

# **Portland State University**

## **Department of Electrical and Computer Engineering**



## **Graduate Certificate of Specialization Handbook**

# OVERVIEW OF THE GRADUATE CERTIFICATE

The certificate programs are intended primarily to provide enrichment for professional engineers and scientists who may not initially wish to pursue a more extended M.Eng., M.S., or Ph.D. degree program. A Graduate Certificate of Specialization is awarded for successful completion of an approved course sequence relating to a specific area of Electrical and Computer Engineering. The courses within a sequence include a substantial body of knowledge at the graduate-level. Courses completed for a Graduate Certificate of Specialization may subsequently be applied towards a master's or doctoral degree if, and only if, a student is admitted and completes a graduate certificate program prior to formal admission to a degree seeking program (i.e. M.Eng., M.S., or Ph.D.).

For additional information, please see <http://www.ece.pdx.edu> or write to or call:

Graduate Program  
Electrical and Computer Engineering Department  
Portland State University  
PO Box 751  
Portland Oregon 97207-0751

Telephone (503) 725-3002

E-mail address: [graduate.program@ece.pdx.edu](mailto:graduate.program@ece.pdx.edu)

## II. Admission

### Admission Requirements

Admission requirements for our certificate programs are the same as for our Master of Engineering (M.Eng.) program. Applicants who have completed a B.S. degree in either electrical or computer engineering at a recognized university (PSU Admissions Office maintains a list of recognized universities) with a grade point average of 3.00 or better in all junior and senior level technical courses may be considered for regular admission to the Department of Electrical and Computer Engineering's Graduate Certificate program. Applicants who have completed a B.S. degree in a related field (for example: mathematics, physics, computer science, or mechanical engineering, etc.) or B.S. ECE candidates with a grade point average in their upper-division technical coursework below 3.00 but higher than 2.75 may be granted conditional admission status. An applicant conditionally admitted to a certificate program must achieve a grade of B or better in the first eight graduate of courses applicable to the certificate and may also be required to complete prerequisite courses if appropriate educational background in the field is lacking. If either of the above conditions is not achieved, then the student will be dropped from the certificate program.

Admission is possible in any quarter of the year except the summer quarter. Most course sequences begin in the fall or winter quarters so students who start in the spring quarter may not find suitable courses for their study plans.

### Application Procedure

Applications to ECE Graduate Programs are handled jointly by the University's Office of Admissions and the ECE Department office. Review "Degree Programs: Graduate" at <http://www.ece.pdx.edu> for details.

### **III. Certificate Requirements**

The total number of graduate level credits in a student's program must be at least 15, and some ECE certificates may require more than 15 credits or have additional requirements. Each student is assigned a faculty advisor who will assist the student in selecting courses. The student's program must be approved by his/her faculty adviser. Certificates offered are in the following areas:

#### **Analog and Microwave Circuit Design**

Specific requirements for the Graduate Certificate in Analog and Microwave Circuit Design include the successful completion of four courses from the following list:

ECE521	Analog Integrated Circuit Design I
ECE522	Analog Integrated Circuit Design II
ECE523	Analog Integrated Circuit Design III
ECE531	Microwave Circuit Design I
ECE532	Microwave Circuit Design II

#### **Communication Systems**

Specific requirements for the certificate in Communication Systems include the successful completion of the following courses:

ECE 561	Communications Systems Design I
ECE 562	Communications Systems Design II

The student must also complete one course from the following list:

ECE 518	Linear System Analysis I
ECE 567	Statistical Communications Theory

The student must take at least three additional credits in related areas.

#### **Computer Architecture and Design**

The Certificate in Computer Architecture and Design requires completion of the following four classes. The prerequisite for this sequence is successful completion of the ECE 371 Microprocessors class or equivalent background.

ECE 585	Microprocessor System Design
ECE 586	Computer Architecture
ECE 587	Advanced Computer Architecture I
ECE 588	Advanced Computer Architecture II

A student considering this sequence might audit the ECE 371 class to prepare for the Certificate sequence.

#### **Design Automation**

Specific requirements for the certificate in Design Automation include successful completion of three courses from the following list:

ECE 527	High Performance Digital Systems
ECE 528	Layout Techniques
ECE 529	Performance-Driven Layout
ECE 572	Advanced Logic Synthesis
ECE 573	Control Unit Design
ECE 574	High Level Synthesis and Design Automation

The student must take at least three additional credits in related areas.

## **Digital Design**

Specific requirements for the certificate in Digital Design include successful completion of three courses from the following list:

ECE 573	Control Unit Design
ECE 574	High Level Synthesis and Design Automation
ECE 525	Digital Integrated Circuit Design I
ECE 526	Digital Integrated Circuit Design II

The student must take at least three additional credits in related areas.

