frequency analysis and representations, multicomponent AM-FM signal modeling, SAR based vibrometry and related nonstationary signal analysis, and ICA related signal separation and classification.

Edl Schamiloglu, Professor; IEEE Fellow; Ph.D., Cornell, 1983. Physics and technology of charged particle beam generation and propagation, high-power microwave sources and effects, pulsed-power science and technologies, plasma physics and diagnostics, electromagnetics and wave propagation, neurosystems engineering.

Wei Wennie Shu, Associate Professor; Ph.D., University of Illinois at Urbana-Champaign, 1990. Distributed systems, high performance computing, wireless networking, mobile ad-hoc and sensor networks, biomed modeling and simulation.

Payman Zarkesh-Ha, Assistant Professor; Ph.D. Georgia Institute of Technology, 2001. Statistical modeling of VLSI systems, design for manufacturability, low-power and high-performance VLSI design.

Addendum #2

Application for the Undergraduate Degree & Departmental Honors Application

Department of Electrical and Computer Engineering

Application for an Undergraduate Degree

To The Student: Please complete the steps below.

1.   Complete this form and return it to the undergraduate advisor in 115 of the ECE building.
2.   We will notify you of the status of your application by email.
3.   Changes in the below program must be approved by the Department Chairman or designated advisor. You will need to resubmit this form.

It is recommended that you file an application during the second semester of your Junior Year, or prior to enrollment of the 100th hour toward your degree.

Name (First, Middle, Last)	UNM ID
Street Address	City, State, Zip
Telephone	Email
Catalog used*	Date

*You have the option of completing degree requirements listed in the Catalog in use the year in which you entered the College of Engineering or the catalog in use the year you plan to graduate. Catalogs are available online at:
http://www.unm.edu/~unmreg/catalog.htm

I hearby make application for the degree of:

Major: _____
Second Major/Minor: _____
To be completed by: _____   _____
                              Semester/Year   Student Signature

In order to meet the expected graduation date, I plan to complete the following courses:

Semester: Year:		Semester: Year:		Semester: Year:		Semester: Year:	
Course	Credits	Course	Credits	Course	Credits	Course	Credits
Total Credits		Total Credits		Total Credits		Total Credits	

LIST CURRICULUM MODIFICATIONS OR WAIVERS THAT HAVE BEEN APPROVED:

_____   _____   _____

Electrical and Computer Engineering
Departmental Honors Application

Graduation with Department Honors is not automatic. Application for candidacy is required. Students should at least make their intention of graduating with Departmental Honors known to your Chairperson early in your junior year. Admission to Departmental Honors candidacy cannot be granted later than the semester prior to graduation. The levels of Departmental Honors awarded are cum laude, magna cum laude, and summa cum laude. This honor will appear both on the commencement program and your diploma.

Full Name_____ Banner ID: _____

1. Minimal Requirements
    a. An overall and degree GPA of not less than 3.20

        i. UNM GPA_____ Department GPA_____

    b. Not less than 6 Credit Hours in
        i. Independent Study
            1. ECE 493
            2. ECE 494
            3. Faculty Member:_____

2. Professional/Departmental Activities in which you have been involved in while at UNM:
    _____
    _____
    _____
    _____

Approved for Department Honors
By Academic Advisor_____

Approved for Department Honors
By Undergraduate Director_____

Approved for Department Honors
By Department Chairperson_____

Level granted: cum laude   magna cum laude   summa cum laude
                (3.20-3.74)   (3.75-3.89)   (3.90-4.33)