UNIVERSITY OF COLORADO DENVER
Electrical Engineering Department
GRADUATE STUDY in ELECTRICAL ENGINEERING

I. INTRODUCTION

The University of Colorado Denver, College of Engineering and Applied Science, offers undergraduate and graduate degrees in electrical engineering, computer science, civil engineering, mechanical engineering, and applied mathematics. The College is a major educational support center in the metropolitan area, where traditional students and working individuals can earn a degree through both daytime and evening classes.

The electrical engineering M.S.E.E. degree offers exciting opportunities to pursue graduate degrees in a number of traditional as well as new areas of emphasis. For additional information, the electrical engineering web site can be accessed at: http://www.ucdenver.edu/academics/colleges/Engineering/Programs/Electrical-Engineering/Pages/ElectricalEngineering.aspx

Practicing engineers can extend and update their professional capabilities through credit and/or non-credit courses, as well as earn graduate education in management, public policy, environmental science, computer science, or other areas of engineering through complimentary multi-disciplinary Master of Engineering programs offered by the College.

The Electrical Engineering Department offers graduate programs in electrical engineering with the following areas of concentration:

- Communications and Signal Processing
- Controls and Signal Processing
- Microelectronics and VLSI
- Fields, Waves and Optics
- Computer Engineering and Embedded System Design
- Energy and Power Systems

The Department offers graduate programs leading to the following degrees:

* Master of Science in Electrical Engineering (M.S.E.E.)
* Master of Engineering (M.Engr.)
* Doctor of Philosophy (Ph.D.) in Engineering and Applied Science

All graduate degrees are awarded and administered by the College of Engineering and Applied Science, and the Vice-Chancellor of the Graduate School of University of Colorado Denver in cooperation with the Electrical Engineering Department.

II. ADMISSION TO GRADUATE STUDY IN ELECTRICAL ENGINEERING

Interested students with questions may contact members of the Electrical Engineering Department Graduate Committee by calling the department office at (303) 556 2872 or visiting the web site. Application forms for all graduate degrees may be accessed on-line at the web site: https://soa.prod.cu.edu/degreeprog/applyDEGREEPROG_CUDEN/login.action. All applicants for admission need to submit complete credentials as are outlined in the instructions included in the on-line application.

To be considered for “regular” admission to the Master’s program, candidates must meet the following minimum requirements: a BS degree from a reputable institution, either in Electrical Engineering, or in equivalent Math, Physics and other engineering disciplines and with Grade Point Average (GPA) at least 3.0, on a 4.0 scale. Satisfaction of minimum requirements does not guarantee admission. The grades obtained in the student’s area of
concentration are important factors in the consideration, and so are possible multiple repetitions of fundamental courses.

For those undergraduate students with degrees in science and non-electrical engineering wishing to pursue graduate study in the Electrical Engineering Department there is no restriction or constraint in being admitted into the M.S.E.E. graduate program. However, they must fulfill any pre-requisite course requirements assigned to any graduate course in the department. Students with an undergraduate degree in areas other than electrical engineering must also see their graduate instructor to receive approval before registering for a class in electrical engineering.

Students must plan a program of study in consultation with their departmental advisor(s), during the first semester of study, and submit for approval to the Department.

1. Master of Science (MSEE) Program

Upon acceptance to the MSEE program, each student will be assigned a faculty advisor to help him/her with selecting their courses for the first semester. Subsequently, it is required that a MSEE candidate select a graduate advisor within the first semester of his/her graduate studies at the Electrical Engineering (EE) Department, UC Denver and sign an agreement with this advisor regarding the rules and regulations pertinent to the MSEE degree. The student’s graduate advisor will approve the student’s curriculum, as complying with the rules and conditions in this document, and will supervise the student’s thesis or when applicable (see below for thesis versus course only option). The list of graduate advisors in the EE Department is included in Section IV of this document.

