

MICHIGAN STATE UNIVERSITY

October 22, 2010

MEMORANDUM

TO: Dr. Douglas Estry, Associate Provost for Undergraduate Education
and Dean of Undergraduate Studies

FROM: Dr. Linda O. Stanford, Associate Provost for Academic Services

RE: Request for a New Linked Bachelor of Science Degree in Computer
Engineering and Master of Science Degree in Electrical Engineering

For Transmittal to the University Committee on Academic Policy
(UCAP)

The request referenced above is being sent to the University Committee on Academic Policy (UCAP) in accordance with the *Bylaws for Academic Governance*, 4.4.

UCAP Response Requested:

Please ask the UCAP to consider the request referenced above and provide consultative commentary. Please mail the related materials referenced under the heading Attachments at the end of this memorandum to the UCAP members.

After receiving UCAP's consultative response, the Provost will make a determination to forward or not to forward the request to the University Committee on Curriculum for its approval of curriculum and degree requirements.

If you have any questions, please call Joy Speas, University Curriculum Administrator, at 5-8420.

Thank you.

Attachments:

1. Request to Establish a New Academic Program form dated October 14, 2010: Linked Bachelor of Science Degree in Computer Engineering and Master of Science Degree in Electrical Engineering and attachments.



University Curriculum and Catalog

176 Administration Bldg.
East Lansing, MI
48824-1046

517-355-8420
Fax: 517-353-1935

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COLLEGE OF ENGINEERING

1. Request to establish a Linked **Bachelor of Science Degree in Computer Engineering** and **Master of Science Degree in Electrical Engineering** in the Department of Electrical and Computer Engineering. The University Committee on Academic Policy (UCAP) will consider this request at its November 18, 2010 meeting. The University Graduate Council (UGC) will consider this request at its November 8, 2010 meeting.

Per University policy:

A candidate for a Linked Bachelor's-Master's Degree from Michigan State University may request the application of up to 9 credits toward the master's program for qualifying 400-level and above course work taken at the undergraduate level at Michigan State University or an external accredited institution. The number of approved credits, not to exceed 9, are applied toward the credit requirement of the master's degree. Credits applied to the Linked Bachelor's-Master's Program are not eligible to be applied to any other graduate degree program.

- a. Add the following statement to the Department of Electrical and Computer Engineering:

LINKED BACHELOR'S-MASTER'S DEGREE IN ELECTRICAL ENGINEERING
Bachelor of Science Degree in Computer Engineering
Master of Science Degree in Electrical Engineering

The department welcomes applications from Michigan State University Computer Engineering undergraduate students in their junior and senior year. Admission applications must be made during the prior spring semester for an anticipated spring graduation or the prior fall semester for an anticipated fall graduation to allow admission before the final semester as a Computer Engineering undergraduate. Admission to the program requires a minimum undergraduate grade-point average of 3.5 and an approved program of study for the Master of Science degree in Electrical Engineering at the time of admission. Admission to the Linked Bachelor's-Master's program allows the application of up to 9 credits toward the master's program for qualifying 400-level and above course work taken at the undergraduate level at Michigan State University or an external accredited institution. The number of approved credits, not to exceed 9, are applied toward the credit requirement of the master's degree. Credits applied to the Linked Bachelor's-Master's program are not eligible to be applied to any other graduate degree program.

Effective Summer 2011.

View a Program		Main Menu
Joy Speas, RO	Thursday, 10/14/2010	
Program Name: Computer Engineering Linked BS/MS Program Degree: LINK Sequence Number: 1	Program Request ID: 1828	
Effective Dates: Spring 2011 - Open Status: Interim Initial Action: New		
Requested Date: 9/29/2010 12:06:47 PM		
1. Department/School/College:		
16250 Department of Electrical and Computer Engineering		
2. Name of Program:		
Computer Engineering <i>and Electrical Engineering</i> Linked BS/MS Program		
3. Name of Degree:		
LINK		
4. Type of Program:		
Major		
5. Effective Start Semester:		
Spring 2011		
6. Target student audience for the program:		
Computer Engineering Undergraduates w/high graduate student potential		
7. Enrollment:		
What is the expected enrollment per year: 20		
What is the minimum enrollment acceptable: 10		
8. Source of budget for the program:		
To align academic planning and curricular change, ALL requests for NEW funds must be included in the College's annual planning letter. Provost approval of new funds and the effective date for the new program must align. If funding is not approved, then the program request will not be forwarded to Academic Council.		
Internal reallocation		
If new funds, was this request included in the College's annual planning letter? Indicate yes or no. If no, then this is a department or college fund reallocation (If the program is implemented, no additional resources are required.).		
9. Projected Costs as compared to other programs in unit:		
Lower		
10. Staff requirement:		
How many additional staff will be required: 0		
Who will provide the primary instruction. Describe any external linkages(industry, government, etc.):		

Four other big 10 schools including the University of Michigan have this program.

