INFORMATION ON GRADUATE PROGRAMS IN THE DEPARTMENT OF ELECTRICAL ENGINEERING AND COMPUTER ENGINEERING
(Revised June 2006)

ADMISSION
Admission to the graduate programs in the Department of Electrical and Computer Engineering (ECE) is based on an individual assessment of the applicant’s ability to successfully complete the program. Many factors, including undergraduate performance and relevant professional experience, enter into this assessment. Applicants who meet the minimum requirements, explained below, may still be denied admission if, in the opinion of the department’s Graduate Committee, such denial is in the best interest of the applicant and/or the departmental graduate program.

MASTER OF SCIENCE DEGREE ADMISSION CRITERIA
Applicants for either a Master of Science Degree in Electrical Engineering or a Master of Science Degree in Computer Engineering will be admitted on either a regular or qualified basis depending on their undergraduate grade point average (GPA) and background.

1. Regular M.S. admission requires a minimum 3.0 (C=2.0) GPA with undergraduate degree in Electrical and/or Computer Engineering from an ABET (Accreditation Board for Engineering and Technology) accredited program.
2. Qualified M.S. admission requires a GPA of at least 2.8 with an undergraduate degree in Electrical and/or Computer Engineering. Applicants are required to take certain ECE courses assigned by the Graduate Advisor and to pass these courses with a “B” grade or better. These courses will be specified on the “ADMISSION ACTION” and may increase the credit hour requirements. On successful completion of the conditional program, applicants are granted regular status in the M.S. program.
3. A student admitted to the regular M.S. program with any previous or current WSU financial support (GTA, GRA, and Rumble Fellow) must select the Plan A option, with eight-credit thesis.
4. An applicant with an undergraduate degree in Electrical and/or Computer Engineering from a non-ABET accredited university is required to submit other pertinent information including the results of the general test of Graduate Record Examination (GRE), publications, and/or inventions.

Non-ECE Undergraduate Majors
Qualified admission may be granted to an applicant who does not have an undergraduate degree in either Electrical or Computer Engineering but has an undergraduate degree from a regionally accredited institution in engineering, physics, chemistry, mathematics, or computer science and meets the equivalent of the above minimum standard. Students must take five prerequisite undergraduate courses as specified by the ECE Graduate Advisor before they are permitted to take graduate courses. The prerequisite courses cannot be taken by examination. Students must have a “B” grade or better in each of the five prerequisite courses. In some cases, prerequisite courses may be part of the program undertaken while holding Qualified Admission (this will be indicated on the “ADMISSION ACTION” and on the plan of work and will increase the credit hour requirements). The M.S. program of study along with prerequisites for these students must be approved by the ECE Graduate Committee.

Ph.D. ADMISSION CRITERIA
Applicants are admitted on a regular basis depending on their M.S. Degree GPA and background. Doctoral applicants must present higher entrance qualifications than those required for the M.S. Degree applicants. The same conditions relative to graduates from ABET-accredited institutions hold as specified for the M.S. program, furthermore:

1. Regular Ph.D. admission requires a 3.6 GPA or better with a Master of Science Degree in Electrical or Computer Engineering.
2. Post-master’s admission requires a 3.3 GPA or better with a Master of Science Degree in Electrical or Computer Engineering. Applicants are required to take four ECE courses assigned by the ECE Graduate Advisor with a 3.6 GPA or better and must not have any grades below B. On the successful completion of the post-master’s program, applicants may be granted regular admission to the Ph.D. program.
3. An applicant with a master’s degree from another field can be admitted on a regular basis if recommended and supervised by a Ph.D. advisor.
An applicant with a undergraduate degree in Electrical and/or Computer Engineering from a non-ABET accredited university is required to submit other pertinent information including the results of the general test of Graduate Record Examination (GRE), publications, and/or inventions.

CHANGE OF STATUS
A change of status from the M.S. to the Ph.D. program is normally allowed only if the applicant has completed 24 or 32 credit requirements of the M.S program. An exceptional undergraduate student may be admitted to the Ph.D. program if recommended and supervised by a Ph.D. advisor.