To fulfill the requirements for the MSEE degree, the EE Department at UC Denver requires that, within a five-year period, a candidate complete an approved program in one of two options: (a) a thesis option consisting of at least 30 semester hours or (b) a course only option consisting of at least 30 semester hours. It is also required that the MSEE candidate maintain a grade point average of 3.0 or higher. In compliance with the Graduate School Rules, the minimum grade required for a unit to count towards the required semester hours is “B minus” (2.7). For the students in the thesis option, it is recommended that they attend the CEAS seminar series. For the students in the courses only option, it is required that they take the ENGR5150 seminar course for 1 semester and 0 credits. The ENGR5150 seminar course is a pass/fail; for passing a 75% minimum attendance plus a report on one of the seminars are required.

The EE department offers six areas of concentration at the Master level: Controls and Signal Processing; Communications and Signal Processing; Microelectronics and VLSI; Fields, Waves and Optics; Computer Engineering and Embedded Design; and Energy and Power Systems. The courses offered in each concentration area are listed in Section III of this document.

For both thesis and course only MSEE options, it is required that a student select a primary area of concentration and a secondary area of concentration among the seven areas listed above, in agreement with the student’s graduate advisor (the list of graduate advisors is included in Section IV of this document). The student must take at least four (4) 3-unit courses in the primary area of concentration and at least two (2) 3-unit courses in the secondary area of concentration, all these six (6) courses being selected from those listed in Section III and being offered by the UCD EE Department. Additional courses may be selected from any area of concentration among those in Section III that are offered by the UCD EE Department, where one (1) 3-credit course may be an independent study with one of the graduate faculty at the UCD EE Department. It is emphasized that a student may take no more than one independent study courses. At least 21 course units must be taken from the UCD EE Department. At the discretion of the EE graduate committee, a maximum of nine (9) credits may be transferred from other programs. To register in any course, the student must first obtain the signed approval of his/her graduate advisor. The additional requirements dictated by each one of the two, thesis versus courses only, options are stated below.

- The thesis option allocates six units to the Master’s thesis, completed under the auspices of the student’s graduate advisor. In addition to the six (6) courses in primary and secondary concentration areas mentioned above, this option also requires an additional 3- unit graduate course. The latter course may be selected via signed pre-agreement with the student’s graduate advisor.
Typical Degree Construct – Thesis Option

<table>
<thead>
<tr>
<th>Requirement</th>
<th>Details</th>
<th>Credits</th>
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</thead>
<tbody>
<tr>
<td>Primary Area (required)</td>
<td>minimum four courses, Section III, UCD EE Dept</td>
<td>12 SH</td>
</tr>
<tr>
<td>Secondary Area (required)</td>
<td>minimum two courses, Section III, UCD EE Dept</td>
<td>6 SH</td>
</tr>
<tr>
<td>One additional course (required)</td>
<td>Section III, UCD EE Dept</td>
<td>3 SH</td>
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<tr>
<td>Thesis (required)</td>
<td></td>
<td>6 SH</td>
</tr>
<tr>
<td>Other course (required)</td>
<td>pre-approved by advisor</td>
<td>3 SH</td>
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<tr>
<td>Total (minimum)</td>
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<td>30 SH</td>
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</table>

• The course only option requires a total of 30 credits, including a mandatory 1 semester - 0 credit of the CEAS seminar. Additional graduate courses are selected with the signed pre-agreement of the student’s graduate advisor.

Typical Degree Construct – Course Only Option

<table>
<thead>
<tr>
<th>Requirement</th>
<th>Details</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Primary Area (required)</td>
<td>minimum four courses, Section III, UCD EE Dept</td>
<td>12 SH</td>
</tr>
<tr>
<td>Secondary Area (required)</td>
<td>minimum two courses, Section III, UCD EE Dept</td>
<td>6 SH</td>
</tr>
<tr>
<td>Other courses (required)</td>
<td>can include one additional seminar or graduate labs</td>
<td>12 SH</td>
</tr>
<tr>
<td>CEAS Seminar (required)</td>
<td>must be officially enrolled and submit a report</td>
<td>0 SH</td>
</tr>
<tr>
<td>Total (minimum)</td>
<td></td>
<td>30 SH</td>
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</table>

• The M.S.E.E. major advisor must be a full-time, UCD Electrical Engineering Department, graduate faculty member. Those currently satisfying these requirements are listed in Section IV of this document.

