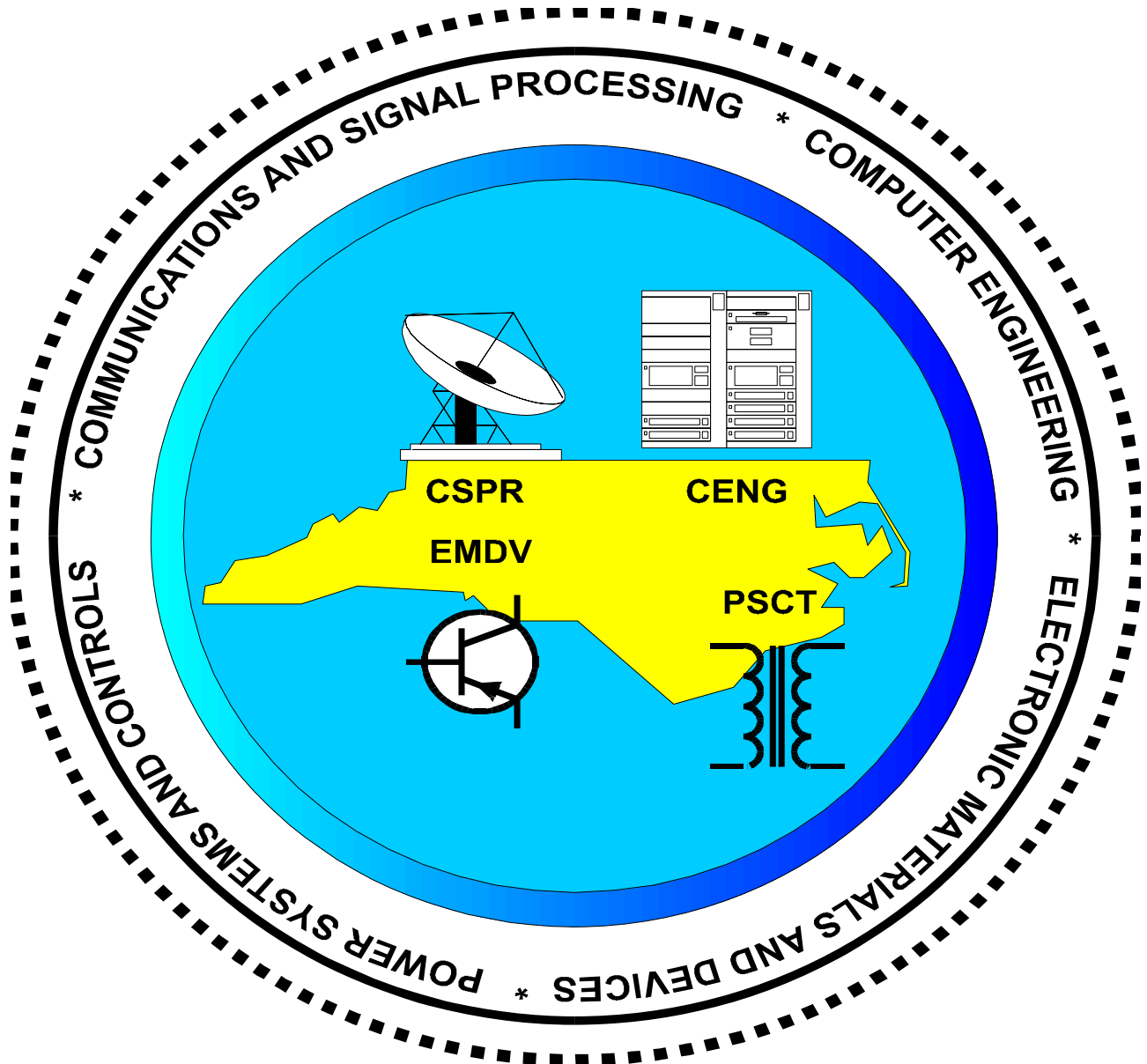


Electrical and Computer Engineering
UNDERGRADUATE STUDENT HANDBOOK



DEPARTMENT OF
ELECTRICAL AND COMPUTER ENGINEERING

North Carolina Agricultural and Technical State University
Greensboro, North Carolina 27411
McNair Hall Room 551
(336) 334-7760/7761

June 07, 2005

NONDISCRIMINATION POLICY AND INTEGRATION STATEMENT

North Carolina Agricultural and Technical State University is committed to equality of educational opportunity and does not discriminate against applicants, students, or employees based on race, color, national origin, religion, sex, age, or handicap. Moreover, North Carolina Agricultural and Technical State University is open to people of all races and actively seeks to promote racial integration by recruiting and enrolling a large number of white students.