11. Will additional equipment be required:

Approximate cost: 0

Source of funding:

12. Will additional library materials be required:

Approximate cost: 0

Source of funding: Students will be able to use current library materials in Engineering Library

13. Will additional space be required:

Type:

Approximate amount:

14. If the program requirements contain a named concentration, do you wish for the concentration to be noted on the student's transcript?:

No

15. Detailed Description:

Catalog Changes for

Proposed

Computer Engineering

Linked BS/MS Program

Department of Electrical and Computer Engineering

ELECTRICAL ENGINEERING

Master of Science

In addition to meeting the requirements of the University and of the College of Engineering, students must meet the requirements specified below.

Admission

(Paragraph remains unchanged)

Linked BS/MS Programs

The department welcomes applications from Michigan State University students in their junior and senior year. Admission application must be made at least 1 ½ semesters before graduation to allow admission before their final semester as Computer Engineering undergraduates. The program requires a minimum undergraduate GPA of 3.5 and an approved Master of Science Degree Program of Study at the time of admission. Admission to the Joint BS/MS Program allows nine (9) credits coursework to be counted towards both the BS and MS programs including at least one (1) Electrical & Computer Engineering course at the 800 level.

Requirement for the Master of

Science Degree in Electrical Engineering

(Paragraph remains unchanged)

16. Are there admissions requirements for this program?:

Grade or grade-point average requirements and if so in which course(s), portfolio requirement, audition, essay, etc. If there are not admission requirements other than those required by the University policy indicate "none".

None

DEPARTMENT LEVEL APPROVAL STATUS

Approved: Department of Electrical and Computer Engineering
9/29/2010 12:18:43 PM by Pauline VanDyke for Timothy Grotjohn, Chairperson

COLLEGE LEVEL APPROVAL STATUS

Approved: College of Engineering
10/14/2010 9:06:55 AM by Taylor Logan for Manoochehr Koochesfahani, Associate Dean

DEPARTMENT of ELECTRICAL and COMPUTER ENGINEERING

Timothy Grotjohn, Chairperson

UNDERGRADUATE PROGRAMS

COMPUTER ENGINEERING

Computer engineering is concerned with the organization and design of computers and computer systems. The study of computer hardware and software, and their integration and application, is emphasized. The undergraduate program in computer engineering integrates studies in mathematics, basic sciences, engineering sciences, and engineering design. The program is structured to establish analytical and design skills in areas such as computer architecture, digital logic design, analog and mixed-signal circuits, computer communication networks, digital computer control, integrated circuit engineering, software engineering, operating systems, data structures and algorithms, computer-aided engineering, and electronic design automation. Complementing these fundamentals, the program also provides opportunities for specialization in individually selected areas of interest.

The Bachelor of Science Degree program in Computer Engineering is accredited by the Engineering Accreditation Commission of ABET, 111 Market Place, Suite 1050, Baltimore, MD 21202-4012; telephone 1-410-347-7700.

Requirements for the Bachelor of Science Degree in Computer Engineering

- The University requirements for bachelor's degrees as described in the *Undergraduate Education* section of this catalog; 128 credits, including general elective credits, are required for the Bachelor of Science degree in Computer Engineering.

The University's Tier II writing requirement for the Computer Engineering major is met by completing Electrical and Computer Engineering 480. That course is referenced in item 3. b. below.

Students who are enrolled in the College of Engineering may complete the alternative track to Integrative Studies in Biological and Physical Sciences that is described in item 1. under the heading **Graduation Requirements for All Majors** in the College statement. Certain courses referenced in requirement 3. below may be used to satisfy the alternative track.

- The requirements of the College of Engineering for the Bachelor of Science degree. The credits earned in certain courses referenced in requirement 3. below may be counted toward College requirements as appropriate.