ECE COMBINED BS/MS ‘A GRADE’ (Accelerated Graduate Enrollment) PROGRAM
The requirements for admission to the A GRADE program are:
1. Completion of approximately 90 credit hours towards the undergraduate degree.
2. An overall GPA of at least 3.4 in engineering courses.
3. Not less than 3.6 GPA in courses completed in the department of specialization as computed by the rules of the Division of Engineering.

GRADUATE NON-DEGREE ADMISSION
A student entering the Graduate Division with objectives not related to the pursuit of graduate degree may request admission on a non-degree basis. An Application for Graduate Admission must be completed, but a major is not recorded. The student may register for any course for which he/she is prepared. Qualified graduate applicants may apply for the following categories:

1. PRE-MASTER’S: For students with an acceptable grade point average and an earned bachelor’s degree from an accredited institution. Applicants must submit an Application for Graduate Admission and request official transcripts be sent to the University Office for Graduate Admissions.
2. POST-MASTER’S: For students who hold an earned master’s degree. Students with a Wayne State master’s degree should contact the Engineering Graduate Office. Others must submit a graduate application and transcripts to the University Office for Graduate Admissions.
3. POST-DOCTORAL: For those holding an earned doctoral degree.

A maximum of nine credit hours is normally permitted in the above classifications. Beyond that, registration as a non-degree student requires approval of the College of Engineering Graduate Office. Not more than nine credits, subject to the approval of the graduate officer, may be applied at a later date toward the residence and credit-hour requirements for either the M.S. or Ph.D. degrees. If the student decides to seek admission to a graduate degree program, he/she should apply to the ECE Department for a change of status before completing nine credit hours.

INTERNATIONAL STUDENTS
Students from other countries desiring admission to the Graduate Division must contact the University Office for Graduate Admissions for material and deadline dates. To be considered for graduate admission, applicants must have completed an appropriate university-level program comparable in subject matter and credits to a program for which an undergraduate degree is awarded at Wayne State University. All graduate applicants MUST (1) present an acceptable scholastic record (see section on admission); (2) make financial arrangements which allow for approximately $18,000 per academic year for tuition, supplies, living expenses, and medical insurance; (3) have a score on the regular Test of English as a Foreign Language (TOEFL) of 550 to be able to study in classes conducted entirely in the English language.

The University Office of Graduate Admissions prefers results from the TOEFL. However, other standard examinations, which measure English proficiency, may be substituted if conditions prohibit taking the TOEFL. Examinations must be administered by qualified persons in American Consulates, USIS Offices, universities or international centers.

Applicants educated in countries where English is not the native language and who are now permanent residents or U.S. citizens can be tested in the Wayne State University English Language Institute. Procedures for such testing must be initiated through the University Office for Graduate Admissions.
FINANCIAL ASSISTANCE

Although financial assistance for graduate students is limited, the department currently awards approximately 20 Graduate Teaching Assistantships. Furthermore, research funding in the department allows individual professors to award Graduate Research Assistantships.

MASTER of SCIENCE DEGREE PROGRAMS

After receiving his/her credentials from the University Office of Graduate Admissions, and before registration, the student should contact the graduate advisor for details on program planning and to discuss course requirements and work. A preliminary plan of work must be prepared at this time in accordance with the master’s degree requirement work-sheet.

A master’s thesis may be elected by those students wishing to pursue independent research. An oral presentation must be delivered upon completion of a thesis.

Graduate Courses
Graduate work is classified either as course work, in which students meet as a group, or as research. A student registered for eight or more credits is considered full time.

Directed Study
Directed study may be authorized provided the area of interest for the study is an integral part of the student's graduate program and is not covered by courses available while completing the degree requirements. Normally, no credits of ECE 5990 and no credits of ECE 7990 are allowed in the master’s program without a thesis. Before a masters and Ph.D. students can register for directed study (or research), an outline of study must be prepared and approval of the advisor and departmental chair must be obtained. In addition, Ph.D. students must also obtain the permission of the Dean of the Graduate School.

English Proficiency
It is expected that all graduate students should be able to write at a level of English surpassing that of an undergraduate student. Therefore, all papers and examinations will be graded on the basis of content and use of the English language.

Grades and Probation
No less than a B average overall (3.0) is required for graduation. Also, a B average must be attained in all ECE courses attempted. A C grade in a core course must be repeated. No more than two courses repeats are allowed in the master’s program. A student is placed on probation if two C grades are received or if his/her GPA is below 3.0. A student placed on probation may enroll for the next eight credits to restore his/her cumulative GPA to at least a 3.0; failure to do so will result in immediate termination from the program. A grade below C may result in termination from the program.

