

**HANDBOOK FOR  
ELECTRICAL AND COMPUTER  
ENGINEERING STUDENTS  
UNDERGRADUATE PROGRAM**

**DEPARTMENT OF ELECTRICAL AND  
COMPUTER ENGINEERING  
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## **ELECTRICAL AND COMPUTER ENGINEERING HANDBOOK**

This handbook has been designed to help you earn a Bachelor of Science Degree in Electrical and/or Computer Engineering at Old Dominion University. The handbook complements the ODU catalog by providing further details about the undergraduate electrical and computer engineering program. The handbook is revised periodically as the undergraduate program and departmental policies change. Comments and suggestions that will improve the handbook are welcome. Please contact:

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*It is the responsibility of the individual student to be familiar with the information contained in the University Catalog. With respect to official university policy and regulations, the University Catalog takes precedence over any information contained in this handbook.*

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## INTRODUCTION

Welcome to the Department of Electrical and Computer Engineering. Congratulations on choosing electrical or computer engineering as your major area. We are confident that there will be exciting and challenging opportunities lying ahead for you. Of course, it does require hard work and dedication on your part. We have designed this handbook especially to aid you in your pursuit of the Bachelor of Science in Electrical Engineering or the Bachelor of Science in Computer Engineering degree. It is intended **only to complement** the information provided in the University Catalog. You must be aware that *students are held individually responsible for knowing the information contained in the University Catalog.*

Included in this handbook is information concerning university and departmental curricula requirements as well as departmental policies and procedures. Please keep this handbook as a source of information during your studies at Old Dominion University. We wish you the best in your pursuit of the degree.

## MISSION STATEMENT

The Department of Electrical and Computer Engineering at Old Dominion University is a partnership among students, faculty and staff in **S**ervice to the profession of **E**lectrical and computer engineering through academic excellence, **R**esearch and real-world experiences, dedicated to a **V**ision of the future that includes **I**ndustry and community, **C**ontinuous improvement, and personal **E**nrichment and growth (**SERVICE**).

## ELECTRICAL AND COMPUTER ENGINEERING AT ODU

The Department of Electrical and Computer Engineering (ECE) offers a four-year baccalaureate program in electrical engineering and a four-year baccalaureate program in computer engineering. Both programs are accredited by the Accreditation Board for Engineering and Technology (ABET).

The electrical engineering program provides a solid foundation in circuits, linear systems, electronics, electromagnetics, digital systems, and microelectronics. Elective freedom allows specialization in areas such as controls, communications, physical electronics, signal processing, and computers.

The computer engineering program is jointly offered with the Department of Computer Science. This program is designed to provide a broad engineering background and a comprehensive foundation in the technical principles underlying the computer area. The technical core consists of course work from electrical engineering to address hardware aspects of computer engineering, and course work from computer science to address software aspects.

Upon graduation, electrical engineers and computer engineers find employment in a wide spectrum of activities covering various fields. These include controls, image processing, communications, networks, computers, VLSI design, semiconductor and solid-state devices, physical electronics, lasers, and optics. There are many different job functions associated with these technical areas. Electrical engineers and computer

engineers are employed in systems analysis and design, engineering design and development, applications design and technical sales, production and manufacturing, field service and user training, management, and many other job titles.

## **OUTCOMES AND OBJECTIVES**

### **ECE Department Program Assessments**

Beginning in 2000, the Accreditation Board for Engineering and Technology (ABET) changed the “rules” for accreditation of engineering programs. Prior to 2000, ABET specified a detailed list of curricular requirements for each engineering program and a very large part of accreditation involved the demonstration that these curricular requirements were being met. With the “ABET 2000” criterion, as the new guidelines are referred to, programs have somewhat more flexibility to define curricular content. However, ABET does require that each program define a set of objectives and outcomes, and continually assess how well the objectives and outcomes are met, and then make adjustments as needed so that the objectives and outcomes are better met. As defined by ABET, objectives are meant to be longer-term goals, typically in terms of general characteristics graduates are expected to have several years after graduation. Outcomes are desirable abilities that graduating seniors should have. In line with this thinking, the faculty in ECE (with input from students and industry) has determined a set of outcomes and objectives for both the BSEE degree and the BSCOME degree. These outcomes and objectives are listed on the next two pages. Additionally, these program objectives are posted on the Department’s web site. A link to them can be found at: <http://www.eng.odu.edu/ece/academics/undergrad/objectives.shtml>

We ask that each student read these pages, and provide feedback to us in two ways. First, we will ask each student to fill out a course evaluation at the end of each semester, which will include a brief questionnaire about how the various outcomes are met in that course. We ask you to take these evaluations seriously and really tell us your opinion about how each course meets the various outcomes. Your input is critical. Secondly, if you believe that any of these outcomes or objectives should be modified, deleted or added to, please let us know, by either talking with our department chair, Dr. Vishnu Lakdawala, or emailing him ([vlakdawa@odu.edu](mailto:vlakdawa@odu.edu)) with detailed notes. One of the components of assessment is to review our objectives and outcomes and modify them as needed.

Aside from ABET requirements, the ECE department is committed to a quality undergraduate program, and we really want to do our best to continually improve. This can only happen if all of us-- students, faculty, and staff-- cooperate in constructive and open ways. Please feel free at any time to meet with your advisor, or the chief departmental advisor (Dr. Vishnu Lakdawala), or the department chair (Dr. Shirshak Dhali) to give us suggestions for improvement. We may not be able to directly address your concerns, but we assure you they will be given due consideration. If we are alerted to a problem that is common to many students, then we will do our best to take corrective actions.

## Electrical Engineering Undergraduate Program

### Program Objectives

The objectives of the electrical engineering program are:

- To provide fundamental electrical engineering knowledge to our graduates for continued study in graduate school and for pursuing successful professional careers in industry or government.
- To provide necessary skills to our graduates for organizing, communicating and presenting their ideas effectively in English.
- To prepare our graduates to understand and appreciate issues arising in professional practice including teamwork, leadership, safety, ethics, and professional organizations.
- To prepare our graduates to propose innovative solutions to problems and be well-positioned to take leadership positions in technical endeavors.

### Program Outcomes

Our electrical engineering graduates must attain:

1. an ability to apply knowledge of mathematics, science, and engineering.
2. an ability to design and conduct experiments, as well as to analyze and interpret data.
3. an ability to design an electrical system, component, or process to meet desired needs, considering all realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability and sustainability.
4. an ability to function on both intra-disciplinary and multi-disciplinary teams.
5. an ability to identify, formulate, and solve electrical engineering problems.
6. an understanding of professional and ethical responsibilities.
7. an ability to communicate technical ideas effectively in writing and speaking.
8. the broad education necessary to understand the impact of electrical engineering solutions in a global and societal context.
9. a recognition of the need for, and an ability to engage in life-long learning.
10. a knowledge of contemporary issues.
11. an ability to use the techniques, skills, and modern engineering tools necessary for electrical engineering practice.
12. an ability to apply the knowledge of advanced mathematics of differential equations, linear algebra, complex variables, vector calculus, and discrete mathematics to electrical engineering problems.

# Computer Engineering Undergraduate Program

## Program Objectives

The objectives of the computer engineering program are:

- To provide fundamental computer engineering knowledge to our graduates for continued study in graduate school and for pursuing successful professional careers in industry or government.
- To provide necessary skills to our graduates for organizing, communicating and presenting their ideas effectively in English.
- To prepare our graduates to understand and appreciate issues arising in professional practice including teamwork, leadership, safety, ethics, and professional organizations.
- To prepare our graduates to propose innovative solutions to problems and be well-positioned to take leadership positions in technical endeavors.

## Program Outcomes

Our computer engineering graduates must attain:

1. an ability to apply knowledge of mathematics, science, and engineering.
2. an ability to design and conduct experiments, as well as to analyze and interpret data.
3. an ability to design a digital hardware and/or software system to meet desired needs, considering all realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability.
4. an ability to function on both intra-disciplinary and multi-disciplinary teams.
5. an ability to identify, formulate, and solve computer engineering problems.
6. an understanding of professional and ethical responsibilities.
7. an ability to communicate technical ideas effectively in writing and speaking.
8. the broad education necessary to understand the impact of computer engineering solutions in a global and societal context.
9. a recognition of the need for, and an ability to engage in life-long learning.
10. a knowledge of contemporary issues.
11. an ability to use the techniques, skills, and modern engineering tools necessary for computer engineering practice.
12. an ability to apply the knowledge of advanced mathematics of differential equations, linear algebra, and discrete mathematics to computer engineering problems.
13. an ability to apply advanced programming techniques to solve computer engineering problems.

## THE ECE DEPARTMENT

The Department of Electrical and Computer Engineering is one of six departments in the Batten College of Engineering and Technology (BCET). There are approximately 155 undergraduate students in the electrical engineering program and approximately 80 undergraduate students in the computer engineering program, not including freshmen. There are 24 full-time faculty who hold PhD degrees conducting active research in different areas of electrical and computer engineering. A brief description of the faculty along with their ongoing research activities is given in Appendix A. Appendix B lists the instructional and research facilities available in the department.

## ACADEMIC PROGRAMS

### THE CORE CURRICULA

The following section outlines the core curricula for the degrees of Bachelor of Science in Electrical Engineering (124 credit hours) and the Bachelor of Science in Computer Engineering (125 credit hours). The charts on p.6 and 8 show the subject areas required for the BSEE and the BSCOME respectively. The flow charts on p. 7 and 9 show the progression of the major courses through the curriculum.

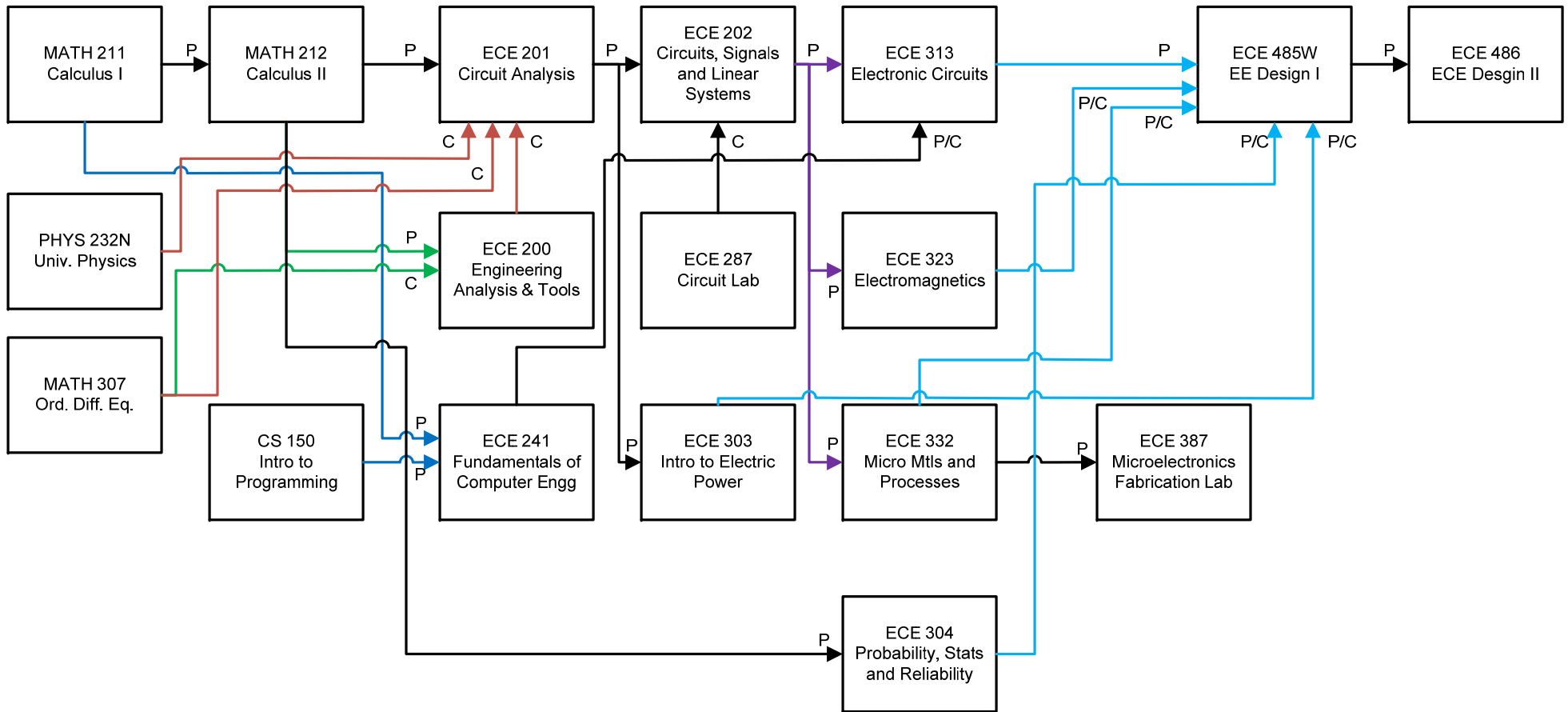
To obtain a BS in Electrical or Computer Engineering, a student must complete the undergraduate electrical or computer engineering program with a grade point average (GPA) of 2.00 or better. Students must also earn a grade point average of at least 2.00 in all major courses (those with the ECE and CS prefixes for computer engineering, and ECE for electrical engineering). Please see the individual curriculum sheets at the end of this handbook for the list of courses to be completed.

### PREREQUISITE STRUCTURE

The prerequisite structure for electrical or computer engineering courses required for the BSEE or BSCOME is listed on the right side of the respective curriculum sheet (pages 41-46). When selecting a course schedule, it is imperative that this prerequisite structure be followed absolutely. ***If a student enrolls in a course which he or she subsequently drops, fails, or changes to audit status, the student must retake this course and obtain a passing grade before the next course can be taken.***

## Overview of the Bachelor of Science in Electrical Engineering

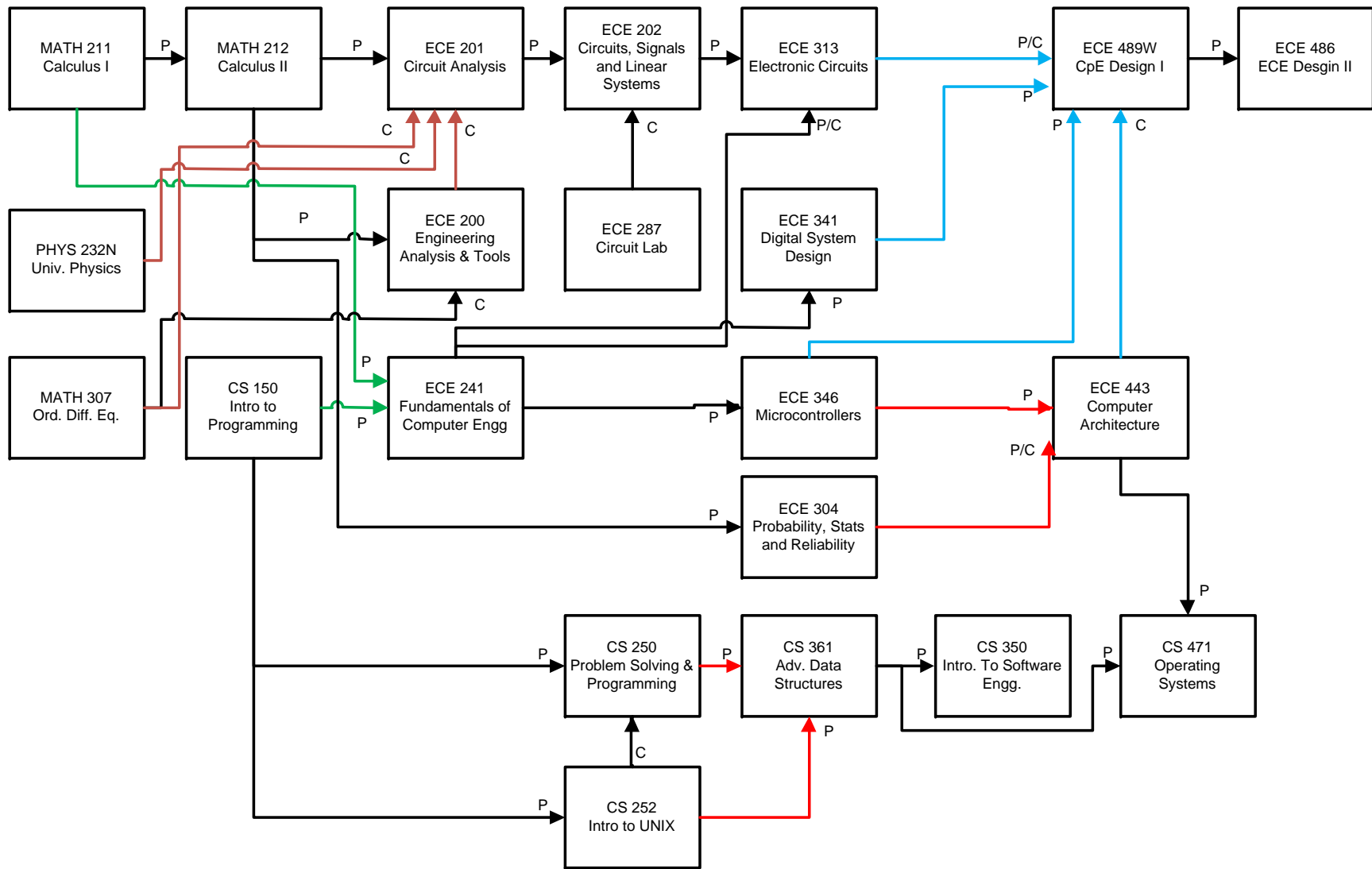
<b>MATHEMATICS</b>		21
MATH 211	Calculus I (4)	
MATH 212	Calculus II (4)	
MATH 307	Differential Equations (3)	
MATH 312	Calculus III (4)	
ECE 200	Engineering Analysis Tools (3)	
ECE 304	Probability, Statistics and Reliability (3)	
<b>SCIENCE</b>		15
CHEM 115N	Foundations of Chemistry (4)	
CHEM 117	Principles of Chemistry (3)	
PHYS 231N	University Physics (4)	
PHYS 232N	University Physics (4)	
<b>ELECTRICAL ENGINEERING CORE</b>		46
Required ECE Lecture Courses (23)		
Required ECE Laboratory Courses (5)		
ECE Technical Electives (12)		
Senior Design Projects (6)		
<b>HUMANITIES AND SOCIAL STUDIES</b>		15
Five three-credit courses selected to satisfy the general education distribution requirements.		
<b>OTHER COURSES</b>		21
ENGL 110C	English Composition I (3)	
ENGL 131C	Technical Writing (3)	
CS 150	Introduction to Programming (4)	
ENGN 110	Introduction To Engineering (2)	
ENGN 111	Introduction To Engineering (2)	
ENGN 401	FE Exam Review (1)	
Non-major Eng.	Elective (3)	
Approved Elective	Approved Elective (3)	
<b>UPPER DIVISION GENERAL EDUCATION</b>		6
May be satisfied by either a focus area cluster, approved minor or two courses at the Upper-Level, 300/400 level, outside of and not required by the student's major or college.		
<b>TOTAL CREDITS</b>		<b>124</b>



Flow Chart for the Electrical Engineering Core Curriculum

## Overview of the Bachelor of Science in Computer Engineering

<b>MATHEMATICS</b>		17
MATH 211	Calculus I (4)	
MATH 212	Calculus II (4)	
MATH 307	Differential Equations (3)	
ECE 200	Engineering Analysis Tools (3)	
ECE 304	Probability, Statistics and Reliability (3)	
<b>SCIENCE</b>		15
CHEM 115N	Foundations of Chemistry (4)	
CHEM 117	Principles of Chemistry (3)	
PHYS 231N	University Physics (4)	
PHYS 232N	University Physics (4)	
<b>COMPUTER ENGINEERING CORE</b>		57
Required CS Lecture Courses (14)		
Required ECE Lecture Courses (23)		
Required ECE Laboratory Courses (2)		
Senior Design Project (6)		
ECE Technical Electives (12)		
<b>HUMANITIES AND SOCIAL STUDIES</b>		15
Five three-credit courses selected to satisfy the general education distribution requirements.		
<b>OTHER COURSES</b>		15
ENGL 110C	English Composition I (3)	
ENGL 131C	Technical Writing (3)	
CS 150	Introduction To Programming (4)	
ENGN 110	Introduction To Engineering (2)	
ENGN 111	Introduction To Engineering (2)	
ENGN 401	FE Exam Review (1)	
<b>UPPER DIVISION GENERAL EDUCATION</b>		6
May be satisfied by either a focus area cluster, approved minor or two courses at the Upper-Level, 300/400 level, outside of and not required by the student's major or college.		
<b>TOTAL CREDITS</b>		<b>125</b>



Flow Chart for the Computer Engineering Core Curriculum

## UNIVERSITY GENERAL EDUCATION REQUIREMENTS

The University requires that all students receiving baccalaureate degrees complete a sequence of courses designed to develop language, writing, mathematics and computer skills at a lower level and be able to apply these skills at the more advanced upper level. The foreign language requirement is fulfilled with completion of three years of a high school foreign language (or two years of two different languages). If you graduated from high school before 1986, as verified by your high school transcript sent to the Office of Admissions, you are exempt from the foreign language requirement. If you have any questions about this, please check with your advisor.