ACCREDITATION

The undergraduate program in Electrical Engineering, leading to the Bachelor of Science degree, is accredited by the Engineering Accreditation Commission of the Accreditation Board for Engineering and Technology (ABET). A degree in this field prepares a student for careers in power and control engineering, computer engineering design, electronics, communications, and signal processing, or for graduate study in electrical or computer engineering.

INTRODUCTION

This Handbook represents a compilation of information about the BSEE (ELEN) and BSCpE (CPEN) curriculums and the operations of the Department of Electrical and Computer Engineering (ECE) at North Carolina Agricultural and Technical State University. It is meant to serve as a guide to the students and faculty of the Department and should be followed to ensure uniformity in all phases of the undergraduate program. Please also see the current University Undergraduate Bulletin.

Revisions to this Handbook may be made at any time, since the intention is to make the Handbook dynamic and to accommodate necessary changes within the Department. The normal procedure for revision is by majority vote at any regularly scheduled or called Departmental faculty meeting.

ECE DEPARTMENTAL UNDERGRADUATE MISSION STATEMENT

Our mission is to educate our students with the knowledge and skills relevant to the practice of electrical and computer engineering, to instill in them the desire for continuing education, and to maintain a supportive environment for the students, faculty and staff.

UNDERGRADUATE ELEN PROGRAM EDUCATION OBJECTIVES

1. Be employed in the electrical engineering profession or continue with graduate education.
2. Demonstrate teamwork and leadership skills in solving interdisciplinary problems.
3. Be active in their communities and professional societies.
4. Enhance their professional development through life-long learning.

ELEN GRADUATION REQUIREMENTS

A minimum of 128 semester hours is required for the Bachelor of Science in Electrical Engineering degree. These 128 hours are outlined as follows:

MATHEMATICS **15 hrs**

Math 131, 132, 231, and 431 are required.

BASIC SCIENCES **12 hrs**

Chemistry 106, 116; Physics 241, 251, 242, and 252 are required.

HUMANITIES AND SOCIAL SCIENCES **21 hrs**

English 100, 101, Economics 200/1, six credits (6 hrs) of Humanities, and six credits (6 hrs) of Social Science. Of the 12 Humanities and Social Science credits, three credits (3 hrs) must be from the African American Studies, and three credits (3 hrs) from the Global Studies.

ENGINEERING TOPICS **78 hrs**

Fourteen hours of General Engineering 100, 160 and 161, Industrial Engineering 260 and 270, and Mechanical Engineering 313 are required.

Fifty six hours of electrical engineering/technical elective courses are required: ELEN 200, 300, 306, 320, 327, 328, 400, 425, 427, 430, 433, 460, 466, 475, 598, 599; two courses from the following: ELEN-410, ELEN-449 ELEN-470, two courses from ELEN-4xx or ELEN-6xx, and one course from the following: MEEN-337, MEEN-413.

Six hours of advanced electrical engineering courses (ELEN 6xx) and **Two** hours of advanced electrical engineering laboratories (ELEN 6xx) are required.

OTHER REQUIREMENTS **2 hrs**

Two hours of Human Performance & Leisure Studies electives are required.

***** See your Electrical Engineering adviser for the formulation of your undergraduate program,

or write: Undergraduate Coordinator
Department of Electrical and Computer Engineering,
North Carolina A & T State University
Greensboro, North Carolina 27411

Electrical Engineering Curriculum

Fall 2005

This example curriculum guide for the **Electrical Engineering Program** is offered for planning purposes. Students should consult with an academic advisor when setting up their course program.

FRESHMAN

ENGL-100	Fresh Comp I	3	ENGL-101	English Writing Elective	3
MATH-131	Calculus I	4	MATH-132	Calculus II	4
HSS-xxx	African-Amer. Elect	3	PHYS-241	Gen. Phys. I	3
HPED-xxx	Human Performance Elect.	1	PHYS-251	Gen. Phys. I Lab.	1
GEEN-100	Engineering Design and Ethics	2	CHEM-106	Gen. Chem. I	3
GEEN-160	Introd. to Computer Prog.	2	CHEM-116	Gen. Chem. Lab.	1
GEEN-110	Colloquium I	0	GEEN-161	Comp. Prog. In Matlab	2
			GEEN-120	Colloquium II	0
15			17		