- The following requirements for the major:

	CREDITS
a. One of the following courses:	1
CEM 161 Chemistry Laboratory I	1
PHY 191 Physics Laboratory for Scientists, I	1
b. All of the following courses:	56
CSE 231 Introduction to Programming I	4
CSE 232 Introduction to Programming II	4
CSE 260 Discrete Structures in Computer Science	4
CSE 331 Algorithms and Data Structures	3
CSE 410 Operating Systems	3
ECE 201 Circuits and Systems I	3
ECE 202 Circuits and Systems II	3
ECE 203 Electric Circuits and Systems Laboratory	1
ECE 230 Digital Logic Fundamentals	3
ECE 280 Electrical Engineering Analysis	3
ECE 302 Electronic Circuits	3
ECE 303 Electronics Laboratory	1
ECE 331 Microprocessors and Digital Systems	4
ECE 390 Ethics, Professionalism and Contemporary Issues	1
ECE 480 Senior Design	4
c. Electives Complete 24 credits of electives as specified below. At least 18 credits must be from core and focus track electives combined. Ad-	

ditional credits to meet the 24 credit requirement may be taken from other courses listed below, any 400-level Computer Science and Engineering (CSE) or Electrical and Computer Engineering (ECE) courses, or by completing an approved 3 or 4 credit experiential, out-of-classroom education experience obtained through engineering cooperative education or independent study.

Core

At least 6 credits from the following:

CSE 420	Computer Architecture	3
CSE 422	Computer Networks	3
ECE 410	VLSI Design	4

Focus Track

At least 12 credits from the following:

Hardware

ECE 402	Applications of Analog Integrated Circuits	4
ECE 411	Electronic Design Automation	4
ECE 412	Introduction to Mixed-Signal Circuit Design	4

Software

CSE 335	Object-oriented Software Design	3
CSE 450	Translation of Programming Languages	3
CSE 471	Media Processing and Multimedia Computing	3
ECE 366	Introduction to Signal Processing	3

Recommended Electives

ECE 305	Electromagnetic Fields and Waves I	4
ECE 313	Control Systems	3
ECE 404	Radio Frequency Electronic Circuits	4
ECE 415	Computer Aided Manufacturing	3
ECE 416	Digital Control	3
ECE 457	Communication Systems	3
ECE 458	Communication Systems Laboratory	1
ECE 466	Digital Signal Processing and Filter Design	3
ECE 474	Principles of Electronics Devices	3

ELECTRICAL AND COMPUTER ENGINEERING

The Bachelor of Science degree in Electrical and Computer Engineering is offered only at the MSU Dubai instructional site. The program is designed to provide students with an opportunity to study electrical engineering and computer engineering including exploration of both hardware and software.

Requirements for the Bachelor of Science Degree in Electrical and Computer Engineering

- The University requirements for bachelor's degrees as described in the *Undergraduate Education* section of this catalog; 128 credits, including general elective credits, are required for the Bachelor of Science degree in Electrical and Computer Engineering.

The University's Tier II writing requirement for the Electrical and Computer Engineering major is met by completing Electrical and Computer Engineering 480. That course is referenced in item 3. b. below.

Students who are enrolled in the College of Engineering may complete the alternative track to Integrative Studies in Biological and Physical Sciences that is described in item 1. under the heading **Graduation Requirements for All Majors** in the College statement. Certain courses referenced in requirement 3. below may be used to satisfy the alternative track.

- The requirements of the College of Engineering for the Bachelor of Science degree. The credits earned in certain courses referenced in requirement 3. below may be counted toward College requirements as appropriate.
- The following requirements for the major:

a.	One of the following courses:	CREDITS	1
	CEM 161 Chemistry Laboratory I	1	
	PHY 191 Physics Laboratory for Scientists, I	1	
b.	All of the following courses:	43	
	CSE 232 Introduction to Programming II	4	
	CSE 260 Discrete Structures in Computer Science	4	
	CSE 331 Algorithms and Data Structures	3	
	ECE 201 Circuits and Systems I	3	
	ECE 202 Circuits and Systems II	3	
	ECE 203 Circuits and Systems Laboratory	1	
	ECE 230 Digital Logic Fundamentals	3	
	ECE 280 Electrical Engineering Analysis	3	
	ECE 302 Electronic Circuits	3	
	ECE 303 Electronics Laboratory	1	
	ECE 313 Control Systems	3	
	ECE 331 Microprocessors and Digital Systems	4	
	ECE 366 Introduction to Signal Processing	3	
	ECE 390 Ethics, Professionalism and Contemporary Issues	1	
	ECE 480 Senior Design	4	
c.	Complete a minimum of 21 credits from the following courses. Specific courses offered at the Dubai instructional site can be expected to be a subset of this list during an individual student's degree pursuit.		
	(1) At least one of the following laboratory courses:		
	ECE 402 Applications of Analog Integrated Circuits	4	
	ECE 404 Radio Frequency Electronic Circuits	4	
	ECE 410 VLSI Design	4	