• It is required by the Graduate School Rules that the student defend his/her Thesis in front of a three-member committee of graduate faculty.

Candidates with a B.S.E.E. degree from UCD Electrical Engineering Department can count 6 electrical engineering UCD graduate credits toward both undergraduate and graduate degrees, if their undergraduate GPA was at least 3.0. Double-counting applies only to credits earned at 5000-level or higher, and with a “B minus” (2.7) or higher grade.

2. Master of Engineering (M.Engr.) Program

A qualified student may enroll in the graduate program of the Department of Electrical Engineering to pursue the degree of Master of Engineering. This program is broad-based and is designed especially for that person who wants to further his/her education in more than just one discipline. An example might be in engineering administration where course work in business management would logically supplement engineering studies.

A minimum of 30 credit semester hours of academic work acceptable to the Advisory Committee (within the rules established by the College of Engineering and Applied Science) will be required for the degree Master of Engineering. In compliance with the Graduate School Rules, the minimum grade required for a unit to count towards the 30 semester hours is “B minus” (2.7). To couple this degree with electrical engineering, at least 15 of these hours must be 5000 level or above in electrical engineering courses, and must be taken in UCD Electrical Engineering Department. As many as 15 credit hours can be taken outside of engineering, including 3 credit hours of Master of Engineering project. The project should cover some area of creative investigation performed by the student and may relate directly to his/her professional work and must be defended orally before the Advisory Committee.

Students may earn up to a maximum of 9 credit hours required for the degree through the Center for Advanced Training in Engineering and Technology Education, CAETE, videotape program or from another accredited institution including CATETE. These credit hours cannot be part of the 15 credit hours required from the UCD Electrical Engineering Department.
3. Doctor of Philosophy (Ph.D.) Program

The College of Engineering and Applied Science (CEAS) at the University of Colorado Denver (UCD) admits students into the program in Engineering and Applied Science (EASPhD). Under the EASPhD program, a successful doctoral student receives the degree “Doctor of Philosophy in Engineering and Applied Science”. The program is multidisciplinary with four departments of the College serving as host departments (Civil (CE), Computer Science and Engineering (CSE), Electrical (EE) and Mechanical (ME)) and all five departments (Bioengineering (BIOE), CE, CSE, EE and ME) offering secondary areas of concentration. The secondary concentration may also be chosen from another College/School at UC Denver. While the degree is conferred by the Graduate School, applicants to this program apply to and enter the program through one of four departments of the College: CE, CSE, EE, or ME, called the host department. The BIOE department participates as a secondary concentration choice. A CEAS committee appointed by the Dean oversees the fulfillment of the curriculum requirements, including the multidisciplinary component. This committee is comprised of one faculty representative from each of the five CEAS departments. All applicants for admission need to submit complete credentials as are outlined in the instructions included in the on-line application. The web site for the on-line application is: http://www.ucdenver.edu/admissions/doctoral/pages/index.aspx. For students whose primary concentration is Electrical Engineering, Engineering and Applied Science-PhD should be selected under Field of Study. Then, Electrical Engineering should be selected as the applicant’s host department in the Background Information field,

Admission Requirements

Following are the admission requirements for the EASPhD degree. This document should be used by the department Graduate Committees in making admission decisions.

Materials to be Submitted by the Applicant

- Application for admission
- GRE scores
- Three letters of recommendation
- Two copies of all transcripts
- Processing fee
- Personal statement of academic and research interests, including intended primary concentration within the host department
- International applicants whose native language is not English are required to submit TOEFL scores

Application Process

A student will apply to and enter the program through one of the four host departments of the College: Civil Engineering (CE), Computer Science and Engineering (CSE), Electrical Engineering (EE) or Mechanical Engineering (ME).