SOPHOMORE

MATH-431	Differential Equations	3	MATH-231	Calculus III	4
PHYS-242	Gen. Phys. II	3	ELEN-300	Elect. Circuit Analysis II	3
PHYS-252	Gen. Phys. II Lab.	1	ELEN-306	Circuits & System Lab.	2
ELEN-200	Elect. Circuit Analysis I	3	ELEN-327	Digital Logic	3
HSS-xxx	Global Studies Elective	3	ELEN-328	Digital Logic Lab.	1
INEN-270	Engineering Statistics I	3	ELEN-320	Electronics I	3
ELEN-201	ELEN Colloquium	0	HPED-xxx	Human Performance Elect.	1
			ELEN-202	ELEN Colloquium	0
16			17		

JUNIOR

ELEN-475	Applied Engineering Analysis	3	ELEN-460	Electronics II	3
ELEN-400	Linear Systems and Signals	3	ELEN-466	Electronics Lab.	1
ELEN-427	Intro. to Microprocessor	3	ELEN-430	Power Systems	3
ELEN-433	Microprocessor Laboratory	1	ELEN-4xx	Technical Elective I	3
ELEN-425	Introd. to Electromagnetics	3	MEEN-313	Statics & Mechanics	3
HSS-xxx	Human./Social Sci. Elect.	3	INEN-260	Engr. Econ. Analysis	2
ELEN-301	ELEN Colloquium	0	ELEN-302	ELEN Colloquium	0
16			15		

SENIOR

ELEN-598	Senior Design Project I	3	ELEN-599	Senior Design Project II	3
ECON-200/1	Economic Elective	3	HSS-xxx	Human./Social Sci. Elect.	3
ELEN-4xx	Technical Elective I	3	ELEN-xxx	Technical Elective II	3
ELEN-xxx	Technical Elective II	3	Tech. Elect.	Technical Elective III	3
ELEN-6xx	Adv. ELEN Elective	3	ELEN-6xx	Adv. ELEN Elective	3
ELEN-6xx	Adv. ELEN Lab.	2			
17			15		

Technical Elective I (ELEN-410, ELEN-449, ELEN-470)
 Technical Elective II (ELEN-4xx, ELEN-6xx)
 Technical Elective III (MEEN-337, MEEN-413)

*** GRAND TOTAL 128 ***

CPEN GRADUATION REQUIREMENTS

A minimum of 128 semester hours is required for the Bachelor of Science in Computer Engineering degree. These 128 hours are outlined as follows:

MATHEMATICS **18 hrs**

Math 123, 131, 132, 231, and 431 are required.

BASIC SCIENCES **12 hrs**

Chemistry 106, 116; Physics 241, 251, 242, and 252 are required.

COMPUTER SCIENCES **9 hrs**

Comp 280, 375, and 450 are required.

HUMANITIES AND SOCIAL SCIENCES **21 hrs**

English 100, 101, Economics 200/1, six credits (6 hrs) of Humanities, and six credits (6 hrs) of Social Science. Of the 12 Humanities and Social Science credits, three credits (3 hrs) must be from the African American Studies, and three credits (3 hrs) from the Global Studies.

ENGINEERING TOPICS **63 hrs**

Eleven hours of General Engineering 100, 161, 163 and 165, are required.

Forty one hours of electrical engineering courses are required: ELEN 200, 300, 306, 320, 327, 328, 356, 400, 423, 425, 427, 429, 433, 449, 598, and 599. **Six** hours from the following: ELEN 452, 459, 602, 606, 621, 622, 623, 624, 629, 630, 650, 657, 673, 674, 678, 679; COMP 285, 322, 476, 650, 653, 663

Three hours of advanced computer engineering courses (ELEN 6xx Adv. CpE Specific Electives) and **Two** hours of advanced computer engineering laboratories (ELEN 6xx Adv. CpE Specific Elective Lab.) are required.

ELECTIVES **3 hrs**

Three hours from the following: BIOL 100, 101; INEN 270; MATH 440; MCEN 310; MEEN 210, 313, 413

OTHER REQUIREMENTS **2 hrs**

Two hours of Human Performance & Leisure Studies electives are required.

***** See your Electrical Engineering adviser for the formulation of your undergraduate program,

or write: Undergraduate Coordinator
Department of Electrical and Computer Engineering,
North Carolina A & T State University
Greensboro, North Carolina 27411

Computer Engineering Curriculum

Fall 2005

This example curriculum guide for the **Computer Engineering Program** is offered for planning purposes. Students should consult with an academic advisor when setting up their course program.