Electrical and Computer Engineering students must take 15 hours of lower division General Education Perspectives, as described in the next section. Students who have received an AA or AS degree from a Virginia community college are considered by the University to have met all of the lower division requirements, regardless of the specific general education courses taken while earning the AS degree. Those who hold AS degrees in General Studies must have their transcripts evaluated individually by the Transfer department in Admissions to determine whether the program and courses are parallel to those offered at Old Dominion University.

The requirements listed below represent a combination of the University general education requirements and any additional work needed to meet the accreditation requirements of the Accreditation Board for Engineering and Technology (ABET). All candidates for the degree of Bachelor of Science in Electrical Engineering (BSEE) or Bachelor of Science in Computer Engineering (BSCOME) must complete the identified minimum requirements or their equivalents.

Students admitted as Second Degree students are exempt from the University General Education Requirements. By virtue of their holding a recognized bachelor's degree from a duly accredited institution, the University considers these students to have already met all of these requirements, at both the lower and upper level.

The following is a list of coursework necessary to satisfy general education requirements:

### LOWER DIVISION REQUIREMENTS

#### I. Skills

- A. Composition - 6 hours. ENGL 110C and ENGL 131C within the curricula satisfy this requirement.

*\*\*Special Note: All students are required to take the Writing Sample Placement Test (WSPT) before mid-semester of the semester they enter the University, even if they have received transfer credit for ENGL 110C. Students will **NOT** be allowed to register for their next semester's classes until they have passed the WSPT.*

- B. Mathematics - 8 hours. MATH 211 and MATH 212 within the curricula satisfy this requirement.

- C. Foreign Languages - 6 hours (does not apply to students earning high school diploma before 1986). This requirement is satisfied by the following options.

3 years of a single foreign language in high school  
 2 years each of 2 different foreign languages in high school  
 6 credit hours from one of the following course sequences

ARAB 111F	Beginning Arabic I (6 credits)
CHIN 111F	Beginning Chinese I (6 credits)
FR 101F-102F	Beginning French I and II
GER 101F-102F	Beginning German I and II
HEBR 101F-102F	Beginning Hebrew I and II
HEBR 111F	Intensive Beginning Hebrew (6 credits)
ITAL 101F-102F	Beginning Italian I and II
JAPN 111F	Beginning Japanese I (6 credits)
LATN 101F-102F	Beginning Latin I and II
PRTG 101F-102F	Beginning Portuguese I and II
RUS 101F-102F	Beginning Russian I and II
SPAN 101F-102F	Beginning Spanish I and II
SPAN 121F	Intensive Beginning Spanish (6 credits)

- D. Computer Skills - 3 hours. CS 150 within the curricula satisfies this requirement.

## II. Perspectives

- A. Fine and Performing Arts Perspective - 3 hours. Electing one of the following courses satisfies this requirement.

ARTH 121A	An Introduction to the Visual Arts
ARTS 122A	Visual Communication
MUSC 264A	Music in History and Culture
DANC 185A	Dance and Its Audience
THEA 241A	The Theater Experience
THEA 270A	Film Appreciation

- B. Historical Perspective - 3 hours. Electing one of the following courses satisfies this requirement.

HIST 101H	Asia in a World Setting
HIST 102H	Europe in a World Setting
HIST 103H	Latin America in a World Setting
HIST 104H	United States in a World Setting
HIST 105H	Africa in a World Setting

- C. Literary Perspective - 3 hours. Electing one of the following courses satisfies this requirement.

ENGL 112L	Enjoying Literature
ENGL 144L	American Writers, American Experiences
FLET 100L	Understanding World Literature

- D. Natural Science and Technology Perspective - 8 hours. PHYS 231N and PHYS 232N within the curricula satisfy this requirement.
- E. Philosophical Perspective - 3 hours. Electing one of the following courses satisfies this requirement.

PHIL 110P	Introduction to Philosophy
PHIL 120P	Logic and Philosophy
PHIL 150P	World Religions: A Philosophical Introduction

- F. Social Science Perspective - 3 hours. Electing one of the following courses satisfies this requirement.

ANTR 110S	Introduction to Anthropology
COMM 200S	Introduction to Human Communication
CRJS 215S	Introduction to Criminology
ECON 200S	Basic Economics
ECON 201S	Principles of Macroeconomics
ECON 202S	Principles of Microeconomics
GEOG 100S	Cultural Geography
GEOG 101S	Environmental Geography
POLS 100S	Introduction to International Politics
POLS 101S	Introduction to American Politics
PSYC 201S	Introduction to Psychology
PSYC 203S	Lifespan Development
SOC 201S	Introduction to Sociology
WMST 201S	Women in a Changing World

## UPPER DIVISION REQUIREMENTS

Electrical Engineering and Computer Engineering students may complete this requirement by Option A, B or C.

**Option A:** Any University approved minor, second degree, or second major.

Under this option any university approved minor, second degree, or second major fulfills the Upper Division requirements. However, students majoring in Electrical Engineering are encouraged to consider a minor in Computer Engineering, and students in Computer Engineering are encouraged to consider a minor in Electrical Engineering to fulfill the upper division general education requirements. For this option, all the requirements listed for the minor in computer or electrical engineering (depending on the minor taken) must be fulfilled, as mentioned previously. Although some credits may count for both the major and the minor, the student must take at least 6 credits of coursework in the minor, which do not count for the major.

Advantages of these minors include the following. Minors in electrical engineering and computer engineering have been designed to fulfill all leveling requirements needed for the master's programs for students in other engineering undergraduate majors. Thus an electrical engineering undergraduate student who wants to obtain a master's in computer engineering should definitely minor in computer engineering. Similarly students in computer engineering who wish to pursue the master's in electrical engineering should minor in electrical engineering as an undergraduate. Other advantages of choosing a minor inside the ECE program include an increase of overall technical content in the curriculum, and the potential for providing an additional approved elective to the student. Students who would have fewer than the required number of credit hours by their anticipated time of graduation would be able to use this approved elective to complete the minimum required credit hours.

Students may also wish to fulfill the Upper Division General Education requirement by choosing to complete both majors within our department. Through careful planning, this could be accomplished by taking only a few extra courses in addition to those required for the first major. The extra courses would be taken in place of the elective courses. A minimum of 129 credits are needed to complete all requirements for both majors.

The ECE department has collaborated with the Computer Science department to make a similar double major option available to those students who wish to complete both the computer engineering and the computer science majors. Students earning less than 150 credits would receive one degree listing two majors (double major), the primary major and the secondary major. Students having accumulated a total of 150 or more credit hours (mainly transfer students with extra credits) would receive two distinct degrees (double degree).

Another approved option for a second degree is now available for students wishing to pursue degrees in both electrical engineering and in physics. This combined program requires 150 credits, thus giving the student two distinct degrees. For the outlines of these curricula, see Curriculum Worksheets, p. 41-46.

**Option B:** Cluster: Advanced Study in a Focus Area

This option requires advanced study in a focus area; 9 hours of upper division courses on a specific issue, viewed from multidisciplinary perspectives. To satisfy the requirements, students must complete 3 courses (9 credits) from any focus area, 6 hours of which must be taken through Old Dominion University. Students should plan ahead. Prerequisites may be required for some of the following classes. Often these may be taken as Lower Level General Education Requirements. Clusters are periodically reviewed and updated. Please check the website for up-dates at: <http://uc.odu.edu/clusters/index.shtml>. Any questions you may have regarding clusters may be addressed to Dr. Lucien Lombardo, 683-3800, or to the Cluster Coordinator listed.

The following is a list of the 10 university-recognized Clusters.

1. Administrative Leadership and Ethics for Professional Roles

COMM 351	Interpersonal Communication in Organizations
HLTH 425	Leadership and Management for Health Professionals
MGMT 325	Contemporary Organizations and Management
MGMT 350	Employee Relations or
MKTG 414	Ethics and Social Issues in Administration
PHIL 303	Business Ethics or
PHIL 345	Bioethics
PSYC 303	Industrial/Organizational Psychology

2. Aesthetics in Art and Science

ARTS 304	Color
MUSC 410	Psychology of Music
PHIL 324	Philosophy of Art
PHYS 311	Color in Nature and Art
PHYS 332W	Physics of Music and Musical Reproduction
PSYC 413	Perception

3. The Designed World

ARTH 320	History of Design
ARTH 435W	Modern Architecture
ARTH 439	Art Between the Wars: 1919-1939
Either GEOG 310	Geography of the City
	Or
GEOG 412	Cities of the World
OTS 386	Architecture
OTS 422	Fashion Design and Coordination
PSYC 344	Human Factors
PSYC 413	Sensation and Perception

4. Environmental Management

CEE 458	Sustainable Development
ECON 447	Natural Resource and Environmental Economics
ENVH 402W	Environmental Health Administration and Law
GEOG 306T	Hazards: Natural and Technological
PHIL 344T	Environmental Ethics

5. Explorations in Conflict and Resolution

COMM 421	Communication and Conflict Management
CRJS 401W	Understanding Violence
ECON 454W	Economic Development
ENGL 472	America in Vietnam: The Government and the Media in Conflict
GEOG 320	Political Geography
HIST 410	War as a Human Experience

6. Health and Wellness

CHP 400	Philosophy of Health
EXSC 403	Lifetime Fitness and Wellness
PHIL 345	Bioethics
PSYC 306	Health Psychology
RTS 485	The Philosophy of Play
SOC 440W	The Sociology of Health, Illness and Society

7. Impacts of Technology

CS 300	Computers in Society
GEOG 305	World Resources
GEOG 306T	Hazards: Natural and Technological
OPMT 303T	Operations Management and Technology
HIST 389T	Technology and Civilization
OTS 370T	Technology and Society
OTS 382	Industrial Design
PHIL 383T	Technology: Its Nature and Significance
POLS 350T	Technology of War

8. Understanding the World of Children

COMM 427	Children's Communication
CRJS 403W	Violence in the World of Children
ESSE 476	Practical Applications in the World of Children
PSYC 351	Child Psychology
SOC 402	Child Welfare

9. The Urban Community

CHP 415W	Critical Issues in Community Health
CRJS 355	Crime and the Community
ECON 455	Urban Economics
Either GEOG 310	Geography of the City
	Or
GEOG 412	Cities of the World
HIST 303	The City in Western Civilization
PSYC 431	Community Psychology

10. World Cultures: Values and Visions

ENGL 371W	Communication Across Cultures or
COMM 400W	Intercultural Communication
IT 425W	Information Systems for International Business
MGMT 361	International Business Operations
MKTG 411	Multi-National Marketing
PHIL 354	Comparative Philosophy: East and West
PSYC 420	Cross-Cultural Psychology or
ANTR 320	The Sexes in Cross-Cultural Perspective
WMST 401W	Women: A Global Perspective
Foreign Language and Culture: FR 320, or GER 355, or GER/FLET 445/COMM 444, or JAPN/FLET 310W, or SPAN 320, or SPAN 321	
Study Abroad: Any study abroad course at the 300/400-level that offers three credits can fulfill one course requirement for cluster 10. In cases where a study	

abroad course fits the themes of another cluster, students may request approval from the university cluster coordinator to use that study abroad course.

**Option C: Two Upper-Level Courses**

Students may take two courses at the Upper-Level, 300/400 level, outside of and not required by the student's major or college.

## MATH REQUIREMENTS FOR ELECTRICAL & COMPUTER ENGINEERING

Proficiency in math is the foundation of the electrical and computer engineering programs. All in-coming students without transferable credits in math must take the COMPASS Math Placement Test. The score on this test determines the particular math course the student will take in their first semester at Old Dominion University. In certain instances the SAT or ACT Math scores may also be used to place students in the appropriate math course. If a student's score places him or her in one of the lower-level courses, up to two years may be added to the total time required to complete their curriculum. Therefore, it is important that students realize that they might need to take a math class each semester until they are caught up in the curriculum.

The math courses follow a strict prerequisite structure. Each course must be successfully completed with a grade of "C" or better before the next level may be taken. Additionally, for ECE students, Calculus I and II must be completed with minimum grades of C in each before the basic ECE circuit courses may be taken. Since the ECE program is so math-intensive, students who do not build a firm foundation in math generally do not perform well in the ECE courses.

Following is a chart of Math Placement, based on the COMPASS Math Placement Score, SAT or ACT Math scores.

<b>COMPASS Placement Score</b>	<b>SAT Math Score</b>	<b>ACT Math Score</b>	<b>Math Placement/Math Prerequisites</b>
1	Any SAT Math score	Any ACT Math score	MATH 101M Intro to Mathematics
2	Any SAT Math score	Any ACT Math score	MATH 101M Intro to Mathematics
3	Any SAT Math score	Any ACT Math score	MATH 102M College Algebra
4	551-650	30-36	MATH 162M Pre-calculus I
5	651-700		MATH 163 Pre-calculus II
6	701 and above		MATH 211 Calculus I
-			MATH 212 Calculus II
-			MATH 307 Differential Equations
-			MATH 312 Calculus III

ACT scores only place into MATH 101M, 102M or 162M. Placement into MATH 163 or 211 requires appropriate score on the COMPASS Math Placement Test.

Any student may challenge his/her placement by making an appointment with the ODU Testing Center and coming to campus to take the COMPASS Math Placement Test.

## DEPARTMENTAL COURSE OFFERINGS

The Department of Electrical and Computer Engineering offers most sophomore and junior courses each semester. Senior courses are offered with 2 or 3 semester rotations. Following is a complete list of all required courses for both programs.

### REQUIRED ECE COURSES

#### Offered Fall and Spring

ECE 200	Engineering Analysis Tools (P- <i>MATH 212</i> , P/C- <i>MATH 307</i> )
ECE 201	Circuit Analysis (P- <i>MATH 212</i> , P/C- <i>ECE 200</i> , <i>MATH 307</i> , <i>PHYS 232N</i> )
ECE 202	Circuits, Signals and Linear Systems (P- <i>ECE 201</i> , C- <i>ECE 287</i> )
ECE 241	Fundamentals in Computer Engineering (P- <i>CS 150</i> , <i>MATH 211</i> )
ECE 287	Fundamental Electric Circuits Laboratory (P- <i>ECE 201</i> , <i>CS 150</i> , C- <i>ECE 202</i> )
ECE 304	Probability, Statistics, and Reliability (P- <i>MATH 212</i> )
ECE 313	Electronic Circuits (P- <i>ECE 202</i> , P/C <i>ECE 241</i> )
ECE 486	ECE Design II (P- <i>ECE 485W</i> or <i>489W</i> )

#### Electrical Engineering only

ECE 303	Electrical Power (P- <i>ECE 201</i> ) – fall
ECE 323	Electromagnetics (P- <i>ECE 202</i> ) – fall and spring
ECE 332	Microelectronic Materials and Processes (P- <i>ECE 202</i> ) – fall
ECE 387	Microelectronic Fabrication Laboratory (P- <i>ECE 332</i> ) – spring
ECE 485W	EE Design I (P- <i>ECE 313</i> , P/C- <i>ECE 303</i> , <i>304</i> , <i>323</i> , <i>332</i> ) – fall and spring
ECE Technical Electives	– 4 required (see list pages 17-18)

#### Computer Engineering only

ECE 341	Digital System Design (P- <i>ECE 241</i> ) – fall and spring
ECE 346	Microcontrollers (P- <i>ECE 241</i> ) – spring
ECE 443	Computer Architecture (P- <i>ECE 341</i> , <i>346</i> , P/C- <i>ECE 304</i> , <i>489W</i> ) – fall
ECE 489W	CpE Design I (P/C- <i>ECE 313</i> , P- <i>ECE 341</i> , <i>346</i> , C- <i>ECE 443</i> ) – fall
ECE/CS Technical Elective	– 4 required (see list pages 17-18)

#### Computer Science courses for Computer Engineering only

CS 250	Problem Solving & Programming (P- <i>CS 150</i> , C- <i>CS 252</i> )
CS 252	Introduction to UNIX (C- <i>CS 250</i> )
CS 361	Advanced Data Structures (P- <i>CS 250</i> , <i>252</i> )
CS 350	Software Engineering (P- <i>CS 361</i> )
CS 471	Operating Systems (P- <i>CS 361</i> , <i>ECE 443</i> )

NOTE: All prerequisite courses listed above in *italics* must be passed with a grade of C or better in order to proceed in the curriculum. See Minimum “C” Grade Policy, p. 37.

**The Computer Science Department does not necessarily offer all courses each semester.** To be certain of availability, please consult the Computer Science

department. Check the CS Course website:  
<http://www.cs.odu.edu/~ibl/courseschedpage.html> or Leo Online for course availability.

For more information concerning CS courses, the student is referred to the University Catalog, which contains a description of all courses.

#### NON-MAJOR ENGINEERING ELECTIVE

*This is required only for BSEE students.* The non-major engineering elective provides the student with exposure to computer science or another engineering field. Departmental approval of the selected course is required. This approval is obtained during review of the Curriculum Plan of Study. Some suggested courses are: CEE 100-Statics, ME 201-Materials Science, ME 204-Engineering Mechanics I-Statics, ME 205-Dynamics, ME 303-Mechanics of Fluids, ME 311-Thermodynamics, CS 250-Problem Solving and Programming, CS 381-Introduction to Discrete Structures, CS 418-Web Programming, or one of the 300/400-level ENMA courses. The non-major engineering elective may not be used as a substitute for ENGN 110 or ENGN 111, and will not be double-counted as part of a minor.

#### APPROVED ELECTIVE

The electrical engineering program contains an approved elective. This must be a 300/400-level course which enhances or complements your major area of interest. Please see your ECE advisor for further details.

#### TECHNICAL ELECTIVES

Technical electives are required for the electrical engineering and computer engineering undergraduate degree programs. Students must select a minimum of four technical electives from the following listing but are not required to choose all of their technical electives from one particular emphasis area. They may choose any four technical electives of interest. Courses are grouped in emphasis areas to allow students to specialize in an area of interest if they so desire. Additionally, electrical engineering students may choose technical electives from computer engineering emphasis areas and vice versa.