Application Deadlines

The application deadlines for fall admission are March 1 for international applicants and April 1 for domestic applicants. The application deadlines for spring admission are September 15 for international applicants and October 1 for domestic applicants. No summer applications for admission will be considered. Applicants must submit all required application materials to their host department by the relevant deadline to be guaranteed full consideration for admission.

Prior Degree and GPA Requirements

A student does not need to possess a Master’s degree before applying to the EASPhD program. The minimum requirements for admission to the EASPhD program are a B.S. in one of the corresponding engineering disciplines, or an equivalent degree in Mathematics, Physics, Chemistry or Biology, from a reputable institution, with Grade Point Average (GPA) at least 3.0, based upon a 4.0 scale. Satisfaction of minimum requirements will not guarantee admission. The grades obtained in the student’s area of concentration will be an important factor in the consideration, as will possible multiple repetitions of fundamental courses.

Prerequisites for Courses

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Students with undergraduate degrees in mathematics, science, or other engineering or non-engineering fields are eligible to apply for admission into the EASPhD program through one of the engineering host departments. However, all students must fulfill any prerequisite course requirements assigned to any graduate course in the corresponding department. Students with an undergraduate degree in areas other than engineering must also see their graduate advisor to receive approval before registering for a class in engineering.

**GRE Requirements**
Preferred minimum GRE scores are 150 Verbal, 153 Quantitative, and 3.5 for Analytical Writing for tests taken August 1, 2011 or later. For tests taken prior to August 1, 2011, preferred minimum GRE scores are 450 Verbal, 680 Quantitative, and 3.5 for Analytical Writing.

**TOEFL Requirements**
An international student whose undergraduate language of instruction was not English, should have a minimum TOEFL score of 600 (paper-based test) or 250 (computer-based test). A student with TOEFL score below 550 (paper-based test) or 213 (computer-based test) may be required to enroll in English classes. An applicant who does not meet these requirements can petition the University of Colorado Denver Graduate School for admittance, as either a Regular or Provisional degree student.

**Provisional Acceptance**
A student who meets the minimum requirements for admission, as dictated by the graduate school, but is not deemed qualified for direct admission to this program, may be admitted “provisionally;” that is, he/she may be required to take or repeat certain undergraduate courses before his/her admission to the program is official.

**Transfer Credit**
Request for transfer of credit will be considered on a case-by-case basis. This includes students possessing a Master’s degree. In keeping with the Rules of the Graduate School, doctoral students may transfer in a maximum of 21 credit hours, including graduate courses completed at the University of Colorado. Students possessing a Master’s degree, including those that obtained the degree from the University of Colorado, will be required to take a minimum of 9 additional course credit hours. Additional imposed course credit requirements will be considered on a case-by-case basis. All requests for transfer of credit must be made at the time of application for admission and will be granted solely at the discretion of the Graduate Committee of the pertinent CEAS host department. Furthermore, no coursework completed five or more years prior to the commencement of study in the EASPhD program will be considered for transfer of credit and all transfer students must meet the same requirements for admission as non-transfer students.

**Advisor**
Upon acceptance to the EASPhD program, each student will be assigned a temporary graduate faculty advisor from the ranks of full-time, CEAS host-department graduate faculty who possesses a Ph.D. degree in Engineering, Mathematics or Sciences to help the student select courses for the first semester. During the first semester, this advisor will also help the student plan a long-term program of study, which will be submitted to the respective host department for approval. In the first year of graduate studies, each EASPhD candidate must select and have an agreement from a permanent graduate faculty member from the ranks of the full-time CEAS host-department graduate faculty who possesses a Ph.D. degree in Engineering, Mathematics or Sciences to be the student’s research advisor or the student will be discontinued from the program.

**Required Signatures**
After the host department Graduate Committee Chair has signed to accept a candidate, the file should be passed to the Department Chair for his/her signature indicating that the Department Chair agrees that everything is in order for acceptance of the candidate.