- d. ECE 411 Electronic Design Automation 4
- ECE 412 Introduction to Mixed-Signal Integrated
 Circuits 4
- ECE 416 Digital Control 3
- ECE 458 Communication Systems Laboratory 1
- (2) At least one of the following courses:
 - CSE 335 Object-oriented Software Design 3
 - CSE 410 Operating Systems 3
 - CSE 420 Computer Architecture 3
 - CSE 450 Translation of Programming Languages 3
 - CSE 471 Media Processing and Multimedia Computing 3
- (3) At least one of the following courses:
 - ECE 305 Electromagnetic Fields and Waves I 4
 - ECE 320 Energy Conversion and Power Electronics 3
 - ECE 423 Power System Analysis 3
 - ECE 442 Introduction to Communication Networks 3
 - ECE 457 Communication Systems 3
 - ECE 466 Digital Signal Processing and Filter Design 3
 - ECE 474 Principles of Electronic Devices 3

Students may use registered 'out of classroom' experiences to substitute for credits in this requirement. Students who complete a total of three experiences documented by pre-approved Engineering 393 or Electrical and Computer Engineering 490 or 499 credits, may reduce this requirement to 18 credits. All substitutions must be approved by the student's academic advisor.

ELECTRICAL ENGINEERING

The program provides both required and elective studies in communications, computers, control systems, electromagnetics, electronics, materials processing, power, signals, solid state, and biomedical engineering. It places emphasis on the fundamentals of science and mathematics and their application to the solution of contemporary problems that are within the purview of professional electrical engineers. The program is designed to establish a sound scientific basis for continuous growth in professional competence.

The Bachelor of Science Degree program in Electrical Engineering is accredited by the Engineering Accreditation Commission of ABET, 111 Market Place, Suite 1050, Baltimore, MD 21202-4012; telephone 1-410-347-7700.

Requirements for the Bachelor of Science Degree in Electrical Engineering

1. The University requirements for bachelor's degrees as described in the *Undergraduate Education* section of this catalog; 128 credits, including general elective credits, are required for the Bachelor of Science degree in Electrical Engineering.
 The University's Tier II writing requirement for the Electrical Engineering major is met by completing Electrical and Computer Engineering 480. That course is referenced in item 3. b. below.
 Students who are enrolled in the College of Engineering may complete the alternative track to Integrative Studies in Biological and Physical Sciences that is described in item 1. under the heading **Graduation Requirements for All Majors** in the College statement. Certain courses referenced in requirement 3. below may be used to satisfy the alternative track.
2. The requirements of the College of Engineering for the Bachelor of Science degree.
 The credits earned in certain courses referenced in requirement 3. below may be counted toward College requirements as appropriate.
3. The following requirements for the major:

	CREDITS
a. One of the following courses:	1
CEM 161 Chemistry Laboratory I	1
PHY 191 Physics Laboratory for Scientists, I	1
b. All of the following courses:	42
CSE 251 Programming in C	1
ECE 201 Circuits and Systems I	3
ECE 202 Circuits and Systems II	3
ECE 203 Electric Circuits and Systems Laboratory	1
ECE 230 Digital Logic Fundamentals	3
ECE 280 Electrical Engineering Analysis	3
ECE 302 Electronic Circuits	3
ECE 303 Electronics Laboratory	1
ECE 305 Electromagnetic Fields and Waves I	4
ECE 313 Control Systems	3
ECE 320 Energy Conversion and Power Electronics	3
ECE 331 Microprocessors and Digital Systems	4
ECE 366 Introduction to Signal Processing	3
ECE 390 Ethics, Professionalism and Contemporary Issues	1
ECE 480 Senior Design	4
EGR 102 Introduction to Engineering Modeling	2
c. One of the following courses:	3
CE 221 Statics	3
ME 201 Thermodynamics	3

A minimum of six courses totaling a minimum of 18 credits, of 3 or 4 credits each, selected from at least four different areas. A laboratory course must be included. Students may substitute, for one of the six required courses, a 3 or 4 credit experiential education experience obtained in a minimum of three out-of-classroom experiences through engineering cooperative education or independent study. Students interested in the experiential education experience must contact the department for approval.