FRESHMAN

ENGL-100	Fresh Comp I	3	ENGL-101	English Writing Elective	3
CHEM-106	Gen. Chem. I	3	MATH-132	Calculus II	4
CHEM-116	Gen. Chem. Lab.	1	HSS-xxx	Global Studies Elective	3
MATH-131	Calculus I	4	GEEN-165	Computer Programming	4
GEEN-100	Engineering Design and Ethics	2	GEEN-161	Comp. Prog. In Matlab	2
GEEN-163	Introd. to Computer Prog.	3	GEEN-120	Colloquium II	0
GEEN-110	Colloquium I	0			
		16			16

SOPHOMORE

MATH-431	Differential Equations	3	MATH-231	Calculus III	4
PHYS-241	Gen. Phys. I	3	ELEN-300	Elect. Circuit Analysis II	3
PHYS-251	Gen. Phys. I Lab.	1	ELEN-306	Circuits & System Lab.	2
ELEN-200	Elect. Circuit Analysis I	3	PHYS-242	Gen. Phys. II	3
ELEN-327	Digital Logic	3	PHYS-252	Gen. Phys. II Lab.	1
ELEN-328	Digital Logic Lab.	1	COMP-280	Data Structures	3
MATH-123	Discrete Math	3	HPED-xxx	Human Performance Elect.	1
		17			17

JUNIOR

ELEN-427	Intro. to Microprocessor	3	ELEN-449	Intro to Communications.	3
ELEN-433	Microprocessor Laboratory	1	ELEN-423	Digital System Design	3
ELEN-400	Linear Systems and Signals	3	ELEN-429	Digital System Design Lab	1
ELEN-320	Electronics I	3	COMP-375	Comp. Org. & Arch.	3
XXXX-xxx	Technical Elective	3	ELEN-425	Intro. To Electromagnetics	3
ELEN-356	Stochastic Pro. & Ran Var.	3	XXX-xxx	African Am. Elective	3
HPED-xxx	Human Performance Elect.	1			
		17			16

SENIOR

ELEN-598	Senior Design Project I	3	ELEN-599	Senior Design Project II	3
COMP-450	Operating Systems	3	HSS-xxx	Human./Social Sci. Elect.	3
ECON-200/1	Economic Elective	3	HSS-xxx	Human./Social Sci. Elect.	3
ELEN-xxx	CpE Spec. Elective	3	ELEN-xxx	Adv. CpE Spec. Elective	3
ELEN-xxx	Adv. CpE Spec. Elective	3	ELEN-xxx	Adv. CpE Spec. Elective Lab.	2
		15			14

*** GRAND TOTAL 128 ***

OVERVIEW OF RELATIONSHIP AMONG COURSES FOR THE DEGREE

The undergraduate curriculums of the Electrical Engineering (ELEN) and Computer Engineering Programs in the Department of Electrical and Computer Engineering at North Carolina Agricultural and Technical State University are dictated by the ABET accreditation requirements. As a consequence, the curriculums are very similar to that of most Electrical Engineering and Computer Engineering Bachelor Degree programs throughout the United States. Table I defines the pre-requisites and co-requisites of the courses in the ELEN and CPEN Programs and those offered in support of the ELEN and CPEN Programs by the Computer Science, Mathematics, Physics, Mechanical Engineering, Industrial Engineering, and Chemistry Departments. A description of Electrical Engineering courses is provided in the back of this Handbook. All courses are required to be taken in the sequence shown. Together they provide the academic base on which the ELEN or CPEN degree candidates build their knowledge and skills for the specialized and professional oriented topics offered in the advanced elective courses (600 level).

Table I. Pre-requisites/Co-Requisites for Required Courses

A. Electrical and Computer Engineering

<u>Course</u>	<u>* Pre-requisite</u>	<u>** Co-requisite</u>
ELEN-200	----	MATH-431
ELEN-300	ELEN-200, MATH 431	----
ELEN-306		ELEN-300
ELEN-320	ELEN-200	----
ELEN-327	----	----
ELEN-328	----	ELEN-327
ELEN-356	----	----
ELEN-400	ELEN-300	----
ELEN-410	ELEN-300	----
ELEN-423	ELEN-327	----
ELEN-425	MATH-231	----
ELEN-427	ELEN-327	----
ELEN-429	ELEN-328	----
ELEN-430	ELEN-300, ELEN-425	----
ELEN-433	ELEN-328	ELEN-427
ELEN-436	ELEN-306	ELEN-430
ELEN-449	ELEN-400	----
ELEN-450	ELEN-425	----
ELEN-452	ELEN-400	----
ELEN-459	ELEN-400	----
ELEN-460	ELEN-320	----
ELEN-466	ELEN-306	ELEN-460
ELEN-470	ELEN-425	----
ELEN-475	MATH-231 and MATH-431	----
ELEN-598	ELEN-433 and ELEN-466 or consent of instructor	----
ELEN-599	ELEN-598	----