**Rules and Regulations**
Following are the Rules and Regulations for the EASPhD degree. The document is useful to candidates and their faculty advisors in making sure that the requirements are met for completion of the Ph.D. degree. Each doctoral candidate should read and understand this document. He/she should sign the document signifying that he/she understands the document and has a curriculum plan complying with it.
Host Department
Applicants to the EASPhD program apply to and enter the program through one of four departments, called the host department, of the College: CE, CSE, EE, or ME. The student chooses the host department whose course offerings match with his/her desired primary area of concentration. As this Ph.D. program is multidisciplinary, a student must take courses from both a primary and secondary concentration.

Selection of Primary and Secondary areas of Concentration
For his/her research and study area and with the assistance and approval of his/her advisor, a Ph.D. candidate will select a primary area of concentration within his/her host department. With the agreement of his/her faculty advisor, the student will also select a secondary concentration outside of the student’s host department, which could be any one of the remaining CEAS departments, including the BIOE department. The secondary concentration may also be chosen from another College/School at UC Denver. The student’s advisor(s) will be instrumental in the selection of a secondary area that supports and complements the primary area of concentration. At least one of the student’s research committee members must be from the department that supports the student’s secondary concentration.

Graduate Advisor and Research Committee
Upon acceptance to the EASPhD program, each student will be assigned a temporary graduate faculty advisor from the ranks of full-time, CEAS host-department graduate faculty who possesses a Ph.D. degree in Engineering, Mathematics or Sciences to help the student select courses for the first semester. During the first semester, this advisor will also help the student plan a long-term program of study, which will be submitted to the respective host department for approval. In the first year of graduate studies, each EASPhD candidate must select and have an agreement from a permanent graduate faculty member from the ranks of the full-time, CEAS host-department graduate faculty who possesses a Ph.D. in Engineering, Mathematics or Sciences to be the student’s research advisor or the student will be discontinued from the program. The student will sign an agreement that outlines the rules and regulations pertinent to the Ph.D. degree and the student’s curriculum plan as complying with the rules and conditions in this document. The advisor will assist the student with the design of his/her course curriculum, will supervise the student’s dissertation, will help the student form a five-member research committee that will approve the student’s plan of study and will help mentor the student’s research. The research committee must include at least two faculty outside the student’s home department, at least one of whom from the department that supports the student’s secondary concentration and at least one of whom outside of CEAS, while all members of the committee must possess a Ph.D. degree in Engineering, Mathematics or Sciences.

Coursework Requirements
The coursework requirement is 30 units (i.e., 10 courses each of which is 3 units) for all students. Students must take at least five courses in the primary area of concentration in the host department and at least three courses in the secondary area of concentration. The two additional courses may be selected from any area of concentration among those listed in the graduate documents of the CEAS departments or other colleges in the University. Other courses may be recommended by the student’s advisor. As already stated above, to maintain the multidisciplinary feature of the program, the three courses in the secondary area of concentration must come from outside the student’s host department; i.e., from any of the remaining four departments of the College. The secondary concentration may also be chosen from another College/School at UC Denver. For students with more than 15 units of transfer credits, the course distribution will be decided on a case-by-case basis. To register for any of these required courses, the student must first obtain the signed approval of his/her graduate advisor(s).

Independent Study Courses
A student may take one, but no more than one, independent study course from one of the CEAS graduate faculty.

Research Requirements
For the research/dissertation requirement, an additional 30 dissertation units are required with supervision by the student’s graduate advisor(s). A student who successfully completes the 30-unit course requirement, but decides to not pursue the 30-unit dissertation requirement, may graduate with a Master’s degree in the discipline of his/her primary concentration provided he/she has met the degree requirements of the host department.

Seminar and GPA Requirements
The candidate must maintain a grade point average of 3.0 or higher. In compliance with the Graduate School Rules, the minimum grade required for a unit to count toward the 30 semester hours of coursework is “Bminus” (2.7). The College of Engineering and Applied Science (CEAS) will require that all EASPhD candidates take at least two
semesters of the ENGR7150 seminar course, at 0.5 credits per each semester. The class is a pass/fail; for passing a 75% minimum attendance plus a report on one of the seminars are required.