#### Electrical and Computer Engineering Emphasis Areas

##### System Science

ECE 355	Intro to Networks and Data Communications (P-junior standing) – fall
ECE 381	Introduction to Digital Signal Processing (P-ECE 202) – fall
ECE 451	Communication Systems (P-ECE 202, 304) – spring
ECE 455	Network Engineering and Design (P-ECE 355, or permission from instructor) – spring
ECE 458	Instrumentation (P-ECE 202, PHYS 102N, 112N or 232N) – spring
ECE 461	Automatic Control Systems (P-ECE 202) – fall
ECE 482	VLSI Systems Design (P/C ECE 241, 313) – spring

## Physical Science

- ECE 303 Introduction to Electric Power (P-*ECE 201*) - fall
- ECE 454 Introduction to Bioelectrics (P-MATH 200 or higher, PHYS 111N or higher) – fall
- ECE 458 Instrumentation (*ECE 202*, PHYS 102N, 112N or 232N) – spring
- ECE 472 Plasma Discharges and Materials Processing (P-ECE 323) – fall
- ECE 473 Solid State Electronics (P-ECE 313, 323, 332) – fall
- ECE 474 Optical Communications (P-ECE 323 and MATH 312) – spring
- ECE 478 Lasers and Laser Applications in Engineering (P-ECE 313 and MATH 312) – spring

## Digital Design

- ECE 341 Digital System Design (P-*ECE 241*)
- ECE 346 Microcontrollers (P-*ECE 241*) – spring
- ECE 443 Computer Architecture (P-ECE 341, 346, P/C-ECE 304, 489W) – fall
- ECE 458 Instrumentation (P-*ECE 202*, PHYS 102N, 112N or 232N) – spring

## Modeling and Simulation, Medical Imaging Computer Graphics and Visualization

- ECE 405 Introduction to Discrete Event Simulation (P-ECE 304 or equiv.) – spring
- ECE 406 Introduction to Visualization (P-*CS 150*) – fall
- ECE 462 Introduction to Medical Image Analysis (P-*MATH 212*)
- ECE 481 Introduction to Digital Image Processing (P-*ECE 202*) – spring
- CS 460 Computer Graphics (P-*CS 361*)

## Computer Hardware, Embedded Systems, Real-Time Systems, FPGA/VLSI Design

- ECE 332 Microelectronic Materials and Processes (P-*ECE 202*) – fall
- ECE 387 Microelectronic Fabrication Laboratory (P-ECE 332) – spring
- ECE 441 Advanced Digital Design and FPGAs (P-ECE 341) – spring
- ECE 482 VLSI Systems Design (P-*ECE 241*, 313) – spring
- ECE 483 Embedded Systems (P-ECE 313, 346) – fall

## Computer Networks, Wireless Communications, Sensor Networks, Network Security

- ECE 355 Intro to Networks and Data Communications (P-junior standing) – fall
- ECE 455 Network Engineering and Design (P-ECE 355, or permission from instructor) – spring
- ECE 451 Communication Systems (P-*ECE 202*, 304) – spring
- ECE 452 Intro to Wireless Communication Networks (P-*ECE 202*, 304) – spring
- CS 472 Network Systems Security (P-*CS 361*)

## Signal/Image Processing, Computer Vision, Pattern Recognition, Machine Intelligence

- ECE 381 Introduction to Digital Signal Processing (P-*ECE 202*) – fall
- ECE 481 Introduction to Digital Image Processing (P-*ECE 202*) – spring
- ECE 480 Intro. to Imaging Technologies for Homeland Security (P-*ECE 202*)



All students are required to take three core courses:

- ECE 304 Prob., Stats, and Reliability (P-MATH 212) 3 Credits
- ECE 323 Electromagnetics (P-ECE 202) 3 Credits
- ECE 332 Micro. Materials & Proc. (P-ECE 202) – fall 3 Credits

Students may select one senior level course (each 3 Credits) from the following list:

- ECE 472 Plasma Discharges and Materials Processing (P-ECE 323) – fall
- ECE 473 Solid State Electronics (P-ECE 313, 323, 332) – fall
- ECE 474 Optical Communications (P-ECE 323 and MATH 312) – spring
- ECE 478 Lasers and Laser Applications in Engineering (P-ECE 313 and MATH 312) – spring

### III. Digital Design Track (13 Credits)\*

All students are required to take three core courses:

- ECE 304 Prob., Stats, and Reliability (P-MATH 212) 3 Credits
- ECE 340 Digital Circuits (P-CS 150) 4 Credits
- ECE 341 Digital System Design (P-ECE 241 or 340) 3 Credits

Students may select one senior level course (each 3 Credits) from the following list:

- ECE 346 Microcontrollers (P-ECE 241) – spring
- ECE 443 Computer Architecture (P-ECE 341, 346, P/C-ECE 304) – fall

\* *Not available to Computer Engineering majors.*

NOTE: All prerequisite courses listed above in *italics* must be passed with a grade of C or better in order to proceed in the curriculum. See Minimum “C” Grade Policy, p. 37.

### Minor in Computer Engineering

To complete the Minor in Computer Engineering, a student must take four courses (or equivalent) for a total of 12 or more credits. In addition, a student seeking a minor in computer engineering must satisfy all pre- or co-requisite requirements for the courses selected. The Chief Departmental Advisor must approve the precise course of study. Completion of a minor in computer engineering with a GPA of 3.00 or greater satisfies the leveling requirements for a graduate degree in computer engineering.

All students are required to take two core courses:

- CS 333 Programming (P-CS 150, MATH 163) 4 Credits\*
- CS 361 Data Structures (P-CS 250, 252) 3 Credits

Students may select two courses from the following list:

- ECE 340 Digital Circuits (P-CS 150) 4 Credits\*\*
- ECE 341 Digital System Design (P-ECE 241 or 340) 3 Credits
- ECE 346 Microcontrollers (P-ECE 241) – spring 3 Credits
- ECE 355 Intro to Networks and Data Comm. (P-Junior standing) – fall 3 Credits

- ECE 381 Introduction to Digital Signal Processing (P-*ECE 202*) – fall
- ECE 405 Intro to Discrete Event Simulation (P-*ECE 304* or equiv.) – spring  
3 Credits
- ECE 406 Introduction to Visualization (P-*CS 150*) – fall 3 Credits
- ECE 441 Advanced Digital Design and FPGAs (P-*ECE 341*) – spring  
3 Credits
- ECE 455 Network Engineering and Design (P-*ECE 355*, or permission from  
instructor) – spring 3 Credits
- ECE 482 VLSI Systems Design (P-*ECE 241, 313*) – spring 3 Credits
- ECE 483 Embedded Systems (P-*ECE 313, 346*) – fall 3 Credits

\* *CS 250 and CS 252 satisfy this requirement.*

\*\* *ECE 340 is not available to ECE majors.*

NOTE: All prerequisite courses listed above in *italics* must be passed with a grade of C or better in order to proceed in the curriculum. See Minimum “C” Grade Policy, p. 37.

### Minor in Modeling & Simulation

To complete the Minor in Modeling and Simulation, a student must take four courses (or equivalent) for a total of 12 or more credits.

All students are required to take three core courses:

- ECE 304, STAT 330 or equiv. Probability and Statistics Course 3 Credits
- ECE 405 Intro to Discrete Event Simulation (P-*ECE 304* or equiv.) – spring  
3 Credits
- ECE 406 Introduction to Visualization (P-*CS 150*) – fall 3 Credits

Students may select one course from the following list:

- CS 333 Programming (P-*CS 150, MATH 163*) 4 Credits\*
- CS 361 Data Structures (P-*CS 250, 252*) 3 Credits
- CS 460 Computer Graphics (P-*CS 361*) 3 Credits
- CS 475 Introduction to Computer Simulation (P-*CS 361*) 3 Credits
- DSCI 476 Simulation Modeling and Analysis for Business Systems 3 Credits
- ECE 462 Intro to Medical Image Analysis (P-*MATH 212*) 3 Credits
- ECE 480 Intro to Imaging Technologies for Homeland Security (P-*ECE  
202*) – spring 3 Credits
- ECE 481 Introduction to Digital Image Processing (P-*ECE 202*) – spring  
3 Credits

\* *CS 250 and CS 252 satisfy this requirement.*

NOTE: All prerequisite courses listed above in *italics* must be passed with a grade of C or better in order to proceed in the curriculum. See Minimum “C” Grade Policy, p. 37.

The revised minor in Modeling and Simulation is currently pending approval. We expect it to be approved soon. In the meantime, substitutions will be allowed.

Computer engineering students often choose a minor in Computer Science. This can be accomplished by completing only two additional computer science courses over and above those already required for the major, either two 400-level courses or one 300-level course from CS 312, 330, 355, 390 and one 400-level course. For specific information and/or to declare your minor, please contact the Chief Departmental Advisor in the Computer Science department, Ms. Janet Brunelle, at [brunelle@cs.odu.edu](mailto:brunelle@cs.odu.edu), or by phone, 683-6001.

Other popular minors for students in the electrical or computer engineering programs include minors in math, engineering management, physics and business. Please contact the Chief Departmental Advisor in the respective department for further information and/or to declare minors in these disciplines.

For completion of a minor, a student must have a minimum grade point average of 2.00 in all courses taken toward the minor and complete at least 6 hours of upper division courses in the minor requirement at Old Dominion University. Students must satisfy all pre- or co-requisite requirements for the courses selected in their chosen minor.

## SENIOR DESIGN

The ECE Senior Design I courses, ECE 485W and ECE 489W, are courses involving well-structured projects. They are required courses for all ECE students. An exception is made for students who choose to participate in the IEEE car team competition. Students in the two-semester car team project should register for the ECE 486-ECE 487 sequence rather than the ECE 485W-ECE 486 or ECE 489W-ECE 486 sequence. They are required to give reports and presentations in each of the two semesters. Occasionally, students from other departments, such as mechanical engineering, choose to also participate in the projects. However, they are to be graded by their own department. Other ECE students who wish to join in particular projects of special interest to them, in either ECE 485W, 489W, or ECE 486 may do so. However, their names should not be included in the final report or presentation unless they are officially registered for the course. Students in the BS/Master's program normally take the ECE 485W-ECE 486 or ECE 489W-ECE 486 sequence. Additionally, they may continue their research (started in ECE 486) in ECE 487, in lieu of one of the technical/approved electives. CpE students in the BS/Master's program would take the additional ECE 487 as a technical elective. On occasion these students may also opt to take ECE 486-ECE 487 as a two-semester research option.

## COMBINED BS/Master's AND BS/PhD PROGRAMS

The combined BS/Master's program in the College of Engineering and Technology at Old Dominion University is designed to provide an opportunity for exceptionally qualified students to obtain a combined undergraduate and graduate degree in Electrical or Computer Engineering. The program provides students with a rigorous and thorough education in the basic principles of Electrical or Computer Engineering, together with one year of graduate education. The curriculum in this program is designed

appropriately so that students can advance smoothly from undergraduate program to graduate admission and the degree requirements can be met in five years.

Successful graduates of this program will be afforded accelerated entry into higher than entry-level positions into the profession. The students' unique preparation will create opportunities for rapid advancement in their careers.

The combined BS/PhD program is established for students who are highly motivated in pursuing scientific research and have shown high academic and research achievements in their undergraduate program. The duration of the combined BS/PhD degree is approximately eight years.

#### General Guidelines

- The program will grant BS/ME, BS/MS and BS/PhD degrees.
- Entrance into the program will be available to suitably qualified students in the freshman, sophomore, junior years, as well as to qualified transfer students. Freshmen students seeking admission into the program must have a high school grade point average of at least 3.00 and an SAT score of at least 1100. Junior-level transfer students admitted into the program must have a GPA of 3.00 or better in all the course work attempted at the college(s) from which they are transferring. It is preferred that students apply to the accelerated programs at the beginning of their junior year. Students applying to the BS/Master's program should have completed all 200-level ECE courses with a 3.0 or higher GPA and have at least a 3.0 overall GPA. For the BS/PhD program, a GPA of 3.50 or higher is required for entry and continuance.
- The continuing eligibility of students in this program will be based upon their maintaining a GPA of 3.00 or better in all engineering courses taken at Old Dominion University, as reviewed periodically by the department. Students who have not maintained the required minimum GPA by the commencement of the graduate portion of the accelerated program (400-/500-level courses) will be dropped from the program.
- The BS/Masters track requires 30 hours of coursework; however, 6 hours of graduate coursework (taken at the 500-level or higher) can count for both the undergraduate and graduate degrees. The 6 hours that are credited to both degrees must be paid for at the graduate tuition level. Students can choose either the MS degree or the non-thesis ME degree route for the Masters work. The total minimum number of credits for the BS/Masters program is 150 hours, as compared to 155 total hours for the BS degree (125 hours) + MS degree (30 hours).
- The BS/PhD track will allow a student to have a course load reduction of up to 12 hours relative to the sum of course hours required for the BS/MS/PhD separately ( $125 + 30 + 24 = 179$ ). Students in the BS/PhD track will be required to take 24 hours of PhD graduate classes (of which at least 15 hours must be at the 800 level). In total, students will be required to take either 42 hours of graduate

classes (if MS thesis is also completed), or 48 hours of graduate classes (if MS thesis is not completed as part of program). Of the total credit hour reduction, 6 hours will be reduced at the master's level, and 6 hours reduced at the BS level. In addition, these students must earn 24 hours of dissertation credit based on their research. Summarizing, a BS/PhD will be required to complete 119 hours at the BS level, either 18 course hours + thesis or 24 course hours at the master's level, 24 graduate course hours beyond master's, and 24 dissertation hours (overall total of 191 hours) as compared to 203 total hours if each degree were completed independently. It is expected that highly qualified students will be able to take advantage of the reduced course load to devote more emphasis to original research.

- Students on the BS/MS track performing exceptionally well at the end of the fifth year and wishing to transfer to the BS/PhD will have that option.
- Students admitted into any of the accelerated programs must meet with the Graduate Program Director for selection of the appropriate graduate courses (400/500-level). Students must register for the courses at the 500-level. As stated in the University Catalog, "Courses at the 500-level are available for graduate credit only and correspond to undergraduate 400-level courses. However, a different grading scale is used for 500-level registrants (grades below C- are assigned a grade of F); additional and higher quality work is required in 500-level courses".
- Deadlines for application: Fall term – February 1; Spring term – October 1
- For more information, please contact the Graduate Program Director, Dr. Sacharia Albin, in the department at 757-683-3741 or visit our website at the following address: <http://eng.odu.edu/ece/> at the Graduate/Accelerated Programs link.

## COOPERATIVE EDUCATION

Cooperative education at Old Dominion University allows students to combine academic study with professional-level training. The integration of academic and professional experience provides a broader education than classroom instruction alone. The Southeastern Virginia area affords students plenty of opportunity for practical experience in area research sites, various industries, and a large number of consulting firms within and outside of the Hampton Roads region. Successful completion of three credit hours of co-op education will satisfy the departmental requirement for one *approved* (not *technical*) elective within the electrical engineering program. The Engineering Co-op office is located in Kaufman Hall, Room 132. For further information, contact Bev Forbes at 683-5341 or visit the website at <http://www.odu.edu/ao/cmce/en/index.shtml>.

## GETTING STARTED

### ADMISSIONS

Admission policies and procedures for the College of Engineering and Technology for freshmen and transfer applicants are described in the University catalog. The following sections briefly describe these procedures.

### NEW STUDENTS

Before you can register for classes, you must be admitted to Old Dominion University. You may do this by completing a non-degree or a degree application through the Office of Admissions, <http://www.admissions.odu.edu/home.php>

#### Application Deadlines:

Fall semester:	Spring semester:	Summer semester:
March 15 Freshman June 1 Transfer	October 1 Freshman & Transfer	March 15

Admission applications received after these dates will be processed on a space available basis. *The priority deadline for applications and all merit-based scholarships is December 1.*

The Domicile Determination Form **MUST** be completed to determine your tuition rate. Freshmen students **MUST** attend the University's orientation program, PREVIEW. The admission office will send information about PREVIEW following admission to the University.

All freshmen intending to major in electrical or computer engineering will be advised in the Engineering Fundamentals Division of the College of Engineering and Technology, located in Kaufman Hall, Room 102, phone 683-4245. Dr. Linda Vahala serves as the Director of the Engineering Fundamentals Division. Dr. Amin Dharamsi serves as the ECE Freshman Advisor. Ms. Bonita Anthony serves as the Assistant Director of the Engineering Fundamentals Division.

### RETURNING STUDENTS

If you have attended Old Dominion University but have not been enrolled for two consecutive semesters or have attended college elsewhere, you must complete the readmission application in the Office of Admissions, Rollins Hall.

### TRANSFER STUDENTS

Transfer students must send all their transcripts to Old Dominion University Office of Admissions, Rollins Hall, Norfolk VA 23529, to have their credit evaluated. They should also arrange to have their high school transcripts sent to the Admissions

Office if they have met the Foreign Language requirement in high school, as outlined on p.9. Transfer students who have credit for the first year of the ECE curriculum will work directly with the ECE department for articulation of transfer credit, advising, and class scheduling upon admission to the University. Students who do not have the first year of the ECE curriculum will be required to contact the Engineering Fundamentals Division of the College of Engineering and Technology, located in Kaufman Hall, Room 102. Students transferring from Tidewater Community College, Thomas Nelson Community College, or Piedmont Virginia Community College will follow the curriculum specified in the Articulation Agreements, Appendix C, until further notice.

## WRITING SAMPLE PLACEMENT TEST (WSPT)

All incoming students, except those possessing a bachelor's or higher degree, are required to take the Writing Sample Placement Test. The results are used for placement purposes for all first-year students, including transfer students without credit for ENGL 110C. Transfer students with credit for ENGL 110C are encouraged to take the WSPT either before or within the first few weeks of their **first semester**. The students must take the WSPT **before the end of the first semester**, or the Writing Center will place a hold on their registration for the second semester. Transfer students who have not passed the WSPT prior to completing their second semester will not be able to register for a third semester until the test has been passed.

## ADVISING

The ECE department provides student advising in two forms. Each student is assigned a faculty advisor. The most current list with the name of the student and their respective faculty advisor is posted on the undergraduate bulletin board and at the front desk in the office. You are strongly encouraged to check this list regularly. This information is also available on the department home page on the Web. The faculty advisor provides guidance related to choice of a minor, senior specialization and design projects as well as electrical and computer engineering career opportunities in industry and graduate programs.

Beginning with the second semester of freshman year study, each student will be required to create and maintain a curriculum worksheet or plan of study (see the sample copy in the handbook, pages 41-46). This is an important document which will assist you in keeping on track with the degree requirements. Once each semester (excluding summer), the department conducts Group Advising sessions under the supervision of the Chief Departmental Advisor. In preparation for these sessions, students first complete the curriculum worksheet listing the courses they should take in the following semester. They will bring their curriculum sheet with them when they meet with the Undergraduate Coordinator prior to Group Advising. The proposed courses will then be listed on the departmental curriculum worksheet. Photocopies of the worksheets are distributed at the sessions. Students are then required to see their assigned faculty advisor for schedule approval. Once approved (evidenced by the faculty advisor's signature) the signed curriculum worksheets are to be returned to the Undergraduate Coordinator for removal of the Advisor Registration Block before actual registration can be made.

Students also work closely with the Undergraduate Coordinator. Under the close supervision of the Chief Departmental Advisor and Department Chair, the Undergraduate Coordinator maintains student records, assists with transfer credit evaluations, clarifies University and departmental procedures, removes the Advisor Registration Block placed on a student's record prior to the next registration cycle, and assists students in the graduation process. Students are strongly urged to personally track their own progress towards their degree by going to Leo Online, printing out a copy of their Degree Evaluation, and bringing it with them when they meet with the Undergraduate Coordinator to discuss any discrepancies found. *It is each student's responsibility to make sure they are on track for graduation.*

## ADVISING REMINDERS FOR STUDENTS

Following is a timeline of important events during a calendar year.