Plan of Work
A Plan of Work must be completed, signed by the ECE Graduate Advisor; and placed in the student’s folder before eight credits have been accumulated, but before being permitted to register for additional courses. Approval of the Plan of Work advances a M.S. student from “applicant” status to that of “candidate”.

Candidacy
Candidacy is an advanced rank, which is recommended by the ECE Graduate Advisor and authorized by the Engineering Graduate Officer upon evidence of the applicant’s superior scholarship, appropriate personal qualities and promise of professional competence. The applicant must exercise primary responsibility for advancing to candidate. The student must have completed the specified prerequisites and have filed a Plan of Work. Approval of candidacy is a necessary but not sufficient requirement for a graduate degree.

MASTER of SCIENCE DEGREE REQUIREMENTS – TOTAL 32 CREDIT HOURS (MINIMUM)
NOTE: unless otherwise stated, the following courses are 4 credit hours (Cr.)

The Master of Science Degree in Electrical or Computer Engineering is offered under the following options:

Plan A: Thesis Option
- ECE 8999 – 8 Cr.
- Four courses in the major, at least one ECE 7000 level course – 16 Cr. (B- or better)
- Any ECE course and may include 4 Cr. of ECE 5990 (directed study) – 4 Cr.
- Any graduate course (except CSC 5050) from any engineering or science department at WSU or transferred from any ABET accredited institution with grade of B or better – 4 Cr.

Plan C: Course Work Option

- Five courses in major area, at least two ECE 7000 level courses – 20 Cr. (B- or better)
- One course must be from ECE mathematics course list – 4 Cr.
- Any ECE course (except ECE 5990) – 4 Cr.
- Any graduate course (except CSC 5050) from pre-approved engineering or science departments at WSU or transferred from any ABET accredited institution with grade of B or better – 4 Cr.

The department will permit repeating only one course. A student with a GPA below 3.0 must attain a 3.0 GPA within the next two semesters. Failure to do so will result in termination from the program. Overall 3.0 GPA in all graduate courses is required for WSU graduation. All university-supported students must follow Plan A.

**ECE Mathematics:** ECE 5020, 5040 and 7030

**Computer Systems & Applications**

7000/8000 level courses: ECE 7120, 7530, 7610, 7660, 7670, 7680, 7690, 7995, and 8120.
5000/6000 level courses: ECE 5120, 5610, 5620, 563(2), 5640, 5650, 5670, 5680, 5690, 6600, 6640, 6660

**Electrical Systems**

7000 level course: ECE 7030, 7100, 7120, 7160, 7420, 7430, 7440, 7450, 7460, 7480, 7680, 7690, 7700, 7850
5000/6000 level courses: ECE 5120, 5170, 5370, 5380, 5410, 5420, 5430, 5440, 5470, 5480(2), 5690, 5700, 5770, 5870, 6100, 6180, 6690

**Electrical Devices**

7000/8000 level course: ECE 7030, 7530, 7540, 7550, 7570, 7680, 7830, 7850, 8550, 8570(1)
5000/6000 level courses: ECE 5500, 5510(2), 5550, 5690, 5870, 6550, 6570, and 6660

**ECE AGRADE PROGRAM 32 CREDIT HOUR PLAN OF WORK**

Maximum of 16 credit hours out of the 136-credit BSEE requirement represent the AGRADE portion of the AGRADE undergraduate curriculum:

ECE 5001 (4 Cr.)*  Special AGRADE section- to replace one ECE 4000-level course
ECE 5002 (4 Cr.)*  Special AGRADE section – to replace another ECE 4000-level course.
8 Cr. Elective - Additional two 5000 or higher –level courses selected from the student’s chosen ECE M.S. core curriculum.
*Other 5000 level course may be used with advisor’s approval

Minimum 16 credit hours M.S graduate component in addition to 136 credit BSEE requirement.

8 Cr. - Two 7000-level ECE courses selected from the student chosen M.S ECE core curriculum.
12 Cr. - Two 5000-level or higher ECE courses selected in consultation and with the approval of the AGRADE Advisor.