Transfer Credit
Requests for transfer of credit will be considered on a case-by-case basis. This includes students possessing a Master’s degree. In keeping with the Rules of the Graduate School, doctoral students may transfer in a maximum of 21 credit hours, including graduate courses completed at the University of Colorado. Students possessing a Master’s degree, including those that obtained the degree from the University of Colorado, will be required to take a minimum of 9 additional course credit hours. Additional imposed course credit requirements will be considered on a case-by-case basis. All requests for transfer of credit must be made at the time of application for admission and will be granted solely at the discretion of the Graduate Committee of the pertinent CEAS host department. Furthermore, no coursework completed five or more years prior to the commencement of study in the EASPhD program will be considered for transfer of credit and all transfer students must meet the same requirements for admission as non-transfer students.

Timing of Coursework
Each EASPhD candidate will be expected to successfully complete at least fifteen credit hours of coursework during the first year of study. Exceptions to this will be considered on a case-by-case basis, especially for working students. Candidates with more than fifteen granted transfer course credit hours will be expected to complete all required course work the first year of study.

Preliminary Examination
Each PhD candidate is required to take the Preliminary Examination prepared by the full-time faculty of the EE department. The Preliminary Examination consists of two parts: (a) A general mathematics part (only written exam) and (b) an area exam (both written and oral exam). Each candidate is required to successfully complete the Preliminary Examination requirement by the end of his/her third year in the program, while he/she is allowed a maximum of two attempts. A candidate who fails to fulfill the Preliminary Examination requirements will be expelled from the program.

Comprehensive Examination and Doctoral Dissertation Defense
After successful completion of the Preliminary Examination, students will be required to successfully complete two additional examinations: the Comprehensive Examination and the Doctoral Dissertation Defense Examination. The Comprehensive Examination will be prepared by the candidate’s dissertation committee and will be taken by the end of the candidate’s third year of doctoral studies. Consisting of written and oral parts, its purpose is to evaluate the candidate’s proficiency in his/her primary and secondary areas of concentration. The Doctoral Dissertation Defense is the final examination and is designed to evaluate the originality and quality of the candidate’s research. Upon successful completion of the Doctoral Dissertation Defense Examination, the Doctoral Dissertation will be submitted to the Graduate School.

Degree Conferred
Upon satisfactory completion of all requirements, the candidate receives the degree “Doctor of Philosophy in Engineering and Applied Science.”

I understand the Rules and Regulations, and my faculty advisor and I have devised a curriculum plan complying with them.

______________________________ Date _______________
Student

______________________________ Date _______________
Faculty Advisor

III. ELECTRICAL ENGINEERING GRADUATE COURSES AT UCD
(a) Communications and Signal Processing

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<td>Advanced Linear Systems</td>
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<td>ELEC 5248-3</td>
<td>Digital Communication Systems</td>
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<td>Space Communications Systems</td>
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<td>ELEC 5250-3</td>
<td>Information Theory</td>
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<td>ELEC 5551-3</td>
<td>Pattern Recognition</td>
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<td>ELEC 5617-3</td>
<td>Random Processes for Engineers (Prerequisite to</td>
</tr>
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<td></td>
<td>taken concurrently with them)</td>
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<tr>
<td>ELEC 5637-3</td>
<td>Digital Signal Processing (Prerequisite to several</td>
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<td></td>
<td>with them)</td>
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<tr>
<td>ELEC 5638-3</td>
<td>Digital Image Processing</td>
</tr>
<tr>
<td>ELEC 5644-3</td>
<td>Biomedical Imaging</td>
</tr>
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<td>ELEC 5xxx-3</td>
<td>Biomedical Signal and Image Processing</td>
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(b) Controls and Signal Processing