- JANUARY:**            \*GPA in major available late January
- FEBRUARY:**        \*Apply for financial aid for fall  
\*Seniors wishing to graduate in August should apply for graduation and make an advising appointment to review your academic record
- MARCH:**            \*Check undergraduate bulletin board for spring advising schedule  
\*Advising will begin mid-March
- APRIL:**              \*Group Advising sessions held  
\*Pre-registration begins
- MAY:**                \*Seniors wishing to graduate in December should apply for graduation and make an advising appointment to review your academic record  
\* Fundamentals of Engineering Examination Application due for October test (contact Dean's office - Kaufman Hall, Room 102 to obtain application)
- JUNE-AUGUST:**    \*GPA in major available late June  
\*Advising and registration of new students
- OCTOBER:**         \*Check undergraduate bulletin board for fall advising schedule  
\*Advising will begin mid-October  
\*Seniors wishing to graduate in May should apply for graduation and make an advising appointment to review your academic record
- NOVEMBER:**        \*Group advising sessions held  
\*Pre-registration begins

## **DECEMBER:**

- \*Advising and registration of new students
- \*Fundamentals of Engineering Examination Application due for April test

## REGISTRATION

Complete information regarding registration is available in the Enrollment Guide which is available on-line, at the Registrar's Office website: <http://www.odu.edu/ao/registrar/about/guide/index.shtml>. Students may choose to either register through Leo Online or at the Registrar's Office. Advisor signatures will be required for overloads, closed classes, and students exceeding the maximum number of credit hours (18 for undergraduates). Only students with overall GPA 3.00 or greater will be granted permission to register for more than 18 credit hours per semester.

A current schedule of all ECE classes is available both in the office and on our departmental web site. *You are urged to check periodically for all changes and updates to the schedule.*

## HONORS COLLEGE

Top achieving students may wish to join the Honors College. Benefits include being able to register for courses in small class settings. Instructors emphasize innovation and individualized instruction. Honors courses are not designed to be more difficult or time consuming, but to deepen and refine the undergraduate experience.

Being an Honors College student has several benefits. They have privileges at the library, early registration dates, and a \$500 stipend (\$250 per semester.)

### Requirements:

1. Students must earn an overall GPA of at least 3.0 by the end of the first year. To continue, students must earn a GPA of at least 3.25 by the end of the second year and maintain that average. They must take a minimum of four lower division courses with the Honors College designation. They must also take two upper division courses (300-400 level) with an honors designation. A one-credit tutorial and a senior colloquium are also required.
2. Students are required to meet with the Dean once each semester during the first year. First year students are also required to attend honors convocation during the first semester.
3. Honors students enrich their vision of their academic work and the world by attending at least one campus-wide lecture, concert, or workshop each semester.

For a further explanation of benefits and requirements, please visit the website: <http://www.odu.edu/ao/honors/>

## FINANCIAL AID

Information concerning federal and state aid programs and University scholarships is available from the Financial Aid Office, Rollins Hall. You can also visit their web site for more information at <http://www.odu.edu/af/finaid/>. In order to be considered for financial aid during the fall semester, students should be aware that the priority application deadline is February 1 for both scholarships and for the FAFSA form.

## SCHOLARSHIP AND INTERNSHIP OPPORTUNITIES

Scholarship and internship information is available through several different sources. Below are highlighted some of the main opportunities for ECE students.

### *NASA Langley Aerospace Research Summer Scholars (LARSS) Program*

A Summer, Fall, or Spring Paid Internship Opportunity that requires a research project to be completed by the student under supervision of a LaRC mentor. Stipend of \$4,500 for rising juniors and seniors, \$4,000 for rising sophomores, and \$3,600 for rising freshmen.

Eligibility Requirements: U.S. citizen, full-time undergraduate student or first-year graduate student, with minimum GPA of 3.00. Students must team with a faculty member and write a short research proposal outlining work to be done during funding period.

Due Dates: February 1 for Summer 2010, October 31 for Spring 2010, April 15 for Fall 2010

To Apply: Download application from website:  
<http://research.nianet.org/larss/application.html>

### *Honors College Scholarship*

Annual \$500 scholarship to students enrolled in the Honors College

Eligibility Requirements: Full-time ODU students with a minimum GPA of 3.25

Due Dates: None

To Apply: Submit application at website:  
<http://www.odu.edu/ao/honors/>

### *VMEC Scholars Research at ODU*

A 10-to-13-week summer research internship at member institution or research facility, paying up to \$9000 stipend. Funded by The Virginia Microelectronics Consortium for Education and Research.

Eligibility Requirements: A junior or senior engineering student interested in research

Due Dates: February of each year

To Apply: Download application from this website:

<http://people.virginia.edu/~lrh8t/vmec.htm>

*USRP-NASA Undergraduate Student Research Program*

One-year, non-renewable support up to \$9,000

Eligibility Requirements: Undergraduate students enrolled full-time in an accredited U.S. college or university. Applicants must be classified as rising sophomores, juniors or seniors at the beginning of the first session for which they are applying. Highly qualified applicants must be pursuing an undergraduate degree that meets NASA's critical competency needs. Eligible fields of study are academic majors or demonstrated coursework concentration in engineering, mathematics, computer science or physical/life sciences.

Due Dates and Application information can be obtained from website:

<http://www.epo.usra.edu/usrp/>

*The Edgar and Kathleen Kovner Scholarships*

A privately funded, renewable scholarship, featuring four categories, A, B, C, and D

Eligibility Requirements: One category is reserved for minority students (Blacks, Hispanics & American Indians), with high academic achievement in the field of engineering. Other categories are for other specific groups of students.

Prospective recipients are nominated by the various engineering departments.

Students can find additional information on scholarships at this departmental website:

<http://eng.odu.edu/ece/academics/undergrad/usrp.shtml>

More scholarship information is also listed at the College website:

<http://www.eng.odu.edu/eng/resourcesfor/students/Scholarships.shtml>

Specific scholarships listed at this website that would appear to be of interest to ECE students include:

Charles H. Eure Memorial Scholarship  
ECHR (Engineering Club of Hampton Roads)

Framatome Technologies  
ISA , Richmond-Hopewell Section (Instrument Society of America)  
The Lanna, Dunlap & Spriggs Engineering Scholarship  
The Edgar and Kathleen Kovner Scholarships  
Norfolk Foundation Scholarship  
Phillip Morris Scholarship  
SAME Scholarship  
Stuart Russell Memorial Scholarship  
Sumitomo  
SWE - Hampton Roads Section (Society of Women Engineers)  
VA Space Grant Consortium Scholarship  
VSPE (VA Society of Professional Engineers)

The link, <http://www.odu.edu/af/finaid/scholarship/>, lists some general university-wide scholarships, most of which are not intended for ECE students, but may be of interest.

Those planning to continue with a graduate program should also investigate some graduate scholarships (University wide), listed at:

[http://www.odu.edu/af/finaid/graduate\\_student/](http://www.odu.edu/af/finaid/graduate_student/)

## ACADEMIC CONTINUANCE

### UNIVERSITY POLICIES ON ACADEMIC CONTINUANCE

Continuance regulations are based upon grade point average (GPA) computations. ODU uses the following grade system:

A = 4.0	B+ = 3.3	C+ = 2.3	D+ = 1.3	F = 0.0
A- = 3.7	B = 3.0	C = 2.0	D = 1.0	
	B- = 2.7	C- = 1.7	D- = 0.7	

Grade points (Quality Points, as listed on LEO ON LINE) are computed by multiplying the numerical grade equivalent assigned for the course by the number of credit hours. A grade of F counts toward hours attempted (except for an F earned under the Pass/Fail option), even though it carries no grade points. The following table shows an example.

Course	Grade	Course Value	Credits	Quality Points
ENGL 110C	C	2.0	X 3	= 6.0
CHEM 115N	F	0.0	X 4	= 0.0
MATH 211	A	4.0	X 4	= 16.0
SOC 201S	D-	0.7	X 3	= 2.1

Totals = 14 24.1

To arrive at a grade point average for a semester, divide the total number of Quality Points earned by the total number of GPA Hours attempted:  $24.1 / 14 = 1.72$  Current GPA (for one semester). To arrive at the minimum number of Quality Points needed to maintain "good standing", multiply the total number of hours attempted by two, i.e.,  $14 \times 2 = 28$  Quality Points necessary for good standing. So the student is  $(28 - 24.1) = 3.9$  Quality Points short, or has a deficiency of 3.9 points. For example, in order to bring the GPA up to a 2.0, the student should achieve a B+ or better grade in a 3 credit hour course.  $(14 + 3 = 17, \text{ times } 2 = 34, \text{ less current points of } 24.1 = 9.9, \text{ divided by } 3, = 3.3, \text{ a grade of B+ needed.})$  This computation is easily done using the University GPA Calculator located at <http://www.odu.edu/ao/registrar/grades/gpa/index.shtml>

### WITHDRAWING FROM CLASS

Under certain circumstances a student may have to withdraw from a class. Students must submit a completed drop/add form to the Office of Registration and Records or use LEO ON LINE in order to drop or add a class. A signature is not required to drop a class prior to mid-term of the semester. A grade of W will be assigned for classes withdrawn during this period. It is recommended that all students either meet with the Freshman Advisor, or the ECE Faculty Advisor, depending on who advised the student for that semester, prior to adding or dropping a course. Be aware that dropping a course may impact a student's financial aid eligibility.

## GRADING POLICY FOR WITHDRAWAL FROM CLASSES

During the first 6 days of a fall or spring semester (first 3 days of summer session) no grade or reference to a class will appear on a student's academic record should he/she choose to drop a course(s). The date for the drop deadline is posted each semester in the University calendar. Withdrawal from a class after the first six days (or 3 days during summer sessions) will result in a W for the class. A student who stops attending a class without withdrawing will earn a WF unless the student's performance warrants an F, in which case an F will be assigned. When calculating the grade point average, the WF is treated like an F, carrying no grade points.

## ACADEMIC WARNING

A student will be placed on academic warning for one semester when the student's cumulative GPA falls below 2.0 at the end of a semester, including summer sessions. A student on academic warning may not enroll in more than 14 credits per semester of attendance (no more than six credits in the summer sessions, and no more than one course in any single summer session) except under extenuating circumstances and with the permission of the dean or designee of the college in which the student is enrolled. A student on academic warning must achieve a cumulative GPA of at least 2.0 at the end of the next semester of attendance to be in good standing. Failure to achieve a cumulative GPA of at least 2.0 results in academic probation.

Old Dominion University is committed to assisting students in achieving their academic goals. Therefore, freshman students on academic warning are required to participate in a success program sponsored by University College in their next semester of attendance. Failure to complete the requirements of the success program will result in cancellation of registration for the next fall or spring semester.

Students, sophomore level and above, are encouraged to participate in University-sponsored activities designed to help improve the student's status.

## ACADEMIC PROBATION

A student is placed on academic probation when the student's cumulative GPA falls below 2.0 for two consecutive semesters of attendance, including summer sessions. Students on academic probation are expected to improve their cumulative GPA by achieving a semester GPA of 2.0 or better during each semester of attendance. A student who achieves a cumulative GPA of at least 2.0 is removed from academic probation and placed in good academic standing.

Students on academic probation are **required** to meet regularly with their advisor during their next semester of attendance. A student on academic probation **may not** enroll in more than 14 credits per semester of attendance (no more than six credits in the summer sessions, and no more than one course in any single summer session).

Failure to achieve a 2.0 semester GPA at the end of a fall or spring semester while on probation results in academic suspension.

**Students who receive a 0.0 GPA for two consecutive semesters (fall, spring) will be suspended immediately.**

## ACADEMIC SUSPENSION

Academic suspension occurs when a student on academic probation does not maintain a 2.0 SEMESTER GPA. Students who are suspended will follow the matrix below to determine how long they must separate from the University.

First Academic Suspension:

<b>Suspended</b>	<b>Must Separate from ODU for:</b>
Fall term	Spring term
Spring term	Summer and Fall terms

If this is the SECOND suspension:

Student is **no longer eligible to attend** Old Dominion University.

Students do have options as a student on Academic Suspension:

Option #1 - Appeal the Suspension

If a student has extenuating circumstances that caused their academic difficulty, they may file an appeal. The student must have documentation for their situation. The student is also encouraged to include reference letters from their advisor or instructors. Decisions by the appeals committee are final.

Suspension Appeal Application information is found at their website:

<http://uc.odu.edu/continuance/>

Suspension appeal guidelines are found on the paper version.

Option #2 - Accept the Suspension

For more information, contact the Office of Continuance, 757-683-3773.

## ADJUSTED RESIDENT CREDIT OPTION (ARC)

Any undergraduate student who leaves Old Dominion University for at least one calendar year will be given the option of requesting a grade-point-average status equivalent to that of a student admitted as a transfer student according to the following conditions and regulations.

The following conditions governing eligibility will apply:

1. Prior to the one-year's absence, the student must have a grade point average less than 2.00. Upon returning to the University, the student must earn a minimum of 30 credits at Old Dominion University to be eligible for a degree. This must include six hours of upper-level courses in the department of the declared major.
2. The student must have separated from the institution for at least one calendar year. A term in which the student received W grades cannot be counted as part of the calendar year separation.
3. Upon return, a full-time student must have attained a 2.00 grade point average for all work attempted in the first semester or upon completion of the first 12 semester hours, if part-time. Non-degree credit work shall not be counted toward fulfillment of this requirement.
4. Upon satisfying the above requirements, the student must submit the application for Adjusted Resident Credit.
5. This option will be available only once during the student's career at Old Dominion University and must be elected by the end of the second semester following qualifications as described in paragraph 3 above. (In all cases, the Adjusted Resident Credit option must be elected and the student's record adjusted prior to graduation.) Upon written petition by the student and recommendation of the department chair, waivers of the time limit to elect Adjusted Resident Credit and the requirement that students have less than a 2.00 grade point average can be made by the dean of the college in which the student's major program resides.
6. Consultation and approval by the appropriate department and approval of the dean(s) of the college(s) in which the student's major program resides will be required. Once an application is approved and submitted, the student will not be permitted to change status for the purpose of computing the cumulative grade point average or application of credit toward graduation.
7. All grades received at the University will be part of the individual's official transcript and will be used to determine honor awards. However, computation of a new grade point average for graduation and continuance will be based on work performed subsequent to reinstatement.
8. Under this option: (1) eligible students will receive degree credit only for those courses in which grades of C (2.00) or better were earned prior to readmission; (2) likewise, hours attempted for courses in which grades of C- or less were received prior to readmission will not be considered in computing the student's new cumulative grade point average; and (3) grade points earned for any course completed prior to readmission will not count in determining the student's new cumulative grade point average.

9. In cases of dual jurisdiction, University continuance regulations will prevail.

Students wishing to avail themselves of this policy may receive procedural information from the Office of Registration and Records.

## GRADE FORGIVENESS

When students retake courses, each time the grade becomes part of the transcript and the grade point average. The Grade Forgiveness Policy (GFP) makes it possible for a student to retake a course with only the repeated grade computed in the grade point average. The following conditions apply:

1. The GFP applies to all Old Dominion undergraduate courses.
2. The GFP cannot be used once the student has graduated.
3. The GFP applies only if the course grade is C-, D+, D, D-, F, and WF.
4. An individual course can be retaken no more than once using the GFP. Grade forgiveness is automatically applied only to the first repeat of a course with an original grade of C- or less, regardless of how many times the student may elect to repeat the course for other reasons. Any grade received for a subsequent retaking of the course will be included in the grade point average.
5. A student may use grade forgiveness one time per course but only for five courses during the student's enrollment at the University. Students who have already used grade forgiveness, no matter how many times, will be able to use grade forgiveness an additional total of five times beginning this Fall. Once the five-time limit has been reached, grade forgiveness will not be applied, and all attempts at taking a course will be calculated into the student's attempted hours and GPA.
6. Student transcripts will continue to list all courses taken and the grades received; however, under the GFP, the grade point average includes only the repeated grade (even if it is worse). Academic suspensions will not be removed from student transcripts and Dean's list status will not be added after use of the GFP.
7. An enhanced grade point average using the GFP determines eligibility for continuance and graduation but not for graduation with honors or Dean's list.
8. Students may elect to use both the GFP and the Adjusted Resident Credit (ARC) policy. However, students cannot use the GFP for individual courses for which they have already used the ARC policy.

## DEPARTMENTAL POLICIES ON ACADEMIC CONTINUANCE

In addition to continuance regulations administered through the University, the Department of Electrical and Computer Engineering has established continuance regulation policies based on a student's Major GPA.

### A. Probation/Suspension Policies

Courses in the electrical engineering major are defined as courses with an ECE prefix; courses in the computer engineering major are defined as courses with an ECE and CS prefix.

1. Students will be placed on departmental academic probation whenever his or her grade point average in the major (Major GPA) falls below 2.00 after six or more hours are completed.
2. Students will be suspended indefinitely from the department if his or her record shows either of the following:
  - a. A deficiency of more than 9 quality points below that required to maintain 2.00 cumulative average in the major. This rule applies to students who have attempted fewer than 35 hours in the major.
  - b. A deficiency of more than 6 quality points below that required to maintain 2.00 cumulative average in the major. This rule applies to students who have attempted 35 hours or more in the major. (See page 32 for an explanation and computation of deficiency points.)

Appeals of departmental suspension are in order if extenuating circumstances warrant. Appeals are to be made in writing to the Department Chair and will be considered by the department faculty.

#### B. Minimum “C” Grade Policy

In order to maintain the standards of the undergraduate programs within the Department of Electrical and Computer Engineering, a minimum grade of “C” or better is now required for all sophomore-level classes (200-level), ECE 200, 201, 202, 241, and 287. As our undergraduate program in Computer Engineering is offered in conjunction with the Computer Science Department, we also adhere to their “C” grade policy for all Computer Engineering students. The Computer Science Department requires a minimum grade of “C” or better in all the major courses, CS 150, 250, 361, and 350. For both programs, EE and CpE, this means that the minimum grade of “C” must be obtained prior to taking the next course in the sequence. A grade of “C-” does not satisfy the requirement for a “C” grade.

## APPLICATION FOR GRADUATION

ALL STUDENTS ARE REQUIRED TO APPLY TO GRADUATE. Students who have completed 102 credit hours, will be reminded via email to their ODU email account that they are eligible to apply for graduation. First, students must print out a copy of their Degree Evaluation form Leo Online and review it with the Undergraduate Coordinator to be sure they are ready to graduate. Applications are available on the Registrar's web site at <http://www.odu.edu/ao/registrar/>. Go to the Forms section and complete the Undergraduate Application for Graduation. If a student is completing a minor, they must also meet with the advisor of the minor department to be sure the minor requirements have been met.

In addition, all students must pass the University's Exit Exam of Writing Proficiency. Students are eligible to take this test upon completion of 58 credits. Check the Writing Center website, <http://uc.odu.edu/writingcenter/>, for testing dates and information. After students apply for graduation, they will also be sent a link inviting them to take the SENIOR ASSESSMENT test, administered by the University Testing Center, 683-3697. Additional graduation information is published each semester in the Guide to Enrollment, available on the Registrar's website. **Students are responsible for monitoring their own progress toward degree completion and for meeting all graduation requirements.**

### CHECK-LIST for GRADUATION

The following is a list of requirements for your Bachelor of Science degree in Electrical or Computer Engineering that must be completed. Check them off as you do each one.