**STUDENT ADVISING**

Each graduate student enrolled in ECE will have a faculty advisor. New students should meet with the ECE Graduate Advisor to choose their faculty advisor. Each faculty member has posted office hours. A student’s faculty advisor will generally be the only faculty member signing registration forms, plans of work etc. Students should be prepared to complete all paper work for the next semester in a timely manner.

**Core Advisors**

Biomedical: Dr. Robert Erlandson
Computer:                                          Dr. Mohamad Hassoun, Dr. Syed Mahmud, Dr. N Sarhan, Dr. Harpreet Singh, Dr. Pepe Siy, and Dr. Cheng-Zhong Xu.
Communication and Circuits:            Dr. Mohamad Hassoun, Dr. Q. Cheng, Dr. Le Yi Wang, and Dr. Yang Zhao
Control and Power Systems:             Dr. Feng Lin, Dr. Le Yi Wang, and Dr. Hao Ying
Solid State Devices:                           Dr. Gregory Auner, Dr. Choi, Dr. James Woodyard, and Dr. Y. Xu
Optical Engineering:                           Dr. Ivan Avrutsky, Dr. Mohamad Hassoun, and Dr. Yang Zhao

DOCTORAL OF PHILOSOPHY

The general purpose of the Ph.D. program is to provide an educational experience which will enable graduates to develop new knowledge in the field of engineering. Thus, research training is an important component of each student’s program. The faculty recognize that for engineering research to be relevant to the solution of problems encountered by those engaged in professional practices, a broad background in the profession is essential. An acceptable level of competence in each of the major areas of the discipline is a requirement of the program.

It is important for students entering the Ph.D. program to become familiar with the research interests of the entire faculty as soon as possible. This allows a better match between student and faculty advisor in terms of selecting a research area and appropriate research assistantships and fellowships, particularly for sponsored research programs.

Credit-Hour Requirements
A minimum total of 90 credits beyond the bachelor’s degree is required, including at least 30 credits of 7000-8000 level courses and 30 credits of dissertation credit. At least 30 credits must be elected at Wayne State University. At the discretion of the advisor, up to 30 credits may be transferred from a master's program. At least one minor composed of eight or more credits must be elected from another core area or department, but in a related field.

Directed Study
Twelve credits of ECE7990 are normally allowed in the Ph.D. program. The student must complete the proper forms before registering for directed study or research. The forms require an outline of the study and approval of the advisor, departmental chair, Engineering College Graduate Officer, and Dean of the Graduate School.

Plan of Work
A Doctor of Philosophy Plan of Work that is approved by the faculty advisor and ECE Graduate Advisor should be submitted to the Graduate School for approval before completing forty credits including the master's degree work. Any subsequent changes in the Plan of Work must be approved by the advisor and submitted to the Graduate School for approval.

Areas of Research
Bioengineering and Bio electromagnetics Neural Networks (Soft Computing)
Computer Engineering Optical Engineering
Control Theory Power Systems
Information and Communication Theory Software Engineering
Networks and Computer-Aided Design Solid State Devices
Parallel and Distributed Systems Smart Sensors and VLSI