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<td>ELEC 5230-3</td>
<td>Advanced Linear Systems</td>
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<td>ELEC 5436-3</td>
<td>Nonlinear Control Systems</td>
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<td>ELEC 5446-3</td>
<td>Introduction to Modern Control Theory</td>
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<td>ELEC 5456-3</td>
<td>Sampled Data and Digital Control Systems</td>
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<tr>
<td>ELEC 5466-3</td>
<td>Adaptive Control System Design</td>
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<tr>
<td>ELEC 5648-3</td>
<td>Blind Signal Processing</td>
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<tr>
<td>ELEC 5649-3</td>
<td>Adaptive Signal Processing</td>
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<tr>
<td>ELEC 5686-3</td>
<td>Modeling and System Identification</td>
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<td>ELEC 5696-3</td>
<td>Robust Control Systems</td>
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<tr>
<td>ELEC 5551-3</td>
<td>Pattern Recognition</td>
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<td>ELEC 5617-3</td>
<td>Random Processes for Engineers (Prerequisite to</td>
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<td>Digital Image Processing</td>
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(c) Microelectronics and VLSI:

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<td>ELEC 5025-3</td>
<td>Device Electronics</td>
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<td>ELEC 5455-3</td>
<td>Numerical Analysis of Semiconductor Devices</td>
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<tr>
<td>ELEC 5552-3</td>
<td>VLSI System Design</td>
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<tr>
<td>ELEC 5555-3</td>
<td>VLSI Circuit Simulation</td>
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<tr>
<td>ELEC 5xxx-3</td>
<td>Fabrication Lab</td>
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ELEC 5xxx-3  Quantum Electronics
ELEC 6xx5-3  Device Electronics II

(d)  Fields, Waves and Optics

ELEC 5033-3  Advanced Electromagnetic Fields
ELEC 5xxx-3  Quantum Electronics
ELEC 5373-3  Optical Engineering
ELEC 5xxx-3  Introduction to Biomedical Photonics
ELEC 5230-3  Advanced Linear Systems
ELEC 5xx-3  Nonlinear Biophotonics
ELEC 5644-3  Biomedical Imaging
ELEC 5xxx-3  Biomedical Signal and Image Processing
ELEC 5xxx-1  Biophotonics Laboratory
ELEC 5133-3  Electromagnetic Radiation and Antenna
ELEC 5433-3  Applications and Fundamentals of Plasmas
ELEC 5638-3  Digital Image Processing
ELEC 5637-3  Digital Signal Processing
ELEC 5551-3  Pattern Recognition
ELEC 5688-3  Nondestructive Testing
ELEC 5xxx-3  Numerical Electromagnetics

(e)  Computer Engineering and Embedded System Design

ELEC 5501-3  Microprocessor-based Design
ELEC 5511-3  Hardware-Software Interface
ELEC 5521-3  Design & Test of Digital Systems
ELEC 5593-3  Advanced Computer Architecture
ELEC 5723-3  High Performance Computer Architecture

(f)  Energy and Power Systems:

ELEC 5164-3  Electronic Drive Systems
ELEC 5174-3  Power Electronic Systems
ELEC 5xxx-3  Advanced Power Electronic Systems
ELEC 5184-3  Power Systems Analysis
ELEC 5774-3  Power Systems Dynamics and Protection
ELEC 5813-3  Energy Systems Planning
ELEC 5xxx-3  Power System Operation and Control
ELEC 5164-3  Electric Drive System
ELEC 5710-3  Advanced Electric Drive Systems
ELEC 5725-3  Advanced Electric Machinery
ELEC 5020-3  Practical Electric Drive Systems
ELEC 5808-3  Renewable Energy Systems
ELEC 5xxx-3  Special Topics in Energy and Power Systems

Selected Math Courses

ELEC 5210-3  Optimization Methods in Engineering
ELEC 5220-3  Methods of Engineering Analysis
ELEC 5230-3  Advanced Linear Systems

Remark: The EE department occasionally offers special topics courses, numbered EE58xx, which may count towards the satisfaction of the M.S.E.E.major/minor area requirements, as advised by the candidate’s major advisor.
IV. MSEE and MEEngr FACULTY ADVISORS and AREAS OF SPECIALTY

Atkinson, Brian, M.S. Electrical Engineering, University of Colorado Denver.  
System design methodology, microprocessor-based systems, electronic and digital system design, digital and embedded systems and their application to robotic systems.