- Pass the Writing Sample Placement Test. (Testing Center, 683-3697)
- Meet the Foreign Language requirements. (Admissions Office, 683-3685)
- Ensure that all transcripts of previous or additional college course work have been received by the Office of Admissions. (If applicable)
- Pass the Exit Examination of Writing Proficiency. (Writing Center, 683-4112)
- Submit the Application for Graduation.
- Complete the Senior Assessment.
- Attend the Senior Exit Interview session with the Chair of the Department of Electrical and Computer Engineering and complete the Exit Interview Survey online at our website. The link will be provided to Exit Interview participants in their final semester.
- Ensure you hold a major, a minor, and overall grade point average of 2.0 or better.

## **STUDENT ORGANIZATIONS**

### **ETA KAPPA NU**

Eta Kappa Nu, Zeta Upsilon chapter, is the national electrical engineering honor society. Outstanding students are elected to Eta Kappa Nu from the junior and senior classes. Eligibility depends on marked ability, as evidenced by scholarship, personal character, useful voluntary services, and distinguished accomplishments.

Activities sponsored by Eta Kappa Nu include Engineering Career Day during the fall semester, free tutoring services, and presentation of the Outstanding Sophomore Award to the sophomore electrical or computer engineering student with the highest grade point average and best recommendations from ECE faculty.

### **INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS (IEEE)**

The Institute of Electrical and Electronics Engineers is the world's largest technical professional society with over 300,000 members. IEEE is directed toward the advancement of the theory and practice of electrical engineering, electronics, computer engineering and the related branches of engineering and sciences. The ODU student branch offers educational films and speakers, availability to obtain discount computers, and many other activities to enhance one's future.

### **NATIONAL SOCIETY OF BLACK ENGINEERS (NSBE)**

The National Society of Black Engineers is a student-run, non-profit organization whose mission is to recruit, retain and successfully graduate its members. The organization acts as a vehicle promoting unity through programs that encourage academic excellence, personal growth and professional development, thereby increasing the number of minority professionals who are committed to the development of the minority community.

### **SOCIETY OF WOMEN ENGINEERS (SWE)**

The Society of Women Engineers consists of nearly 100 professional sections, 300 student sections, and members-at-large in all engineering and technology disciplines, making SWE a preeminent not-for-profit organization respected among the engineering community and technical societies. The specific objectives of the society are: to inform women, their parents, counselors, and the general public of the qualifications and achievements of women engineers and the opportunities open to them; to assist women engineers in readying themselves for a return as an active work professional; to serve as a center of information on women in engineering and to encourage women engineers to attain high levels of education and professional achievement.

## TAU BETA PI

Tau Beta Pi, the second oldest honor society, was founded in 1885 to recognize distinguished scholarship and exemplary character in engineering students, and to "foster a spirit of liberal culture." To be invited to join Tau Beta Pi, a student must display exemplary character and be in the top eighth of the junior class or the top fifth of the senior class of the College of Engineering and Technology. The Virginia Gamma chapter at Old Dominion University meets twice a month and performs several service projects such as offering a scholarship for juniors in engineering and providing proctors for the high school "JETS" and "TEAMS" test.

## THETA TAU

Theta Tau is a professional engineering fraternity. The purpose of Theta Tau is to develop and maintain a high standard of professional interest among its members and to unite them in a strong bond of fraternal fellowship. It blends desirable features of general fraternities, technical societies, and honor societies to prepare its student members for the engineering profession.

## **CURRICULUM WORKSHEETS**

## B. S. ELECTRICAL ENGINEERING CURRICULUM

Department of Electrical & Computer Engineering

2009-2010 Catalog

### FRESHMAN FIRST SEMESTER

			Term	Grade	Pre-/Co-requisites
ENGN 110	Engineering & Tech I	2	_____	_____	P-MATH 162M
CHEM 115N	Chemistry I	4	_____	_____	C-MATH 102M
MATH 211	Calculus I	4	_____	_____	P-MATH 163
ENGL 110C	English Comp I	3	_____	_____	P-pass Placement test
GEN ED: Fine/Performing Arts Perspective		3	_____	_____	_____

### FRESHMAN SECOND SEMESTER

ENGN 111	Engineering & Tech II	2	_____	_____	P-MATH 162M
CHEM 117	Chemistry II	3	_____	_____	P-CHEM 115N
MATH 212	Calculus II	4	_____	_____	P-MATH 211
CS 150	Intro to Programming	4	_____	_____	P-MATH 102M
PHYS 231N	University Physics	4	_____	_____	P/C-MATH 211

### SOPHOMORE FIRST SEMESTER

MATH 307(280)	Differential Equations	3	_____	_____	P-MATH 212
ECE 200	Engn. Analysis Tools	3	_____	_____	P-MATH 212, C-MATH 307
ECE 201	Circuit Analysis	3	_____	_____	P/C-MATH 307, PHYS 232N, ECE 200
PHYS 232N	University Physics	4	_____	_____	P-PHYS 231N
ECE 241	Fund. Comp. Engn.	4	_____	_____	P-CS 150, MATH 211

### SOPHOMORE SECOND SEMESTER

ECE 202	Circ., Signals & Lin. Syst.	3	_____	_____	P-ECE 201, MATH 307
ECE 287	Circuit Laboratory	2	_____	_____	P-ECE 201, CS 150, C-ECE 202
Engr	Nonmajor Engr elec	3	_____	_____	_____
MATH 312(285)	Calculus III	4	_____	_____	P-MATH 212
GEN ED: History Perspective		3	_____	_____	_____

### JUNIOR FIRST SEMESTER

ECE 303	Electrical Power	3	_____	_____	P-ECE 201
ECE 313	Electronic Circuits	4	_____	_____	P-ECE 202, P/C-241
ECE 332	Micro. Materials	3	_____	_____	P-ECE 202
ENGL 131C	Technical Writing	3	_____	_____	P-ENGL 110C
GEN ED: Literature Perspective		3	_____	_____	_____

### JUNIOR SECOND SEMESTER

ECE 304	Prob. Stat. & Reliab.	3	_____	_____	P-MATH 212
ECE 387	Microelec. Fabric. Lab	3	_____	_____	P-ECE 332
ECE 4XX	Technical Elective 1	3	_____	_____	_____
ECE 323	Electromagnetics	3	_____	_____	P-ECE 202
GEN ED: Philosophy Perspective		3	_____	_____	_____

### SENIOR FIRST SEMESTER

ECE 485W	EE Design I	3	_____	_____	P-ECE 313, P/C-ECE 303, 304, 323, 332
ECE 4XX	Technical Elective 2	3	_____	_____	_____
GEN ED: Social Science Perspective		3	_____	_____	_____
Upper Division Gen Education		3	_____	_____	_____
Upper Division Gen Education		3	_____	_____	_____

### SENIOR SECOND SEMESTER

ECE 486	ECE Design II	3	_____	_____	P-ECE 485W
ECE 4XX	Technical Elective 3	3	_____	_____	_____
ECE 4XX	Technical Elective 4	3	_____	_____	_____
Elec	Approved Elective	3	_____	_____	_____
ENGN 401	FE Exam Review	1	_____	_____	_____

**Cluster/Minor/2 Upper Division:** \_\_\_\_\_ **Upper division cluster-9 hours; Minor – minimum of 12 hours;**

**or 2 Upper Division courses outside the college and not required by the major Foreign Language:** \_\_\_\_\_

**B. S. COMPUTER ENGINEERING CURRICULUM**

2009-2010 Catalog

**FRESHMAN FIRST SEMESTER**

			Term	Grade	Pre-/Co-requisites
ENGN 110	Engineering & Tech I	2	_____	_____	P-MATH 162M
CHEM 115N	Chemistry I	4	_____	_____	C-MATH 102M
MATH 211	Calculus I	4	_____	_____	P-MATH 163
ENGL 110C	English Comp I	3	_____	_____	P-pass Placement test
GEN ED: Fine/Performing Arts Perspective		3	_____	_____	_____

**FRESHMAN SECOND SEMESTER**

ENGN 111	Engineering & Tech II	2	_____	_____	P-MATH 162M
CHEM 117	Chemistry II	3	_____	_____	P-CHEM 115N
MATH 212	Calculus II	4	_____	_____	P-MATH 211
CS 150	Intro to Programming	4	_____	_____	P-MATH 102M
PHYS 231N	University Physics I	4	_____	_____	P/C-MATH 211

**SOPHOMORE FIRST SEMESTER**

MATH 307(280)	Differential Equations	3	_____	_____	P-MATH 212
ECE 200	Engn. Analysis Tools	3	_____	_____	P-MATH 212, C-MATH 307
ECE 201	Circuit Analysis	3	_____	_____	P/C-MATH 307, PHYS 232N, ECE 200
PHYS 232N	University Physics	4	_____	_____	P-PHYS 231N
GEN ED: History Perspective		3	_____	_____	_____

**SOPHOMORE SECOND SEMESTER**

ECE 202	Circ., Signals & Lin. Syst.	3	_____	_____	P-ECE 201, MATH 307
ECE 287	Circuit Laboratory	2	_____	_____	P-ECE 201, CS 150, C-ECE 202
ECE 241	Fund. Comp. Engn.	4	_____	_____	P-CS 150, MATH 211
CS 250	Prob Solving & Prog.	4	_____	_____	P-CS 150, C-CS 252
CS 252	Intro to UNIX	1	_____	_____	C-CS 250
GEN ED: Literature Perspective		3	_____	_____	_____

**JUNIOR FIRST SEMESTER**

ECE 313	Electronic Circuits	4	_____	_____	P-ECE 202, P/C-241
ECE 341	Digital System Design	3	_____	_____	P-ECE 241
CS 361	Adv. Data Structures	3	_____	_____	P-CS 250, CS 252
GEN ED: Philosophy Perspective		3	_____	_____	_____
ENGL 131C	Technical Writing	3	_____	_____	P-ENGL 110C

**JUNIOR SECOND SEMESTER**

ECE 304	Prob. Stat. & Reliab.	3	_____	_____	P-MATH 212
ECE 346	Microcontrollers	3	_____	_____	P-ECE 241
CS 451	Software Engineering	3	_____	_____	P-CS 361
ECE 3XX	Technical Elective 1	3	_____	_____	_____
Upper Division Gen Education		3	_____	_____	_____

**SENIOR FIRST SEMESTER**

ECE 489W	CMEN Design I	3	_____	_____	P/C-ECE 313, P-ECE 341, 346, C-ECE 443
ECE 443	Computer Architecture	3	_____	_____	P-ECE 341, 346, P/C-ECE 304, 489W
ECE 4XX	Technical Elective 2	3	_____	_____	_____
Upper Division Gen Education		3	_____	_____	_____
GEN ED: Social Science Perspective		3	_____	_____	_____

**SENIOR SECOND SEMESTER**

ECE 486	ECE Design II	3	_____	_____	P- 489W
CS 471	Operating Systems	3	_____	_____	P-CS 361, ECE 443
ECE 4XX	Technical Elective 3	3	_____	_____	_____
ECE 4XX	Technical Elective 4	3	_____	_____	_____
ENGN 401	FE Exam Review	1	_____	_____	_____

**Cluster/Minor/2 Upper Division: \_\_\_\_\_ Upper division cluster-9 hours; Minor – minimum of 12 hours; or 2 Upper Division courses outside the college and not required by the major**

Foreign Language: \_\_\_\_\_

**B.S. ELECTRICAL ENGR., Second Major in COMPUTER ENGR.****B.S. COMPUTER ENGR., Second Major in ELECTRICAL ENGR.**

Department of Electrical &amp; Computer Engineering

2009-2010 Catalog

**FRESHMAN FIRST SEMESTER**

			Term	Grade	Pre-/Co-requisites
ENGN 110	Engineering & Tech I	2	_____	_____	P-MATH 162M
CHEM 115N	Chemistry I	4	_____	_____	C-MATH 102M
MATH 211	Calculus I	4	_____	_____	P-MATH 163
ENGL 110C	English Comp I	3	_____	_____	P-pass Placement test
GEN ED: Fine/Performing Arts Perspective		3	_____	_____	_____

**FRESHMAN SECOND SEMESTER**

ENGN 111	Engineering & Tech II	2	_____	_____	P-MATH 162M
CHEM 117	Chemistry II	3	_____	_____	P-CHEM 115N
MATH 212	Calculus II	4	_____	_____	P-MATH 211
CS 150**	Intro to Programming	4	_____	_____	P-MATH 102M
PHYS 231N	University Physics I	4	_____	_____	P/C-MATH 211

**SOPHOMORE FIRST SEMESTER**

MATH 307(MATH 280)	Differential Equations	3	_____	_____	P-MATH 212
ECE 200	Engr. Analysis Tools	3	_____	_____	P-MATH 212, C-MATH 307
ECE 201	Circuit Analysis	3	_____	_____	P/C-MATH 307, PHYS 232N
PHYS 232N	University Physics	4	_____	_____	P-PHYS 231N
GEN ED: History Perspective		3	_____	_____	_____

**SOPHOMORE SECOND SEMESTER**

ECE 202	Circ., Signals & Lin. Syst.	3	_____	_____	P-ECE 201, MATH 307
ECE 287	Circuit Laboratory	2	_____	_____	P-ECE 201, C-ECE 202
ECE 241	Fund. Comp. Engr.	4	_____	_____	P-CS 150
CS 250	Prob Solving & Prog.	4	_____	_____	P-CS 150, C-CS 252
CS 252	Intro to UNIX	1	_____	_____	C-CS 250
GEN ED: Literature Perspective		3	_____	_____	_____

**JUNIOR FIRST SEMESTER**

ECE 313	Electronic Circuits	4	_____	_____	P-ECE 202, P/C-241
ECE 341	Digital System Design	3	_____	_____	P-ECE 241
MATH 312 (MATH 285)	Calculus III	4	_____	_____	P-MATH 212
CS 361	Adv. Data Structures	3	_____	_____	P-CS 250, CS 252
GEN ED: Philosophy Perspective		3	_____	_____	_____

**JUNIOR SECOND SEMESTER**

ECE 304	Prob. Stat. & Reliab.	3	_____	_____	P-MATH 212
ECE 323	Electromagnetics	3	_____	_____	P-ECE 202
ECE 346	Microcontrollers	3	_____	_____	P-ECE 241
CS 350	Software Engineering	3	_____	_____	P-CS 361
ENGL 131C	Technical Writing	3	_____	_____	P-ENGL 110C

**SENIOR FIRST SEMESTER**

ECE 485W	EE Design I	3	_____	_____	P-ECE 313, P/C-ECE 303, 304, 323, 332
ECE 489W	CpE Design I	3	_____	_____	P/C-ECE 313, P-ECE 341, 346
ECE 303	Electrical Power	3	_____	_____	P-ECE 201
ECE 443	Computer Architecture	3	_____	_____	P-ECE 341, 346, P/C-ECE 304, 489W
ECE 332	Micro. Materials	3	_____	_____	P-ECE 202
GEN ED: Social Science Perspective		3	_____	_____	_____

**SENIOR SECOND SEMESTER**

ECE 486	ECE Design II	3	_____	_____	P-ECE 485W, 489W
CS 471	Operating Systems	3	_____	_____	P-CS 361, ECE 443
ECE 387	Microelec. Fabric. Lab	3	_____	_____	P-ECE 332
Tech Elec	ECE tech elective	3	_____	_____	_____
ENGN 401	FE Exam Review	1	_____	_____	_____

Foreign Language: \_\_\_\_\_

## BS COMPUTER ENGINEERING AND BS COMPUTER SCIENCE

Departments of Electrical & Computer Engineering/Computer Science

2009-2010 Catalog

### FIRST YEAR FIRST SEMESTER

			Term	Grade	Pre-/Co-requisites
ENGN 110	Engineering & Tech I	2	_____	_____	P-MATH 162M
CS 110	Intro to CS	1	_____	_____	
MATH 211	Calculus I	4	_____	_____	P-MATH 163
ENGL 110C	English Comp I	3	_____	_____	P-pass Placement test
GEN ED: Fine/Performing Arts Perspective		3	_____	_____	_____

### FIRST YEAR SECOND SEMESTER

ENGN 111	Engineering & Tech II	2	_____	_____	P-MATH 162M
MATH 212	Calculus II	4	_____	_____	P-MATH 211
CS 150	Intro to Programming	4	_____	_____	P-MATH 102M
PHYS 231N	University Physics I	4	_____	_____	P/C-MATH 211
GEN ED: History Perspective		3	_____	_____	_____

### SECOND YEAR FIRST SEMESTER

MATH 307(MATH 280)	Differential Equations	3	_____	_____	P-MATH 212
CHEM 115N	Chemistry I	4	_____	_____	C-MATH 102M
ECE 200	Engn. Analysis Tools	3	_____	_____	P-MATH 212, C-MATH 307
ECE 201	Circuit Analysis	3	_____	_____	P/C-MATH 307, PHYS 232N
PHYS 232N	University Physics	4	_____	_____	P-PHYS 231N

### SECOND YEAR SECOND SEMESTER

CHEM 117	Chemistry II	3	_____	_____	P-CHEM 115N
ECE 202	Circ., Signals&Lin.Syst.	3	_____	_____	P-ECE 201, MATH 307
ECE 287	Circuit Laboratory	2	_____	_____	P-ECE 201, CS 150, C-ECE 202
CS 250	Prob Solving & Prog.	4	_____	_____	P-CS 150, C-CS 252
CS 252	Intro to UNIX	1	_____	_____	C-CS 250

### THIRD YEAR FIRST SEMESTER

ECE 241	Fund. Comp. Engn.	4	_____	_____	P-CS 150
CS 330	Obj. Orient. Progr.Dsgn.	3	_____	_____	P-CS 250, CS 252, MATH 163
CS 381	Intro Discrete Structure	3	_____	_____	P-MATH 163, CS 150
GEN ED: Literature Perspective		3	_____	_____	_____
COMM 101R	Public Speaking	3	_____	_____	_____

### THIRD YEAR SECOND SEMESTER

ECE 313	Electronic Circuits	4	_____	_____	P-ECE 202, P/C-241, C-ECE 382
ECE 341	Digital System Design	3	_____	_____	P-ECE 241
CS 361	Adv. Data Structures	3	_____	_____	P-CS 250, CS 252
CS 390	Intro. Theor.Comp.Sci.	3	_____	_____	P-CS 250, CS 381

### FOURTH YEAR FIRST SEMESTER

MATH 316	Linear Algebra	3	_____	_____	P-MATH 212
ECE 304	Prob. Stat. & Reliab.	3	_____	_____	P-MATH 212
CS 350	Software Engineering	3	_____	_____	P-CS 361
ECE/CS	Technical Elective	3	_____	_____	_____
GEN ED: Philosophy Perspective		3	_____	_____	_____

### FOURTH YEAR SECOND SEMESTER

ECE 346	Microcontrollers	3	_____	_____	P-ECE 241
ENGL 131C	Technical Writing	3	_____	_____	P-ENGL 110C
CS 417	Comp. Methods	3	_____	_____	P-CS 250, MATH 316
CS 300	Computers in Society	3	_____	_____	P-ENGL 110C, COMM 101R

### FIFTH YEAR FIRST SEMESTER

ECE 489W	CpE Design I	3	_____	_____	P/C-ECE 313, P-ECE 341, 346
ECE 443	Computer Architecture	3	_____	_____	P-ECE 341, 346, P/C-ECE 304, 489W
CS 410	Prof. Workforce Dev. I	3	_____	_____	P-CS 300, CS 350
GEN ED: Social Science Perspective		3	_____	_____	_____

### FIFTH YEAR SECOND SEMESTER

ECE 486	ECE Design II	3	_____	_____	P- 489W
CS 471	Operating Systems	3	_____	_____	P-CS 361, ECE 443
CS 411W	Prof. Workforce Dev. II	3	_____	_____	P-CS 410
ENGN 401	FE Exam Review	1	_____	_____	