Electromagnetics	
ECE 405	Electromagnetic Fields and Waves II 4
ECE 407	Electromagnetic Compatibility 4
Power	
ECE 420	Machines and Power Laboratory 1
ECE 423	Power System Analysis 3
Integrated Circuits/VLSI	
ECE 402	Applications of Analog Integrated Circuits 4
ECE 404	Radio Frequency Electronic Circuits 4
ECE 410	VLSI Design 4
ECE 411	Electronic Design Automation 4
ECE 412	Introduction to Mixed-Signal Circuit Design 4
Solid-State Electronics/Electro-optics	
ECE 474	Principles of Electronic Devices 3
ECE 476	Electro-Optics 4
ECE 477	Microelectronic Fabrication 3
Communications/Signal Processing	
ECE 442	Introduction to Communication Networks 3
ECE 457	Communication Systems 3
ECE 458	Communication Systems Laboratory 1
ECE 466	Digital Signal Processing and Filter Design 3
Control/Robotics	
ECE 415	Computer Aided Manufacturing 3
ECE 416	Digital Control 3
Biomedical Engineering	
ECE 445	Biomedical Instrumentation 3
ECE 446	Biomedical Signal Processing 3
ECE 447	Introduction to Biomedical Imaging 3
ECE 448	Modeling and Analysis of Bioelectrical Systems 3

Biomedical Engineering Concentration

The department offers a concentration for students who plan to pursue graduate work in biomedical areas or seek employment in selected medical-related areas. The concentration is available to, but not required of, any student enrolled in the Bachelor of Science degree program in Electrical Engineering. Courses completed to satisfy requirement 3. above may also be used to satisfy the requirements of the concentration. The concentration will be noted on the student's transcript.

Biomedical Engineering

To earn a Bachelor of Science degree in Electrical Engineering with a biomedical engineering concentration, students must complete requirements 1., 2., and 3. above and the following:

- | | |
|--|---------|
| | CREDITS |
| 1. Complete 6 credits from the following courses: | |
| ANTR 350 Human Gross Anatomy and Structural Biology | 3 |
| BS 111 Cells and Molecules | 3 |
| PSL 250 Introductory Physiology | 4 |
| PSL 431 Human Physiology I | 3 |
| PSL 432 Human Physiology II | 3 |
| 2. Complete 6 credits from the following courses: | |
| ECE 445 Biomedical Instrumentation | 3 |
| ECE 446 Biomedical Signal Processing | 3 |
| ECE 447 Introduction to Biomedical Imaging | 3 |
| ECE 448 Modeling and Analysis of Bioelectrical Systems | 3 |
| 3. Complete 3 credits from the following courses: | |
| ME 494 Biofluid Mechanics and Heat Transfer | 3 |
| ME 495 Tissue Mechanics | 3 |
| MSE 425 Biomaterials and Biocompatibility | 3 |
| A 400-level listed above or other approved Electrical and Computer Engineering (ECE) courses with biomedical engineering content as approved by the student's advisor. The course used to fulfill this requirement may not be used to fulfill concentration requirement 1. or 2. | |

Insert (A)
 (B)

LINKED BACHELOR'S-MASTER'S DEGREE IN ELECTRICAL ENGINEERING

Bachelor of Science Degree in Electrical Engineering
Master of Science Degree in Electrical Engineering

The department welcomes applications from Michigan State University Electrical Engineering undergraduate students in their ju-

Insert

A

LINKED BACHELOR'S-MASTER'S DEGREE IN COMPUTER SCIENCE
Bachelor of Science Degree in Computer Engineering
Master of Science Degree in Computer Science

The department welcomes applications from Michigan State University Computer Engineering undergraduate students in their junior and senior year. Admission applications must be made during the prior spring semester for an anticipated spring graduation or the prior fall semester for an anticipated fall graduation to allow admission before the final semester as a Computer Engineering undergraduate. Admission to the program requires a minimum undergraduate grade-point average of 3.5 and an approved program of study for the Master of Science degree in Computer Science at the time of admission. Admission to the Linked Bachelor's-Master's program allows the application of up to 9 credits toward the master's program for qualifying 400-level and above course work taken at the undergraduate level at Michigan State University or an external accredited institution. The number of approved credits, not to exceed 9, are applied toward the credit requirement of the master's degree. Credits applied to the Linked Bachelor's-Master's program are not eligible to be applied to any other graduate degree program.