FACULTY SPECIALIZATIONS
Gregory Auner (313-577-3904; e-mail: gauner@eng.wayne.edu) is interested in wide band gap semiconductors, graded pyroelectric materials, magnetic materials for sensors and device development, smart sensors.
Ivan Avrutsky (313-577-4801; e-mail: avrutsky@ece.eng.wayne.edu) is interested in opto-electronics, theory and technology of optical waveguides and gratings, fiber and integrated optics, optics of nanostructures, semiconductor lasers.
Qiang Cheng (313-577-3530; e-mail: qcheng@ece.eng.wayne.edu) is interested in signal processing, multimedia, communications, and statistical learning.
Jaewu Choi (313-577-3990; e-mail: jchoi@eng.wayne.edu) studies nano-technology and molecular electronics.
Robert Erlandson (313-577-3990; e-mail: rerlands@eng.wayne.edu) works on systems methodologies suitable for analysis and evaluation of large complex systems, particularly physiological structures; development of decision-making methodologies utilizing multi-valued logic and nonparametric techniques.  
Mohamad Hassoun (313-577-3966; e-mail: hassoun@brain.eng.wayne.edu) research interest includes artificial neural systems; associative memories; machine learning; pattern recognition; application of artificial neural networks to physiological signal processing, optimization, and control.  
Feng Lin (313-577-3428; e-mail: flin@eng.wayne.edu) has a background in systems and control, hierarchical structure of discrete event systems, decision analysis for complex processes, control and optimization of flexible manufacturing systems.  
Syed M. Mahmud (313-577-3855; e-mail: smahmud@eng.wayne.edu) has been working in the area of microprocessor-based systems design, digital system design, special purpose computer architectures, cache-based multiprocessor system design and performance analysis.  
Nabil J. Sarhan (313-577-7526, e-mail: nabil@ece.eng.wayne.edu) is interested in multimedia systems, multimedia networking, storage subsystems, multiprocessor systems, computer architecture, performance evaluation.  
Donald Silversmith (313-577-0248; e-mail: silversm@ece.eng.wayne.edu) is interested in microelectromechanical system design and fabrication technology, solid-state and micro-system device design, integrated circuit fabrication technology, VLSI design.  
Harpreet Singh (313-577-3917; e-mail: hsingh@eng.wayne.edu) is involved in problems of state-variables and system theoretic and Petri New approach to computer hardware and software, vehicle guidance, software engineering, expert systems, VLSI design.  
Pepe Siy (Graduate Advisor 313-577-3841; e-mail: psiy@ece.eng.wayne.edu) is interested in pattern recognition, image processing, parallel discrete computational problems, analog and digital VLSI, smart sensor technology.  
Le Yi Wang (313-577-4715; e-mail: lywang@eng.wayne.edu) research interests concentrate on H-infinity optimization, stabilization of time-varying systems, frequency-domain systems identification hybrid control systems, automotive control systems, nonlinear and adaptive control.  
James Woodyard (313-577-3758; e-mail: woodyard@eng.wayne.edu) works on ion beam analysis and modification of thin-film devices and device materials; hydrogenation, dehydrogenation, and radiation resistance of amorphous semiconductor materials; optical and electrical characterization of device materials and device fabrication.  
Chengzhong Xu (313-577-3856; e-mail: czxu@eng.wayne.edu) is interested in parallel computing, particularly run-time and operating system support for irregularly structured applications; distributed shared memory systems; multiprocessor server technologies.  
Yong Xu (313-577-3850; e-mail: yxu@ece.eng.wayne.edu) works on MEMS sensors (flow sensors, pressure sensors, inertial sensors, tactile sensors, etc), MEMS flexible skin technology, intelligent textile technology, and micro/nanofluidics.  
Hao Ying (313-577-3738; e-mail: hying@ece.eng.wayne.edu) research interest includes fuzzy control and systems, control, modeling, expert systems, image/single processing, neural networks, and ultrasonics, all with biomedical applications.  
Yang Zhao (313-577-3404; e-mail: yzhao@eng.wayne.edu) research interests relate to optics, in particular nonlinear optical devices for communications, novel optical materials, optical sensing, lasers.
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<td>ECE 9997</td>
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**OTHER**

Course descriptions, etc. may be found in the *Graduate Bulletin* of the University.

**Telephone Contacts**

- **Electrical & Computer Engineering Office**
  Room 3100, Engineering Building
  5050 Anthony Wayne Drive (corner of W. Warren)
  Tel. (313) 577-3920

- **English Language Institute (ELI)**
  351 Manoogian Hall
  Tel. (313) 577-2729

- **Office of International Students and Scholars (OISS)**
  42 W. Warren, 416 Welcome Center
  Detroit, MI 48202
  Tel. (313) 577-3422;
  Fax (313) 577-2962

- **University Graduate Admissions Office**

- **Office of University Admissions**
  Welcome Center, 42 W. Warren Avenue, PO Box 2759,
  Detroit MI 48202
  Telephone: 313-577-3577; Fax: 313-577-3376
  Web: [http://www.admissions.wayne.edu](http://www.admissions.wayne.edu)

- **College of Engineering Home Page:**
  [http://www.eng.wayne.edu/](http://www.eng.wayne.edu/)

- **ECE Home Page**
  [http://www.ece.eng.wayne.edu/](http://www.ece.eng.wayne.edu/)

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