Foreign Language: \_\_\_\_\_

## BS ELECTRICAL ENGINEERING AND BS PHYSICS

Departments of Electrical & Computer Engineering/Physics  
2009-2010 Catalog

<b>FIRST YEAR FIRST SEMESTER</b>			Term	Grade	Pre-/Co-requisites
ENGN 110	Engineering & Tech I	2	_____	_____	P-MATH 162M
CHEM 115N	Chemistry I	4	_____	_____	C-MATH 102M
MATH 211	Calculus I	4	_____	_____	P-MATH 163
ENGL 110C	English Comp I	3	_____	_____	P-pass Placement test
PHYS 231N	University Physics I	4	_____	_____	P/C-MATH 211
<b>FIRST YEAR SECOND SEMESTER</b>					
ENGN 111	Engineering & Tech II	2	_____	_____	P-MATH 162M
CHEM 116N	Chemistry II	4	_____	_____	P-CHEM 115N
MATH 212	Calculus II	4	_____	_____	P-MATH 211
CS 150	Intro to Programming	4	_____	_____	P-MATH 102M
PHYS 232N	University Physics	4	_____	_____	P-PHYS 231N
<b>SECOND YEAR FIRST SEMESTER</b>					
MATH 307(MATH 280)	Differential Equations	3	_____	_____	P-MATH 212
ECE 200	Engn. Analysis Tools	3	_____	_____	P-MATH 212, C-MATH 307
ECE 201	Circuit Analysis	3	_____	_____	P/C-MATH 307U, PHYS 232N
PHYS 323	Modern Physics	4	_____	_____	P-PHYS 232N
PHYS 319	Analytical Mechanics	3	_____	_____	P/C-MATH 307U, PHYS 232N
<b>SECOND YEAR SECOND SEMESTER</b>					
ECE 202	Circ., Signals & Lin. Syst.	3	_____	_____	P-ECE 201, MATH 307U
ECE 287	Circuit Laboratory	2	_____	_____	P-ECE 201, CS 150, C-ECE 202
ECE 241	Fund. Comp. Engn.	4	_____	_____	P-CS 150
PHYS 320	Intro. Electromag. Theory	3	_____	_____	P/C-MATH 312, PHYS 232N
MATH 312(MATH 285)	Calculus III	4	_____	_____	P-MATH 212
<b>THIRD YEAR FIRST SEMESTER</b>					
ECE 303	Electrical Power	3	_____	_____	P-ECE 201
ECE 313	Electronic Circuits	4	_____	_____	P-ECE 202, P/C-241
ECE 332	Micro. Materials	3	_____	_____	P-ECE 202
PHYS 453	Electro. Rad. & Optics	3	_____	_____	P-ECE 323, MATH 312
GEN ED: Fine/Performing Arts Perspective		3	_____	_____	_____
<b>THIRD YEAR SECOND SEMESTER</b>					
ECE 304	Prob. Stat. & Reliab.	3	_____	_____	P-MATH 212
ECE 387	Microelec. Fabric. Lab	3	_____	_____	P-ECE 332
PHYS 352	Intro Quantum Mech.	3	_____	_____	P-PHYS 319, PHYS 323
GEN ED: History Perspective		3	_____	_____	_____
PHYS 4XX	411, 415, 416, or 417	3	_____	_____	_____
<b>FOURTH YEAR FIRST SEMESTER</b>					
ECE 485W	EE Design I	3	_____	_____	P-ECE 313, P/C-ECE 303, 304, 323, 332
ECE 4XX	Technical Elective 1	3	_____	_____	_____
PHYS 456	Intermed Quantum Mech.	3	_____	_____	P-PHYS 323, PHYS 352
PHYS 4XX	Technical Elective 1*	3	_____	_____	_____
GEN ED: Literature Perspective		3	_____	_____	_____
<b>FOURTH YEAR SECOND SEMESTER</b>					
ECE 486	ECE Design II	3	_____	_____	P-ECE 485W
PHYS 350	Light and Lasers	3	_____	_____	_____
PHYS 413	Experimental Physics	3	_____	_____	P-PHYS 323
GEN ED: Philosophy Perspective		3	_____	_____	_____
<b>FIFTH YEAR FIRST SEMESTER</b>					
PHYS 4XX	Technical Elective 2*	3	_____	_____	_____
PHYS 499W	Physics Senior Thesis	3	_____	_____	_____
ENGL 131C	Technical Writing	3	_____	_____	P-ENGL 110C
GEN ED: Social Science Perspective		3	_____	_____	_____
ECE 4XX	Technical Elective 2	3	_____	_____	_____
<b>FIFTH YEAR SECOND SEMESTER</b>					
MATH 422	Complex Variables	3	_____	_____	P-MATH 312
PHYS 420	Computational Physics	3	_____	_____	P-PHYS 232N, MATH 212
ECE 4XX	Technical Elective 3	3	_____	_____	_____
PHYS 454	Thermal & Stat. Physics	3	_____	_____	P-PHYS 319, PHYS 323
ENGN 401	FE Exam Review	1	_____	_____	_____

\* PHYS Technical Electives: 313, 304, 411, 415, 416, 417, 491 or 497, 311 or 332

Foreign Language: \_\_\_\_\_

## CONTACT INFORMATION

<b><u>ECE Department</u></b>	<a href="http://eng.odu.edu/ece/">http://eng.odu.edu/ece/</a>	
Dr. Shirshak Dhali, Chair <a href="mailto:sdhali@odu.edu">sdhali@odu.edu</a>	KAUF 231	683-3744
Dr. Vishnu K. Lakdawala Chief Departmental Advisor <a href="mailto:vlakdawa@odu.edu">vlakdawa@odu.edu</a>	KAUF 217	683-3741
Dr. Amin Dharamsi Departmental Freshman Advisor <a href="mailto:adharams@odu.edu">adharams@odu.edu</a>	KAUF 111F	683-4467
Dr. Sacharia Albin Graduate Program Director <a href="mailto:salbin@odu.edu">salbin@odu.edu</a>	KAUF 231N	683-3741
Linda Marshall Senior Secretary <a href="mailto:lmarshall@odu.edu">lmarshall@odu.edu</a>	KAUF 231	683-3741
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Romina Samson Fiscal Technician <a href="mailto:rsamson@odu.edu">rsamson@odu.edu</a>	KAUF 231	683-3741
<b><u>Batten College of Engineering and Technology</u></b>	<a href="http://www.eng.odu.edu/index.php">http://www.eng.odu.edu/index.php</a>	
Dr. Oktay Baysal, Dean <a href="mailto:obaysal@odu.edu">obaysal@odu.edu</a>	KAUF 102	683-3789
Bev Forbes, Assistant Director Career Management Center <a href="mailto:bforbes@odu.edu">bforbes@odu.edu</a>	KAUF 132	683-5341
Dr. Linda Vahala, Director Engineering Foundations Division <a href="mailto:lvahala@odu.edu">lvahala@odu.edu</a>	KAUF 102	683-4245

## University

Admissions Office <a href="http://www.admissions.odu.edu/home.php">http://www.admissions.odu.edu/home.php</a>	Rollins 108 admit@odu.edu	683-3685
Bookstore <a href="http://www.bkstr.com">http://www.bkstr.com</a>	University Village	683-3407
Career Management Center <a href="http://www.odu.edu/ao/cmc/index.php">http://www.odu.edu/ao/cmc/index.php</a>	2202 Webb Center cmc@odu.edu	683-4388
Cooperative Education Engineering Branch Satellite Office <a href="http://www.odu.edu/ao/cmc/en/index.shtml">http://www.odu.edu/ao/cmc/en/index.shtml</a>	KAUF 132	683-5341
Financial Aid Office <a href="http://www.odu.edu/af/finaid/">http://www.odu.edu/af/finaid/</a>	Rollins 121	683-3683
Office of the Registrar <a href="http://www.odu.edu/ao/registrar/">http://www.odu.edu/ao/registrar/</a>	Rollins 116 register@odu.edu	683-4425
Experiential Learning and Testing Center <a href="http://studentservices.odu.edu/testing/">http://studentservices.odu.edu/testing/</a>	138 Gornto Teletechnet	683-3697
Writing Center <a href="http://studentaffairs.odu.edu/writingcenter/">http://studentaffairs.odu.edu/writingcenter/</a>	1501 West 49th Street wcinfo@odu.edu	683-4112

## APPENDIX A

### DEPARTMENT FACULTY

**Sacharia Albin** 683-4967 salbin@odu.edu  
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B.Sc., M.Sc., University of Kerala (India), Ph.D., University of Poona (India).  
Nanotechnology, photonics, semiconductor lasers, diamond films, fiber optic sensors.

**K. Vijayan Asari** 683-3741 vasari@odu.edu  
Professor of Electrical and Computer Engineering  
B.S., University of Kerala (India); M. Tech and Ph.D., Indian Institute of Technology (India) Signal processing, image processing, multiple valued neural networks, high performance architectures for application specific integrated circuits.

**Helmut Baumgart** 683-3746 hbaumgar@odu.edu  
Professor of Electrical and Computer Engineering  
B.S., University of Heidelberg (Germany), M.S., Purdue University, Ph.D., University of Stuttgart and Max-Planck Institute of Solid State Research (Stuttgart, Germany). Microelectronics, Semiconductor Device Processing, Integrated Circuit Fabrication Technology, IC Process Integration, Design for Yield, Yield Enhancement, Statistical Process Control, Nanotechnology and Nanoelectronics, Atomic Layer Deposition (ALD) Technology, Gate Stack Engineering, High-k Dielectrics for advanced gate stacks in CMOS and DRAM capacitor applications in sub 65nm feature size integrated circuits, BEOL Integration of low-k interconnect isolation materials with Cu dual Damascene metallization, Silicon-on-Insulator (SOI) Technology, Thin Film Materials Science.

**Lee Belfore, III** 683-3746 lbelfore@odu.edu  
Associate Professor of Electrical and Computer Engineering  
B.S. from Virginia Tech; M.S.E. from Princeton University; Ph.D. from University of Virginia. Game based learning, visual simulation, modeling & simulation, artificial intelligence, fault modeling & fault tolerant computing.

**Shirshak K. Dhali** 683-4467 sdhali@odu.edu  
Professor and Chair of Electrical and Computer Engineering  
B.Tech., Indian Institute of Technology, Kharagpur; M.S., Ph.D. Texas Tech University. Atmospheric pressure plasmas, electrical discharge modeling, analog VLSI.

- Amin N. Dharamsi** 683-4467 adharams@odu.edu  
 Professor of Electrical and Computer Engineering  
 B.S., University of Nairobi (Kenya); M.S., Ph.D., University of Alberta (Canada).  
 Quantum electronics, molecular spectroscopy, non-intrusive measurements with lasers.
- Hani E. Elsayed-Ali** 683-3748 helsayed@odu.edu  
 Professor and Eminent Scholar of Electrical and Computer Engineering  
 B.S., University of Miami-Coral Gables (Florida); M.S., Ph.D., University of Illinois-Urbana. Ultrafast lasers, electronic materials, fabrication of thin films, laser-material processing, and surface processing.
- Oscar R. Gonzalez** 683-4966 ogonzale@odu.edu  
 Associate Professor of Electrical and Computer Engineering  
 B.S., University of Idaho; M.S., Ph.D., University of Notre Dame. Multivariable system and control theory, robust control system design, nonlinear control system and artificial intelligence applications.
- W. Steven Gray** 683-4671 sgray@odu.edu  
 Associate Professor of Electrical and Computer Engineering  
 B.S., Purdue University; M.S.E.E., M.S. Applied Math, and Ph.D., The Georgia Institute of Technology. Nonlinear system and control theory.
- Ravindra P. Joshi** 683-4827 rjoshi@odu.edu  
 Professor of Electrical and Computer Engineering  
 B.S., M.S., Indian Institute of Technology; Ph.D., Arizona State University.  
 Physics of ultrafast phenomena and monte carlo modeling for devices applications.
- Juergen Kolb** 683-2414 jkolb@odu.edu  
 Assistant Professor of Electrical and Computer Engineering  
 State Exam (Diploma) Mathematics and Physics, Dr.rer.nat. (Ph.D.) Physics, Friedrich-Alexander University Erlangen. Biological effects of electric fields, atmospheric pressure gas discharges, pulsed power science and applications.
- Vishnukumar K. Lakdawala** 683-4665 vlakdawa@odu.edu  
 Associate Professor of Electrical and Computer Engineering and Chief Departmental Advisor  
 B.E., Bangalore University; M.E., Indian Institute of Sciences; Ph.D., University of Liverpool. Distance Learning using the World Wide Web, Multimedia applications for digital library, Semiconductor switches and gas discharges.
- Mounir Laroussi** 683-6369 mlarouss@odu.edu  
 Professor of Electrical Engineering; Director of the Laser & Plasma Engineering Institute  
 B.S., University of Sfax (Tunisia), M.S., National School of Radioelectricity (France), Ph.D., University of Tennessee. Plasma physics, gaseous discharges,

cold plasmas at atmospheric pressure, biological applications of plasmas, interaction of electromagnetic fields with plasmas.

**James F. Leathrum, Jr.** 683-3749 jleathru@odu.edu  
Associate Professor of Electrical and Computer Engineering  
B.S., Princeton University; M.S., Ph.D., Duke University. Computer architecture, digital computer systems, parallel programming.

**Jiang Li** 683-6748 jli@odu.edu  
Assistant Professor of Electrical and Computer Engineering  
B.S., Shanghai Jiaotong University, M.S., Tsinghua University, Ph.D., University of Texas at Arlington (UTA). Machine learning and statistical pattern recognition, biomedical signal processing, computer-aided diagnosis, medical image processing, and bioinformatics.

**Frederick D. McKenzie** 683-5590 fmckenzi@odu.edu  
Associate Professor of Electrical and Computer Engineering  
B.S., M.S., Ph.D. University of Central Florida. Distributed simulation, knowledge representation, model-based diagnostic reasoning, and software engineering.

**Roland R. Mielke** 683-4570 rmielke@odu.edu  
Professor of Electrical and Computer Engineering; Graduate Program Director, Modeling and Simulation Graduate Programs  
B.S., M.S., Ph.D., University of Wisconsin - Madison. System theory, including graph theory and systems modeling; modeling and simulation including simulation formalisms, composability theory, and applications of discrete event simulation.

**Gon Namkoong** 269-5349 gnamkoon@odu.edu  
Assistant Professor of Electrical and Computer Engineering  
M.S., Ph.D. The Georgia Institute of Technology. Nanotechnology, flexible devices, organic and inorganic hybrid devices, solar cells, and laser diodes.

**Dimitrie C. Popescu** 683-5414 dpopescu@odu.edu  
Assistant Professor of Electrical and Computer Engineering  
Diploma and M.S., Polytechnic Institute of Bucharest, Ph.D., Rutgers University. Wireless communications, multiuser detection.

**Zia-ur Rahman** 683-3745 zrahman@odu.edu  
Associate Professor of Electrical and Computer Engineering  
A.B., Ripon College, MS and PhD, University of Virginia, Digital image processing, computer vision, neural networks, and data compression.

**Karl H. Schoenbach** 683-2421 kschoenb@odu.edu  
Eminent Scholar of Electrical and Computer Engineering; Director of the Frank Reidy Research Center for Bioelectrics. Diploma in Physics, Dr.rer.nat. (Ph.D.),

Technische Hochschule Darmstadt (Germany). Nonthermal plasmas in gases and liquids, pulsed electric field effects on biological cells and tissues.

**Yuzhong Shen** 683-6366 yshen@odu.edu  
Associate Professor of Electrical and Computer Engineering  
BSEE, Fudan University, MSCE, Mississippi State University, Ph.D., University of Delaware. Signal and image processing, visualization and computer graphics, modeling and simulation.

**Min Song** 683-5294 msong@odu.edu  
Associate Professor of Electrical and Computer Engineering  
BSEE, Shandong Institute of Technology; MSEE, North China University of Electric Power; Ph.D., The University of Toledo. Packet scheduling algorithms, network quality of service control and security control, ATM switch design and testing, high-speed network simulation and performance evaluation, active kernel for active networking and intelligent networks.

**Linda L. Vahala** 683-4968 lvahala@odu.edu  
Associate Professor of Electrical and Computer Engineering  
B.S., University of Illinois; M.S., University of Iowa; Ph.D., Old Dominion University. Plasma physics, electromagnetics, wireless communication, quantum lattice methods.

**Shu Xiao** 683-2408 sxiao@odu.edu  
Assistant Professor of Electrical and Computer Engineering  
B.S., Gannan Teachers College, China; M.S., University of electronic Science and Technology, Chengdu, China; Ph.D., Old Dominion University. Pulse power, high power electromagnetics, power electronics, electrical discharges in liquid and gas, and bioelectrics.

## **APPENDIX B**

### **DEPARTMENTAL FACILITIES**

The Department of Electrical and Computer Engineering operates 4 instructional laboratories and 7 instructional/research laboratories.

#### **Instructional Laboratories**

Room 202	Circuits and Basic Electronics Laboratory
Room 222	Microcomputer Design Laboratory
Room 228	Student Resource Laboratory
Room 229/230	Computer Projects Laboratory

#### **Instruction and Research Laboratories**

RB 1, Room 202	VLSI Systems Laboratory
Room 200	Medical Imaging, Diagnosis, and Analysis Laboratory
Room 232	Wireless Communications, & Networking Research Laboratory
Room 233	Systems Research Laboratory
Room 234	Computational Modeling and Research Laboratory
Room 235	Microelectronics Research Laboratory
Room 250	Photonics Laboratory
ECSB 1200	VMASC East

## APPENDIX C

### ARTICULATION AGREEMENTS

On the following pages are the specific Articulation Agreements between Old Dominion University and the three local community colleges within the Virginia Community College System.