Bialasiewicz, Jan, Ph.D. and D.Sc. Electrical Engineering, Silesian University of Technology, Poland.  

Connors, Daniel, Ph.D. Electrical and Computer Engineering, University of Illinois at Urbana-Champaign.  
Systems (computer architecture, embedded system design and fault tolerance), Software (programming languages, parallel processing, compilers), Scientific Computation (high performance computing).

Deng, Yiming (Jerry), Ph.D., Electrical Engineering, Michigan State University.  
Biomedical imaging and medical physics, applied electromagnetic and electromagnetic imaging, signal and image processing, mathematical modeling and simulation, pattern recognition and nondestructive evaluation.

Fardi, Hamid, Ph.D. Electrical Engineering, University of Colorado at Boulder.  
Solid State Electronics: device modeling, VLSI, measurements and characterization.

Golkowski, Mark, Ph.D. Electrical Engineering, Stanford University.  
Electromagnetic waves, interactions of fields and matter, plasma discharges, waves in plasmas, phenomena of the ionosphere and magnetosphere.

Grabbe, Robert, M.S. Electrical Engineering, University of Colorado Denver.  
System design methodology, microprocessor-based systems, real-time software design, digital and embedded systems and their application to robotic systems.

Lei, Tim C., Ph.D., Electrical Engineering, University of Michigan, Ann Arbor.  
Ultrafast and nonlinear optics, biophotonics, advanced spectroscopic and microscopic techniques for biomedical applications, disease diagnostics and treatments with optical techniques.

Mancilla-David, Fernando A., Ph.D. Electrical Engineering, University of Wisconsin Madison.  
Power system engineering, advanced power electronics.

Papantoni- Kazakos P. (Titsa), Ph.D. Electrical Engineering, University of Southern California.  

Park, Jae-Do, Ph.D., Electrical Engineering, Pennsylvania State University.  
Electric machine modeling and control, drive system design, energy conversion system applications.

Radenkovic, Miloje, Ph.D. Electrical Engineering, Belgrade University, Yugoslavia.  
Systems and Control Theory: robust control systems, stochastic control and system identification, adaptive systems in control and signal processing, control of large-scale systems, intelligent control.

V. OTHER GRADUATE FACULTY and AREAS OF SPECIALTY

Beaini, Joseph, M.S. Industrial and systems engineering, University of Memphis, TN.  
Doctoral coursework during M.S. tenure, North Carolina State University.  
M.S. Electrical Engineering, North Carolina State University, Raleigh, N.C.  
Communication, signal processing.
Fermelia, Al, Ph.D. Mechanical Engineering, University of Missouri-Rolla.  
Attitude control, advanced systems engineering

Geissinger, Gary, M.S. Electrical Engineering, University of Colorado at Denver; Chief Electrical Engineering, DigitalGlobe (EarthWatch, Inc.), Longmont, Colorado.  
Digital systems, hardware-software interface, satellite communications systems.

Johnk, Carl T.A., Ph.D. Electrical Engineering, University of Illinois Urbana.  
Electromagnetic fields and waves.

Malmedal, Keith, Ph.D., P.E., Colorado School of Mines, Engineering Systems, M.S. University of Colorado Denver, Civil Engineering; President and Chief Engineering, NEI Engineering. Commercial and industrial power distribution design at low and medium voltages, renewable energy design and integration, short circuit studies, harmonic studies, protection design, commercial lighting design, and fire alarm system design.

Oh, Hyungseon, Ph.D., Electrical and Computer Engineering, Cornell University, New York.  
Electric power systems planning and design, economic impact analysis of renewable energy.

Electric power engineering.


Shen, Tzung-Sz, Ph.D. Mechanical Engineering, Ohio State University Columbus.  
Control system analysis, servo-mechanical systems.

Solomonow, Moshe, Ph.D., University of California Los Angeles,  
Engineering Systems and Neurosciences. Biomedical engineering.