LINKED BACHELOR'S-MASTER'S DEGREE IN ELECTRICAL ENGINEERING
Bachelor of Science Degree in Computer Engineering
Master of Science Degree in Electrical Engineering

The department welcomes applications from Michigan State University Computer Engineering undergraduate students in their junior and senior year. Admission applications must be made during the prior spring semester for an anticipated spring graduation or the prior fall semester for an anticipated fall graduation to allow admission before the final semester as a Computer Engineering undergraduate. Admission to the program requires a minimum undergraduate grade-point average of 3.5 and an approved program of study for the Master of Science degree in Electrical Engineering at the time of admission. Admission to the Linked Bachelor's-Master's program allows the application of up to 9 credits toward the master's program for qualifying 400-level and above course work taken at the undergraduate level at Michigan State University or an external accredited institution. The number of approved credits, not to exceed 9, are applied toward the credit requirement of the master's degree. Credits applied to the Linked Bachelor's-Master's program are not eligible to be applied to any other graduate degree program.

nior and senior year. Admission applications must be made during the prior spring semester for an anticipated spring graduation or the prior Fall semester for an anticipated Fall graduation to allow admission before the final semester as a Electrical Engineering undergraduate. Admission to the program requires a minimum undergraduate grade-point average of 3.5 and an approved program of study for the Master of Science degree in Electrical Engineering at the time of admission. Admission to the Linked Bachelor's-Master's program allows the application of up to 9 credits toward the master's program for qualifying 400-level and above course work taken at the undergraduate level at Michigan State University or an external accredited institution. The number of approved credits, not to exceed 9, are applied toward the credit requirement of the master's degree. Credits applied to the Linked Bachelor's-Master's program are not eligible to be applied to any other graduate degree program.

GRADUATE STUDY

The Department of Electrical and Computer Engineering offers programs leading to the Master of Science and Doctor of Philosophy degrees. Graduate study in the department is organized into three groups: computer engineering including computer architecture, computer networks, and VLSI/microelectronics; electrosciences including electromagnetics and electronic materials and devices; and systems including control and robotics, biomedical engineering, power, and signal processing and communications. An interdisciplinary approach marks many of the research projects that faculty share with graduate students.

Master of Science

In addition to meeting the requirements of the university and of the College of Engineering, students must meet the requirements specified below.

Admission

Applicants for admission should possess a Bachelor of Science degree in electrical engineering or a related field such as physics, mathematics, or computer science, and should have a grade-point average that would indicate success in graduate study.

Students who are admitted without a Bachelor of Science degree in electrical engineering may be required to complete collateral courses.

International applicants are required to submit Graduate Record Examination General Test scores.

Requirements for the Master of Science Degree in Electrical Engineering

The student must complete a total of 30 credits under either Plan A (with thesis) or Plan B (without thesis) and meet the requirements specified below:

CREDITS

Requirements for Both Plan A and Plan B:

- Core Courses.** Complete a minimum of four Electrical and Computer Engineering courses at the 800 or 900-level totaling at least 12 credits. Two of the courses must be selected from the following:

ECE 813	Advanced VLSI Design	3
ECE 820	Advanced Computer Architecture	3
ECE 821	Advanced Power Electronics and Applications	3
ECE 826	Linear Control Systems	3
ECE 835	Advanced Electromagnetic Fields and Waves I	3
ECE 863	Analysis of Stochastic Systems	3
ECE 874	Physical Electronics	3

Electrical and Computer Engineering 801 cannot be used to fulfill this requirement
- Supporting Courses:** At least 6 credits in approved courses in areas such as mathematics, statistics, or physics.
- Seminar Requirement.** First-year graduate students are required to attend seven seminars from the graduate seminar series.

Doctor of Philosophy

Admission

International applicants are required to submit Graduate Record Examination General Test scores.

Requirements for the Doctor of Philosophy Degree in Electrical Engineering

In addition to meeting the requirements of the university and of the College of Engineering, students must meet the requirements specified by their guidance committees.

1. The doctoral program must include a minimum of 36 credits, in addition to 24 credits of Electrical and Computer Engineering 999.
2. No 800-900 level independent study credits taken beyond the bachelor's degree may be counted towards the doctoral degree.
3. A minimum of 3 credits must be taken outside of the College of Engineering in disciplinary areas such as mathematics, statistics, or physics.
4. All courses that are used to satisfy the requirements for the degree must have been completed under the numerical grading system.
5. Students may request up to 3 credits of master's thesis research be applied towards this requirement.

First year graduate students are required to attend seven seminars from the graduate seminar series.