*NOTE: The Office of Admissions is currently working with the Virginia Community College System (VCCS) to explore alternative ways to present the agreements as part of the Guaranteed Admission Agreement. The following agreements are only to be used as a guide. Please contact the Undergraduate Coordinator for details as they become available.*

Tidewater Community College

AS Engineering – Emphasis Electrical Engineering

AS Engineering – Emphasis Computer Engineering

Thomas Nelson Community College (in process of being revised)

AS Engineering – Emphasis Electrical Engineering

AS Engineering – Emphasis Computer Engineering

**ARTICULATION AGREEMENT 2009-2010**  
**Tidewater Community College/Old Dominion University**  
Associate of Science to a Bachelor of Science for Electrical Engineering  
Specialization: Electrical Engineering

TCC A.S. degree program in Engineering Specialization: Electrical Engineering				ODU B.S. degree program in Electrical Engineering			
Major-all are required with a grade of C or better				Major			
CHM	111	College Chemistry I	4	CHEM	115N	Foundations of Chemistry	4
CHM	112	College Chemistry II	4	CHEM	116N	Foundations of Chemistry (satisfied by CHEM 117)	4
PHY	241	University Physics I*	4	PHYS	231N	University Physics	4
PHY	242	University Physics II*	4	PHYS	232N	University Physics	4
MTH	173	Calculus with Analytic Geometry I*	5	MATH	211	Calculus I	4(1)
MTH	174	Calculus with Analytic Geometry II*	4	MATH	212	Calculus II	4
MTH	277	Vector Calculus*	4	MATH	285	Transfer Credit for Calculus III	4
MTH	279	Ordinary Differential Equations*	4	MATH	280	Transfer Credit for Ordinary Differential Equations	3(1)
EGR	125	Intro to Engineering Methods*	4	CS	150	Introduction to Problem Solving and Programming I	4
EGR	110	Engineering Graphics*	3	ENGN	111	Explore Engineering and Technology II	2(1)
EGR	120	Introduction to Engineering*	2	ENGN	110	Explore Engineering and Technology I	2
EGR	140	Engineering Mechanics – Statics	3	CE	204	Statics (satisfies non-major elective)	3
EGR	Elec	EGR 260 Circuit Analysis *	3	ECE	201	Circuit Analysis	3
EGR	Elec	EGR 261 Signals and Systems *	3	ECE	202	Circuits, Signals & Linear Systems (elective)	3
EGR	262	Fundamental Circuits Laboratory *	2	ECE	287	Fundamental Electric Circuit Laboratory	2
EGR	Elec	EGR 270 Fundamentals of Computer Engineering *	4	ECE	241	Fundamentals in Computer Engineering	4
Total in Major			57	Total in Major			57
General Education				General Education			
ENG	111	College Composition I	3	ENGL	110C	English Composition	3
ENG	131	Technical Writing*	3	ENGL	131C	Technical Writing	3
		Humanities Elective from approved list**	3	FPAP	1REQ	Fine & Performing Arts Perspective	3
		Humanities Elective from approved list**	3	PHIP	1REQ	Philosophy Perspective or Literature Perspective	3
		History Elective from approved list**	3	HIST	1REQ	History Perspective	3
		Social Science Elective from approved list**	3	SSCP	1REQ	Social Science Perspective	3
		Health / Physical Education	2	PE	1ELE	Elective	2
SDV	101	Orientation to Engineering and Technology	1	UNIV	100	University Orientation	1
Total General Education			21	Total General Education			21

		<b>Additional Requirements - ODU</b>		
	ECE	200	Engineering Analysis Tools	3
	ECE	313	Electronic Circuits	4
	ECE	303	Intro to Electrical Power	3
	ECE	304	Probability, Statistics, & Reliability	3
	ECE	332	Microelectronic Materials & Processes	3
	ECE	323	Electromagnetics	3
	ECE	387	Microelectronics Fabric Lab	3
	ECE	4xx	Technical Elective 1	3
	ECE	485W	EE Design I	2
	ECE	4xx	Technical Elective 2	3
	ENGN	401	FE Review	1
	ECE	486	ECE Design II	3
	ECE	4xx	Technical Elective 3	3
	ECE	4xx	Technical Elective 4	3
	Elective		Approved Elective	3
	Upper	Gen Ed	Cluster or minor	6
<b>Total Credits to be Taken at ODU</b>				<b>49</b>
<b>Total Credits in Major</b>		<b>57</b>	<b>Total Transfer Credits in Major</b>	<b>57</b>
<b>Total Credits in General Education</b>		<b>21</b>	<b>Total Credits in General Education</b>	<b>21</b>
<b>Credits to be Taken at ODU</b>		<b>49</b>	<b>Credits to be Taken at ODU</b>	<b>49</b>
<b>Total Credits for B.S. Degree at ODU</b>		<b>127</b>	<b>Total Credits for B.S. Degree at ODU</b>	<b>127</b>

Specific transfer equivalencies for ENGN 110 and ENGN 111 are not included in the articulation. With the completion of the A.S., ENGN elective credits will be used to satisfy those B.S.C.E. requirements.

\*Requirement not met automatically by Associate of Science degree. Student must earn a grade of C or better to transfer the course to Old Dominion University. Departmental requirement courses marked with a \* require a grade of C or better to transfer, even with the associate's degree. No credit transfers with a grade of C- or below.

\*\*See the ODU-VCCS General Education transfer equivalency table for course options.

Students are required to have a minimum of 124 credits for graduation from Old Dominion University. This may require students to take elective coursework outside of general education and major requirements to obtain the necessary credits to graduate. Student must earn a grade of C or better to transfer the course to Old Dominion University.

Students must complete 60 credit hours at Old Dominion University to qualify for graduation with honors.

**ARTICULATION AGREEMENT 2009-2010**  
**Tidewater Community College/Old Dominion University**  
Associate of Science to a Bachelor of Science for Computer Engineering  
Specialization: Computer Engineering

TCC A.S. degree program in Engineering Specialization: Computer Engineering				ODU B.S. degree program in Computer Engineering			
Major-all are required with a grade of C or better				Major			
CHM	111	College Chemistry I	4	CHEM	115N	Foundations of Chemistry	4
CHM	112	College Chemistry II	4	CHEM	116N	Foundations of Chemistry (satisfies CHEM 117 requirement)	4
PHY	241	University Physics I*	4	PHYS	231N	University Physics	4
PHY	242	University Physics II*	4	PHYS	232N	University Physics	4
MTH	173	Calculus with Analytic Geometry I*	5	MATH	211	Calculus I	4(1)
MTH	174	Calculus with Analytic Geometry II*	4	MATH	212	Calculus II	4
MTH	277	Vector Calculus*	4	MATH	285	Transfer Credit for Calculus III	4
MTH	279	Ordinary Differential Equations*	4	MATH	280	Transfer Credit for Ordinary Differential Equations	3(1)
EGR	125	Intro to Engineering Methods*	4	CS	150	Problem Solving and Programming I	4
CSC	210	Programming with C++ *	4	CS	250	Problem Solving and Programming II	4
EGR	120	Introduction to Engineering*	2	ENGN	110	Explore Engineering and Technology I	2
EGR	110	Engineering Graphics	3	ENGN	111	Explore Engineering and Technology II	2(1)
EGR	Elec	EGR 260 Circuit Analysis*	3	ECE	201	Circuit Analysis	3
EGR	Elec	EGR 261 Signals and Systems*	3	ECE	202	Circuits, Signals & Linear Systems	3
EGR	262	Fundamental Circuits Laboratory*	2	ECE	287	Fundamental Electric Circuit Laboratory	2
EGR	Elec	EGR 270 Fundamentals in Computer Engineering *	4	ECE	241	Fundamentals in Comp Eng	4
Total in Major			58	Total in Major			58

General Education				General Education				
ENG	111	College Composition I	3	ENGL	110C	English Composition	3	
ENG	131	Technical Writing*	3	ENGL	131C	Technical Writing	3	
		Humanities Elective from approved list**	3	FPAP	1REQ	Fine & Performing Arts Perspective	3	
		Humanities Elective from approved list**	3	PHIP	1REQ	Philosophy Perspective or Literature Perspective	3	
		History Elective from approved list**	3	HIST	1REQ	History Perspective	3	
		Social Science Elective from approved list**	3			Social Science Perspective	3	
		Health / Physical Education	2	PE	1ELE	Elective	2	
SDV	101	Orientation to Engineering and Technology	1	UNIV	100	University Orientation	1	
Total General Education			21	Total General Education			21	
				Additional Requirements - ODU				
		CS	252	Intro to UNIX		1		
		ECE	200	Engineering Analysis Tools		3		
		ECE	313	Electronic Circuits		4		
		ECE	341	Digital System Design		3		
		CS	361	Advanced Data Structures & Algorithms		3		
		ECE	304	Probability, Statistics, & Reliability		3		
		ECE	3XX	Technical Elective 1		3		
		ECE	346	Microcontrollers		3		
		CS	350	Intro To Software Engineering		3		
		ECE	489W	Computer Engineering Design I		3		
		ECE	443	Computer Architecture		3		
		ECE	486	ECE Design II		3		
		ENGN	401	Fundamentals of Engineering Review		1		
		ECE	4XX	Technical Elective 2		3		
		CS	471	Operating Systems		3		
		ECE	4XX	Technical Elective 3		3		
		ECE	4XX	Technical Elective 4		3		
		Upper	Gen Ed	Cluster or minor		6		
		Total Credits to be Taken at ODU					54	
Total Credits in Major		58	Total Transfer Credits in Major					58
Total Credits in General Education		21	Total Credits in General Education					21
Credits to be Taken at ODU		54	Credits to be Taken at ODU					54
			Total Credits for B.S. Degree at ODU					133

Specific transfer equivalencies for ENGN 110 and ENGN 111 are not included in the articulation. With the completion of the A.S., ENGN elective credits will be used to satisfy those B.S.C.E. requirements.

\*Requirement not met automatically by Associate of Science degree. Student must earn a grade of C or better to transfer the course to Old Dominion University. Departmental requirement courses marked with a \* require a grade of C or better to transfer, even with the associate's degree. No credit transfers with a grade of C- or below.

\*\*See the ODU-VCCS General Education transfer equivalency table for course options.

Students are required to have a minimum of 125 credits for graduation from Old Dominion University. This may require students to take elective coursework outside of general education and major requirements to obtain the necessary credits to graduate. Student must earn a grade of C or better to transfer the course to Old Dominion University.

Students must complete 60 credit hours at Old Dominion University to qualify for graduation with honors.

**ARTICULATION AGREEMENT 2006-2008 (in process of being revised)**  
**Thomas Nelson Community College/Old Dominion University**  
Associate of Science to a Bachelor of Science for Electrical Engineering  
Specialization: Electrical Engineering

CR	TNCC AS Engineering	CR	TNCC Courses Needed for Transfer	CR	ODU Equivalent Course
3	ENG 111	3	*	3	ENGL 110C
3	ENG 112 or 115	3	*	3	ENGL 111C or 131C
3	Humanities Elective	3	ART 101 or 102 or MUS 121 or 122 or HUM 201 or 202	3	Fine & Performing Arts Perspective
3	Humanities Elective	3	PHI 101, 102, 211, or 212, or REL 200, 210, 231 or 232 ENG 121, 211, 212, 241, 242, 243, 244, 251, 252, 253, 254, 273, 274, 279	3	Philosophy Perspective OR Literature Perspective
3	Social Science Elective	3	HIS 101, 102, 111, 112, 121, or 122	3	History Perspective
3	Social Science Elective	3	ECO 201, GEO 200 or 210, PLS 135 or 241, PSY 201 or 231, SOC 200 or 211	3	Social Science Perspective
2	Health/Physical Ed.	2		2	Elective
1	SDV 100	1		1	ELS 101
8	CHM 111-112	8	*	8	CHEM 115N & 116N
8	PHY 241-242	8	*	8	PHYS 231N & 232N
8	MTH 173 & 174	8	*	8	MATH 211 & 212
4	MTH 277	4	*	4	MATH 280 (substitution for MATH 307)
3	MTH 291	3	*	3	MATH 285 (substitution for MATH 312)
3	EGR 126 or CSC 201	4	CSC 201*	4	CS 150
3	EGR 110 or CSC 202	4	CSC 202*	4	CS 250
2	EGR 120	2	*	2	ENGN 110/111 (w/completion of AS only)
3	EGR 140	3	*	3	CEE 100
3	Engineering Elective	3	EGR 260*	3	ECE 201
3	Engineering Elective	3	EGR 261*	3	ECE 202
3	Engineering Elective	5	EGR 277 and EGR 278*	5	ECE 241 & 284
<b>72</b>	<b>AS Engineering</b>			<b>76</b>	

\* Requirement not met automatically by Associate of Science degree. Student must earn a grade of "C" or better to transfer the course to Old Dominion University.

Students must complete 60 credit hours at Old Dominion University to qualify for graduation with honors.

**ARTICULATION AGREEMENT 2006-2008 (in process of being revised)**  
**Thomas Nelson Community College/Old Dominion University**  
Associate of Science to a Bachelor of Science for Computer Engineering  
Specialization: Computer Engineering

CR	TNCC AS Engineering	CR	TNCC Courses Needed for Transfer	CR	ODU Equivalent Course
3	ENG 111	3	*	3	ENGL 110C
3	ENG 112 or 115	3	*	3	ENGL 111C or 131C
3	Humanities Elective	3	ART 101 or 102 or MUS 121 or 122 or HUM 201 or 202	3	Fine & Performing Arts Perspective
3	Humanities Elective	3	PHI 101, 102, 211, or 212, or REL 200, 210, 231 or 232 ENG 121, 211, 212, 241, 242, 243, 244, 251, 252, 253, 254, 273, 274, 279	3	Philosophy Perspective OR Literature Perspective
3	Social Science Elective	3	HIS 101, 102, 111, 112, 121, or 122	3	History Perspective
3	Social Science Elective	3	ECO 201, GEO 200 or 210, PLS 135 or 241, PSY 201 or 231, SOC 200 or 211	3	Social Science Perspective
2	Health/Physical Ed.	2		2	Elective
1	SDV 100	1		1	ELS 101
8	CHM 111-112	8	*	8	CHEM 115N & 116N
8	PHY 241-242	8	*	8	PHYS 231N & 232N
8	MTH 173 & 174	8	*	8	MATH 211 & 212
4	MTH 277	4	*	4	MATH 280 (substitution for MATH 307)
3	MTH 291	3	*	3	MATH 285 (substitution for MATH 312)
3	EGR 126 or CSC 201	4	CSC 201*	4	CS 150
3	EGR 120 or CSC 202	4	CSC 202*	4	CS 250
2	EGR 120	2	*	2	ENGN 110/111 (w/completion of AS only)
3	EGR 140	3	*	3	CEE 100
3	Engineering Elective	3	EGR 260*	3	ECE 201
3	Engineering Elective	3	EGR 261*	3	ECE 202
3	Engineering Elective	5	EGR 277 and EGR 278*	5	ECE 241 & 284
<b>72</b>	<b>AS Engineering</b>			<b>76</b>	

\* Requirement not met automatically by Associate of Science degree. Student must earn a grade of "C" or better to transfer the course to Old Dominion University.

Students must complete 60 credit hours at Old Dominion University to qualify for graduation with honors.

**Old Dominion University-VCCS Transfer Guide General Education Equivalency  
Sheet 2009-10 Catalog**

Social Science Perspective (3 credits)		Natural Science and Technology Perspective (11 or 12 credits)	
ODU	VCCS	ODU	VCCS
ANTR 110S	SOC 210, 211, or 212	BIOL 115N and 116N	BIO 101 and 102
COMM 200S	None	Natural Science Perspective (NSCP 1REQ and 2REQ)	BIOL 106 and 107, NAS 111 and 112, MAR 121-122
CRJS 215S	ADJ 107, 201 or SOC 236	Natural Science Perspective (NSCP 1REQ)	CHM 126, GOL 225, SCT 111 or 112, NAS 101, 102, or 130 or PHY 130
ECON 200S	ECO 120	Natural Science Perspective (NSCP 3REQ)	CHM 110, BIO 114, 270, NAS 120 or 125
ECON 201S	ECO 201	CHEM 101N and 102N	CHM 101 or 121 and 102 or 122
ECON 202S	ECO 202	CHEM 115N and 116N	CHEM 111 and 112
GEOG 100S	GEO 210	OEAS 110N	GOL 110
GEOG 101S	GEO 200	OEAS 111N and 112N	GOL 105 and 106
POLS 100S	PLS 241 or 242	OEAS 106N and 107N	GOL 111 and 112 or MAR 101 and 102
POLS 101S	PLS 130, 135, 211 or 212	PHYS 101N	PHY 100, 101,
PSYC 201S	PSY 200, 201, or 202	PHYS 102N	PHY 102,
PSYC 203S	PSY 230, 231, 232, 235	PHYS 103N and 104N	NAS 131 and 132
SOC 201S	SOC 200, 201 or 202	PHYS 111N and 112N	PHY 111 and 112 or 201 and 202
WMST 201S	SSC 210	PHYS 231N and 232N	PHY 231 or 241 and 232 or 242
Soc. Sci. Perspective (SSCP 1REQ)	SOC 220, 255, PLS 120	The Technology requirement may be satisfied by a major course.	
Oral Communication (3 credits)		English Composition (6 credits)	
COMM 101R	CST 100, 105, or 110	ENGL 110C	ENG 111
COMM 103R	CST 111 or 112	ENGL 111C or 131C	ENG 112, 210, or 115, 131
COMM 112R	CST 126		
Fine and Performing Arts Perspective (3 credits)		Foreign Language Skills (0-6 credits)	
ARTH 121A	ART 101, 102, 111, or 112	ARAB 111F	ARA 101 and 102
ARTS 122A	ART 113, 114	CHIN 111F and elective	CHI 101 and 102
COMM/THEA 270A	CST 151, 152, or 250	FR 101F and 102F	FRE 101 and 102
Fine and Perf. Arts Persp.(FPAP 1REQ)	ART 100, 105, 106, 133, 150, 201 or 202, or HUM 100, 201, 202, or 260, MUS 125, or CST 231, 232	GER 101F and 102F	GER 101 and 102
THEA 241A	CST 130, 141, or 142	ITAL 101F and 102F	ITA 101 and 102
MUSC 264A	MUS 121 or 122	JAPN 111F	JPN 101 and 102
DANC 185A	none	LATN 101F and 102F	LAT 101 and 102
		RUS 101F and 102F	RUS 101 and 102
Philosophy Perspective (3 credits)			
PHIL 110P	PHI 100, 101, or 102	SPAN 101F	SPA 101 or 105 and 106
PHIL 120P	PHI 111, 112, or 115	SPAN 102F	SPA 102 or 107 and 108
PHIL 150P	REL 230, 231, 232, 237, or PHI 260	For. Lang. Skills I & II (FLP 1REQ & 2REQ)	GRE 101 and 102, HIN 101 and 102, KOR 101 and 102, VTN 101 and 102
Phil. Perspective (PHIP 1REQ)	PHI 200, 211, 212, or 220	History Perspective (3 credits)	
Computer Skills (3 credits)		History Perspective (HISP 1REQ and HISP 2REQ with sequence)	HIS 101, 102, 111, 112, 121, 122, 203, 231, 232, 251, 252, 253, or 254
CS 101D	ITE 115 or 215, or CSC 155	Mathematical Skills (3 credits)	
CS 149D	CSC 130, 200, EGR 125, ITP 120, 130, 132, 136, 156, 230, 232, or 236	MATH 101M	MTH 122, 152, or 182
OTS 251D	SAF 125, ITE 100, 115, or 215, BUS 226, or ETR 160	MATH 102M	MTH 158

Computer Skills Persp. (CSP 1REQ)	CSC 110, BUS 147, or ITE 100, 116, 119, 120,	MATH 162M	MTH 163
Computer Skills requirement can also be met by approved course in the major.		MATH 163	MTH 164
<b>Literature Perspective (3 credits)</b>		MATH 166	MTH 166
ENGL 112L	ENG 125	STAT 130M	MTH 146, 157, 240, 241, or 242
ENGL 144L	none		
FLET 100L	none		
Literature Perspective (LITP 1REQ)	ENG 236, 237, 241, 242, 243, 244, 245, 246, 251, 252, 253, 254, 255, 256, 267, or 268		

## APPENDIX D

### UNDERGRADUATE COURSES

200. Engineering Analysis Using Modern Software Tools for Electrical and Computer Engineers. Lecture 3 hours; 3 credits.

Corequisite: MATH 307. Prerequisite: A grade of C or better in MATH 212.

This course will introduce the fundamental mathematical and scientific concepts with emphasis on applications specifically for electrical and computer engineering students needed for their intended major. The course will also introduce some important software tools such as MATLAB and EXCEL which will be integrated with the analysis. Topics will include: Integration and differentiation, Leibnitz's rule, Linear Algebra, Vector Spaces, Complex Variables, Matrices, Ordinary Differential Equations, Plotting and Linear Regression, Data Analysis, Discrete Mathematics, Laplace Transforms, and Aspects of Vector Calculus.

201. Circuit Analysis. Lecture 3 hours; 3 credits.

Prerequisite: A grade of C or better in MATH 212, Corequisites: ECE 200, MATH 307 and PHYS 232N.