## **Digital Signal Processing**

Specific requirements for the certificate in Digital Signal Processing include the successful completion of the following courses:

ECE 565	Signals and Noise
ECE 566	Digital Signal Processing
ECE 567	Statistical Communications Theory

The student must take at least three additional credits in related areas.

## **Energy Systems**

- The following two courses are required (8 credits):
  - ECE 541 Transmission Operation and Control (4 credits)
  - ECE 542 Generation Operation and Control (4 credits)
- Two elective (8 credits) must be selected from the following list:
  - ECE 547 Energy Economic Systems (4 credits)
  - ECE 548 Power System Protection (4 credits)
  - ECE 641 Power System Planning (4 credits)
  - ECE 642 Energy Systems Capital Budgeting (4 credits)
  - ECE 643 Sustainable Energy Systems (4 credits)
  
  - ECE 555 AI: Neural Networks I (4 credits)
  - ECE 556 AI: Neural Networks II (4 credits)
  - ECE 559/659 Genetic Algorithms (4 credits)
  
  - ETM 530/630 Decision Making (4 credits)
  - ETM 535/635 Advanced Engineering Economics (4 credits)
  - ETM 540/640 Operations Research (4 credits)
  - ETM 554/654 Expert Systems in Engineering (4 credits)
  - ETM 565/665 Research Methods for Engineering and Technology Management (4 credits)

All elective courses must be approved by the Program Director. Preferences should be given to the energy-related courses listed above (ECE 547, ECE 548, ECE 641, ECE 642, ECE 643). Similar discrete-numbered courses may be substituted for these electives but only with the advance approval of the Program Director.

## **Image Processing**

Specific requirements for the certificate in Image Processing include the successful completion of the following courses:

ECE 568	Introductory Image Processing
ECE 569	Advanced Image Processing
ECE 570	Computer Vision

The student must take at least three additional credits in related areas.

### **Integrated Circuit Test, Verification, and Validation**

Specific requirements for the certificate in Integrated Circuit Test, Verification, and Validation include the successful completion of three courses from the following list:

ECE 525	Digital Integrated Circuit Design I
ECE 526	Digital Integrated Circuit Design II
ECE 527	High Performance Digital Systems
ECE 572	Advanced Logic Synthesis

The student must also take at least three additional credits in related areas such as the following:

ME 588	Design of Industrial Experiments
Stat 566	Experimental Design: Theory and Methods

## **IV. Length of Program**

**Intended time to complete:** If taking one four-credit course per term: 1.5 years

### **Cost of Program (Academic Year 11-12)**

Cost of one four-credit course:	Fees: \$190 Oregon Resident Tuition- \$1690 Non-Oregon Resident Tuition - \$2458
Books & supplies:	\$200+ per course
Other required fees:	\$50 one-time matriculation fee
Total estimated cost:	\$8370 Oregon Resident \$11392 Non-Oregon Resident

**Estimated room & board for one year:**  
\$10,368

**Job placement rate:**  
Program intended for working engineers

## **V. Contact Information**

<b>Admissions and Records Office:</b> Neuberger Hall Lobby (NH) Domestic: <a href="mailto:admissions@pdx.edu">admissions@pdx.edu</a> International: <a href="mailto:intladm@pdx.edu">intladm@pdx.edu</a>	<b>503.725.3511</b>  <a href="http://www.pdx.edu/admissions/graduate.html">www.pdx.edu/admissions/graduate.html</a>
<b>Electrical and Computer Engineering Office:</b> Fourth Avenue Building, Suite 160 (FAB 160) <a href="mailto:graduate.program@ece.pdx.edu">graduate.program@ece.pdx.edu</a>	<b>503.725.3002</b>  <a href="http://www.ece.pdx.edu">www.ece.pdx.edu</a>
<b>Financial Aid Office:</b> Neuberger Hall Lobby (NH) <a href="mailto:askfa@pdx.edu">askfa@pdx.edu</a>	<b>503.725.3461</b>  <a href="http://www.pdx.edu/finaid">www.pdx.edu/finaid</a>
<b>Office of Graduate Studies &amp; Research:</b>	<b>503.725.8410</b>

Cramer Hall, Room 117 (CH 117)  
grad@pdx.edu

[www.gsr.pdx.edu](http://www.gsr.pdx.edu)

**International Student & Faculty Services:**  
East Hall, Room 101 (EH 101)

[www.intl.pdx.edu](http://www.intl.pdx.edu)

**503.725.4094**