An introduction to the analysis and theory of linear electrical circuits. Topics include: component definitions and connection rules; development of network reduction techniques; formulation of mesh-current and node-voltage equations; circuit models for one-port and two-port networks; signal models using impulse functions, step functions, and piecewise continuous notation; introduction to energy storage elements; time-domain analysis of first-order and second-order electrical circuits. (offered fall, spring)

202. Circuits, Signals and Linear Systems. Lecture 3 hours; 3 credits. Prerequisite: A grade of C or better in ECE 201. Corequisite: ECE 287. Frequency-domain analysis of linear electrical circuits. Laplace transforms and Laplace transform analysis of circuits. Linear systems. Classification of systems; Time and frequency domain representation of linear systems. Methods of linear system analysis including convolution and Laplace transforms. Frequency domain representation of signals including Fourier series and Fourier transforms. Application of analysis techniques to electrical filters, signal sampling, and signal multiplexing. (offered fall, spring, summer)

241. Fundamentals in Computer Engineering. Lecture 3 hours; Recitation 1 hour; Laboratory 2 hours; 4 credits.

Prerequisite: A grade of C or better in CS 150 and in MATH 211

This course develops the foundation of computer engineering for computer engineers as well as an introductory breadth appropriate for electrical engineers. Class topics include computer information, digital design (combinational and sequential circuits) and computer organization. The laboratory includes building digital circuits (focusing on programmable logic), and system interfacing. The use of a hardware description language is employed in class and the laboratory to specify, simulate and synthesize digital circuits.

287. Fundamental Electric Circuit Laboratory. Lecture 1 hour; Laboratory 3 hours; 2 credits.

Prerequisite: A grade of C or better in CS 150 and in ECE 201, Corequisite: ECE 202. Objective of course is to provide students in electrical and computer engineering with a “hands-on” introduction to selected topics in electrical engineering. Students will use basic circuit analysis skills and C programming skills to design and build electrical networks interfacing to a microcontroller. Labs will also provide an introduction to basic measurement techniques and electrical laboratory equipment (power supplies, oscilloscopes, voltmeters, etc.).

303. Introduction to Electric Power. Lecture 3 hours; 3 credits.

Prerequisite: A grade of C or better in ECE 201.

Basic concepts of AC systems, sinusoidal steady state response, phasor analysis, AC steady state power, single-phase and three-phase networks, electric power generation, transformers, transmission lines, electric machinery and the use of power. Energy resources, power plants, renewable energy, electric safety. (offered fall )

304. Probability, Statistics, and Reliability. Lecture 3 hours; 3 credits. Prerequisite: A grade of C or better in MATH 212. Introduction to probability, probability models, discrete and continuous random variables, statistics, reliability and stochastic processes. Examples discussed will focus on computer and electrical engineering applications that include both component- and system-level aspects. MATLAB and/or EXCEL are introduced as tools for data analysis, computation and simulation. (offered fall and spring)

313. Electronic Circuits. Lecture 3 hours; Laboratory 3 hours; 4 credits. Prerequisite: A grade of C or better in ECE 202. Corequisite: ECE 241. Introduction to junction diodes, bipolar junction transistors (BJTs), MOS field effect transistors (MOSFETs) and op-amps. The lab component introduces design and techniques for implementation of analog circuits.

323. Electromagnetics. Lecture 3 hours; 3 credits.

Prerequisite: A grade of C or better in ECE 202.

An introduction to electromagnetic waves, wave propagation in various media; propagation across interfaces; propagation in waveguides and transmission lines. Antennas and radiation from antennas.

332. Microelectronic Materials and Processes. Lecture 3 hours; 3 credits.

Prerequisite: A grade of C or better in ECE 202

An introduction to fundamentals of properties of semiconductors and device fabrication processes. The topics include crystal structure, bonding, energy bands, doping, carrier densities, mobility, resistivity, recombination, drift, and diffusion. Basic structure and operations of p-n junctions, BJTs and MOSFETs and their fabrication processes, including solid state diffusion, thermal oxidation of silicon, ion implantation, chemical vapor deposition, thin film deposition, photolithography and etching. (offered fall)

340. Digital Circuits. Lecture 3 hours; recitation 1 hour; laboratory 2 hours; 4 credits.

Prerequisite: A grade of C or better in CS 150 and in MATH 211. Not open to electrical and computer engineering majors.

This course develops the foundations of computer engineering for students outside of electrical and computer engineering. Class topics include computer information, digital design (combinational and sequential circuits) and computer organization. The laboratory includes building digital circuits (focusing on programmable logic) and system interfacing. The use of a hardware description language is employed in class and the laboratory to specify, simulate and synthesize digital circuits.

341. Digital System Design. Lecture 3 hours; 3 credits.

Prerequisite: A grade of C or better in ECE 241.

Tools and methodologies for top-down design of complex digital systems. Important topics include minimization, mixed logic, algorithmic state machines, microprogrammed controllers, creating and using a gold model, data and control path design and data movement and routing via buses. Design methodologies covered include managing the design process from concept to implementation, verification using a gold model, and introduction to design flow. A hardware description language is used extensively to demonstrate models and methodologies, and is also used in design exercises and projects. (offered fall, spring)

346. Microcontrollers. Lecture 3 hours; 3 credits.

Prerequisites: A grade of C or better in ECE 241.

A hands-on approach to microprocessor and peripheral system programming, I/O interfacing, and interrupt management. A sequence of projects requiring the programming and integration of a microcontroller-based system is conducted. Project assignments require a microcontroller evaluation board and accessories supplied by the student. (offered spring)

355. Introduction to Networks and Data Communications. Lecture 3 hours; 3 credits.

Prerequisite: junior standing in an engineering discipline or related work experience.

This course introduces the basic concepts of computer networks and data communications. Topics include protocol layers, the application layer, the transport layer, the network layer, the data link layer, and the physical layer. Students will use network packet analyzer tools in this course. Emphasis is on gaining an understanding of network engineering as it relates to hardware configuration, system operation and maintenance. (offered fall)

367. Cooperative Education. 1-3 credits (may be repeated for credit).

Prerequisite: approval by the department and Career Management in accordance with the policy for granting credit for Cooperative Education programs. Available for pass/fail grading only. Student participation for credit based on the academic relevance of the work experience, criteria, and evaluative procedures as formally determined by the department and Career Management prior to the semester in which the work experience is to take place. (offered fall, spring, summer) (qualifies as a CAP experience)

368. Student Internship. 1-3 credits (may be repeated for credit).

Prerequisite: Approval by department and Career Management. Available for pass/fail grading only. Academic requirements will be established by the department and will vary with the amount of credit desired. Allows students to gain short duration career-related experience. (qualifies as a CAP experience)

369. Practicum. 1-3 credits.

Prerequisite: approval by department and Career Management. Academic requirements will be established by the department and will vary with the amount of credit desired. Allows students an opportunity to gain short duration career related experience. (qualifies as a CAP experience)

371. Circuits and Systems. Lecture 3 hours; 3 credits. Prerequisite: A grade of C or better in ECE 201. Corequisite: ECE 287.

Frequency-domain analysis of linear electrical circuits. Laplace transforms and Laplace transform analysis of circuits. Linear systems. Classification of systems; Time and frequency domain representation of linear systems. Methods of linear system analysis including convolution and Laplace transforms. Frequency domain representation of signals including Fourier series, Fourier transforms. Application of analysis techniques to electrical filters, signal sampling, and signal multiplexing. This course is intended for non-ECE students. (offered fall, spring, summer)

381. Introduction to Digital Signal Processing. Lecture 3 hours; 3 credits.

Prerequisite: A grade of C or better in ECE 202.

An introduction to the analysis and design of discrete time systems. Topics include time domain analysis, solutions of difference equations, z-transform analysis, discrete Fourier transforms, sampling of continuous-time signals, digital filter design, and state variable representations of discrete time systems.

387. Microelectronics Fabrication Laboratory. Lecture 1 hour; Laboratory 4 hours; 3 credits.

Prerequisite: ECE 332.

The laboratory course will enable students to fabricate MOSFETs, MOS capacitors, diffused resistors and p-n diodes. Students will be trained to operate the equipment required for wet and dry oxidation, thin film deposition, solid state diffusion, photolithography, and etching. Students will fabricate and analyze the devices by current-voltage characteristics, capacitance-voltage characteristics, film thickness and conductivity measurements. (offered spring).

395, 396. Topics in Electrical and Computer Engineering. Lecture 1 to 3 hours; 1 to 3 credits.

Prerequisite: Departmental approval.

403/503. Power Electronics. Lecture 3 hours; 3 credits.

Prerequisites: MATH 307 and ECE 303.

Power electronics is an enabling technology, providing the needed interface between the electrical source and the electrical load, and facilitating the transfer of the power from the source to the load by converting voltages and currents from one form to another. Topics include: RMS voltage and power, alternating voltage rectification, DC converters, Buck, Boost, Buck-Boost, Cuk and SEPIC converters; discontinuous conduction mode and continuous conduction mode; negative feedback control in power electronics; voltage control and current control; isolated switching mode power supply; flyback and forward power supply; solid state switches; Thyristor converter; motor and DC motor; brushed motor and brushless motor.

405/505. Introduction to Discrete Event Simulation. Lecture 3 hours; 3 credits.  
Prerequisites: Undergraduate course in probability and statistics; computer literacy.  
An introduction to the fundamentals of discrete event simulation (DES). Topics include discrete event simulation methodology, development of simulation models, simulation verification and validation, and the design of simulation experiments. Important statistical concepts, including selection of input probability distribution and output data analysis are developed and applied. A DES tool will be used to create, simulate and analyze self-defined projects. (Cross-listed with MSIM 405/505)

406/506. Introduction to Visualization. Lecture 3 hours; 3 credits.  
Prerequisite: A grade of C or better in CS 150.  
Introduction to computer graphics and visualization with emphasis on using 3D application programmer's interface (API) libraries. It covers mathematical foundations, rendering pipeline, geometrical transformations, 3D viewing and projections, shading, texture mapping, and programmable shaders. Various visualization applications are covered.

407/507. Introduction to Game Development. Lecture 3 hours; 3 credits.  
Prerequisite: CS 361 or equivalent.  
Introduction to Game Development is an exciting introductory course focused on game development theory and practices using Microsoft XNA Game Studio with emphasis on educational game development. Topics covered in this course include game architecture, computer graphics theory, user interaction, audio, high level shading language, animation, physics, and artificial intelligence. Students will develop games related to science (e.g., physics, chemistry, and biology), technology, engineering, and mathematics (STEM) education. The developed games can run on a variety of platforms, including Microsoft Windows, Xbox 360, and Zune Digital Media Player.

441/541. Advanced Digital Design and Field Programmable Gate Arrays. Lecture 3 hours; 3 credits.  
Prerequisite: ECE 341.  
Course will provide a description of FPGA technologies and the methods using CAD design tools for implementation of digital systems using FPGAs. It provides advanced methods of digital circuit design, specification, synthesis, implementation and prototyping. It introduces practical system design examples. (Offered spring).

443/543. Computer Architecture. Lecture 3 hours; 3 credits.  
Prerequisite: ECE 341, 346. Pre - or Corequisites: ECE 304, 489W.  
An introduction to computer architectures. Analysis and design of computer subsystems including central processing units, memories and input/output subsystems. Important concepts include datapaths, computer arithmetic, instruction cycles, pipelining, virtual and cache memories, direct memory access and controller design. (offered fall)

451/551. Communication Systems. Lecture 3 hours; 3 credits.  
Prerequisites: ECE 304 and a grade of C or better in ECE 202.  
Fundamentals of communication systems engineering using analog and digital techniques. Modulation methods including continuous waveform modulation (amplitude, angle) and introduction to digital transmission. Design of modulation systems and the

performance in the presence of noise. Communication simulation exercises through computer experiments.

452/552. Introduction to Wireless Communication Networks. Lecture 3 hours; 3 credits.  
Prerequisites: ECE 304 and a grade of C or better in ECE 202.

Introduction to current wireless network technologies and standards. The radio spectrum and radio wave propagation models (pathloss, fading, and multipath). Modulation, diversity, and multiple access techniques. Wireless network planning and operation. Common wireless standards and emerging technologies (wireless sensor and ad-hoc networks).

454/554. Introduction to Bioelectrics. Lecture 3 hours; 3 credits.

Prerequisites: PHYS 111N or higher; MATH 200 or higher.

A one-semester course covering the electrical properties of cells and tissues as well as the use of electrical and magnetic signals and stimuli in the diagnosis and treatment of disease. Typical topics to be covered include basic cell physiology, endogenous electric fields in the body, electrocardiography, cardiac pacing, defibrillation, electrotherapy, electroporation, electrotherapy in wound healing. In addition, ultrashort electrical pulses for intracellular manipulation and the application of plasmas to biological systems will be covered. (Cross-listed with ENGN 454/554)

455/555. Network Engineering and Design. Lecture and design 3 hours; 3 credits.

Prerequisite: ECE 355 or permission of the instructor.

This course is an extension of ECE 355 into a semester long project. Emphasis is on gaining an understanding of networking design principles that entails all aspects of the network development life cycle. Topics include campus LAN models and design, VLANs, internetworking principles and design, WAN design, design of hybrid IP networks, differentiated vs. integrated services, traffic flow measurement and management. (offered spring)

457. Professional Review. Lecture 1 hour; 1 credit.

Prerequisites: Junior status or higher in electrical or computer engineering.

Integration of topics fundamental to the electrical and computer engineering profession: chemistry, physics, economics, circuits, analog and digital electronics, systems and controls, DSP.

458/558. Instrumentation. Lecture 2 hours; laboratory 2 hours; 3 credits.

Prerequisites: PHYS 102N, 112N, or 232N, and a grade of C or better in ECE 202.

Computer interfacing using a graphical programming language with applications involving digital-to-analog conversion (DAC), analog-to-digital conversion (ADC), digital input output (DIO), serial ports, and the general-purpose instrument bus (GPIB). Analysis of sampled data involving the use of the probability density function, mean and standard derivations, correlations, and the power spectrum. (offered spring, summer)

461/561. Automatic Control Systems. Lecture 3 hours; 3 credits.

Prerequisite: A grade of C or better in ECE 202.

Analysis and design of control systems via frequency and time domain techniques. Root locus, Bode and Nyquist techniques. Pole placement through state variable feedback.

Stability, sensitivity, and performance specifications. Cascade and feedback compensation.

462/562. Introduction to Medical Image Analysis (MIA). Lecture 3 hours; 3 credits.

Prerequisite: A grade of C or better in MATH 212.

Introduction to basic concepts in medical image analysis. Medical image registration, segmentation, feature extraction, classification are discussed. Basic psychophysics, fundamental ROC analysis, FROC/DROC methodologies are covered.

472/572. Plasma Processing at the Nanoscale. Lecture 3 hours; 3 credits.

Prerequisite: ECE 323.

The science and design of partially ionized plasma and plasma processing devices used in applications such as etching and deposition at the nanoscale. Gas phase collisions, transport parameters, DC and RF glow discharges, the plasma sheath, sputtering, etching, and plasma deposition.

473/573. Solid State Electronics. Lecture 3 hours; 3 credits.

Prerequisites: ECE 313, 323 and 332

The theory and design of bipolar transistors, photonic devices, and unipoar devices. Introduction to integrated circuits and microelectronics.

474/574. Optical Communications. Lecture 3 hours; 3 credits.

Prerequisites: ECE 323 and Math 312.

Electromagnetic waves; optical sources including laser diodes; optical amplifiers; modulators; optical fibers; attenuation and dispersion in optical fibers; photodectors; optical receivers; noise considerations in optical receivers; optical communication systems.

478/578. Lasers and Laser Applications in Engineering. Lecture 3 hours; 3 credits.

Prerequisites: ECE 313, and Math 312.

Applications of lasers in various areas of engineering will be addressed. Relevant aspects of laser engineering and design will be covered. Topics include interaction of light with matter; non-intrusive optical diagnostic techniques; applications of lasers in engineering, technology, science and medicine.

480/580. Introduction to Imaging Technologies for Homeland Security. Lecture 3 hours; 3 credits.

Prerequisite: : A grade of C or better in ECE 202.

Introduction to fundamentals of imaging technologies used in Homeland Security, including visible, infrared, ultrasound, X-ray, and terahertz. Models and applications of technologies. Discussion of visible imagery for security applications and use of image enhancement tedhniques augmented by implementation using MATlab.

481/581. Introduction to Digital Image Processing. Lecture 3 hours; 3 credits.

Prerequisite: : A grade of C or better in ECE 202 or permission of the instructor.

This course introduces the fundamentals of digital image/picture processing in the MATLAB environment. Techniques in spatial and spatial-frequency domains are discussed and implemented for image enhancement, and compression.

482/582. VLSI System Design. Lecture 2 hours; Laboratory 1 hour; 3 credits.

Prerequisites: A grade of C or better in ECE 241, and ECE 313.

This course focuses on the transistor level design of Very Large Scale Integrated (VLSI) chips for complex digital systems using advanced design tools and hierarchical design methods. Design issues at layout, schematic, logic and register-transfer levels will be studied. Commercial design software will be used for laboratory exercises. An overview of VLSI computer-aided design (CAD) tools and theoretical concepts in VLSI architectures and algorithms will also be discussed.

483/583. Embedded Systems. Lecture 3 hours; 3 credits.

Prerequisites: ECE 313 and ECE 346.

This course covers fundamentals of embedded systems: basic architecture, programming and design. Topics include processors and hardware for embedded systems, embedded programming and real time operating systems.

485W. Electrical Engineering Design I. Lecture 1 hour; laboratory 4 hours; 3 credits.

Prerequisites: ECE 313. Corequisites: ECE 303, 323, 332 and 304.

Part one of the senior capstone design experience for electrical engineering majors.

Lectures focus on providing professional orientation and exploration of the design process. Small group design projects focus on the development of electronic subsystems. Oral and written communication skills are stressed. (offered fall, spring).

486. Electrical and Computer Engineering Design II. Lecture 2 hours; laboratory 3 hours; 3 credits.

Prerequisite: ECE 485W or ECE 489W.

Part two of the senior capstone design experience for electrical and computer engineering majors. Group design project focuses on the development of a complete electrical and computer system. Oral and written communication skills are stressed. Industry-sponsored multi-disciplinary design projects are an option.

487. Electrical and Computer Engineering Design III. Lecture 2 hours; laboratory 3 hours; 3 credits.

Prerequisite: ECE 486.

Part three of the senior capstone design experience for electrical and computer engineering majors. Individual and group design projects focus on the development of complete electrical and computer systems. Oral and written communication skills are stressed. Industry-sponsored multi-disciplinary design projects are an option.

489W. Computer Engineering Design I. Lecture 1 hour; laboratory 4 hours; 3 credits.

Prerequisites: ECE 313, 341 and 346. Corequisites: ECE 443.

Emphasis is on the design of a complex digital circuit and microcontroller interfacing. A semester-long project involves the design, simulation and testing of a complex digital architecture and software GUI. Several moderate scale digital modules are designed, simulated, implemented and tested during the semester. Design methods incorporate CAD design tools, implementation with advanced integrated circuit technology and contemporary software tools. Oral and written communication skills are stressed. (offered fall)

491. Microelectronics Design Experience. 3 credits.

Prerequisite: Junior standing in electrical or computer engineering.

This is a VMEC hands-on, state-of-the-art summer research experience. The VMEC internship provides excellent technical knowledge as well as industrial and academic contacts for career development. Students complete a 10 - 13-week summer project on a microelectronics research or design activity at an engineering school or in the State-of-the-Art Cleanroom of industry members of the Virginia Microelectronics Consortium (VMEC) at Micron Technology, Inc in Manassas, VA or at British Aerospace Engineering (BAE). For eligibility, the student has to apply to the VMEC program and must be selected as a VMEC Student Scholar in a competition held late in the fall semester of each academic year. Each student will be required to give at least two formal oral reports and one formal poster presentation summarizing the research results at the end of the summer session. The project must be completed at an institution other than Old Dominion University. Students will be supervised by faculty or industry mentors at the summer location, but must also have an Old Dominion University co-advisor and instructor of record for the course.

495/595, 496/596. Topics in Electrical and Computer Engineering. Lecture 1 to 3 hours; 1 to 3 credits.

Prerequisite: Departmental approval.