B. Computer Science

<u>Course</u>	<u>* Pre-requisite</u>	<u>** Co-requisite</u>
COMP-280	MATH-123, GEEN-165 or COMP-165	----
COMP-375	COMP-280	----
COMP-450	COMP-375	----

C. General Engineering

<u>Course</u>	<u>* Pre-requisite</u>	<u>** Co-requisite</u>
GEEN-100	----	----
GEEN-160	----	----
GEEN-161	----	----
GEEN-163	----	----

D. Mechanical & Industrial Engineering

<u>Course</u>	<u>* Pre-requisite</u>	<u>** Co-requisite</u>
MEEN-313	PHYS-241, MATH-131	----
MEEN-337	MEEN-335, MATH-231	----
MEEN-413	PHYS-242, MATH-231	----
INEN-260	MATH-131	----
INEN-270	MATH-132	----

E. Required English

<u>Course</u>	<u>* Pre-requisite</u>	<u>** Co-requisite</u>
ENGL-100	----	----
ENGL-101	ENGL-100	----

F. Mathematics

<u>Course</u>	<u>* Pre-requisite</u>	<u>** Co-requisite</u>
MATH-123	MATH-110 or equivalent	
MATH-131	MATH-110 or appropriate approval	----
MATH-132	MATH-131	----
MATH-231	MATH-132	----
MATH-431	MATH-132	----

G. Basic Sciences

<u>Course</u>	<u>* Pre-requisite</u>	<u>** Co-requisite</u>
CHEM-106	----	----
CHEM-116	----	CHEM-106
PHYS-241	----	PHYS-251, MATH-132
PHYS-251	----	PHYS-241
PHYS-242	----	PHYS-252
PHYS-252	----	PHYS-242

* PRE-REQUISITES

A course that is designated as pre-requisite to another course indicates that the pre-requisite is required before taking the next course.

** CO-REQUISITES

A course that is designated as co-requisite to another course indicates that the co-requisite is required while taking the course.

LISTS OF APPROVED HUMANITIES & SOCIAL SCIENCE ELECTIVES

All Electrical Engineering students must take **6 credits** of Humanities (**H**) and **6 credits** of Social Science (**S**). Of the **12 credits**, **3 credits** must be from the African American Studies (**B**), and **3 credits** from the Global Studies (**G**) categories.

Note that some courses satisfy more than one category.

COURSE NUMBER	COURSE TITLE	CATEGORIES			
		AFRICAN AMERICAN	GLOBAL STUDIES	HUMANITIES	SOCIAL SCIENCE
ART-xxx	xxx = 225, 400, 459, 520; AREN 112			H	
JOMC-302	Minorities in Mass Media	B			S
ECON-200/201	Economics				S
ECON-505	International Economic Relations		G		
ECON-537	International Marketing		G		S
ENGL-2xx	2xx = 200-204,220, 221			H	
ENGL-333*	Survey of African-American Lit	B		H	
FOLA-xxx	xxx = 100-111, 417, 450, 618		G	H	
HIST-100	History of World Civilizations I		G		S
HIST-101	History of World Civilizations II		G		S
HIST-201	African-American History to 1877	B			S
HIST-202	African-American History Since 1877	B			S
HIST-215	History of Africa to 1800	B	G		S
HIST-216	History of Africa Since 1800	B	G		S
HIST-312	History of Religions		G		S
HIST-320	African History - Art and Arch.	B	G	H	
HIST-332	The Modern Middle East		G		S
HIST-403	Early Modern Europe: ...to 1815		G		S
HIST-404	Modern Europe Since 1815		G		S
HIST-412	Africa From 1920 to the Present	B	G		
HIST-416	History of African-American Culture	B			S
HIST-431	History of the Far East to 1800		G		S
HIST-432	History of the Far East Since 1800		G		S
MUSI-xxx	xxx = 220, 221	B		H	
MUSI-yyy	yyy = 216, 217			H	
PHIL-xxx	Xxx = 260, 261, 262, 308, 309			H	S
POLI-200	American Government & Politics				S
POLI-220	Blacks in The American Political System	B			S
POLI-310	Comparative Politics		G		S
POLI-444	International Relations		G		S
POLI-445	Problems of Contemporary Africa	B	G		S
PSYC-320	General Psychology				S
SOCI-100	Principles of Sociology				S
THEA-xxx	xxx = 210, 630, 631			H	

* For other English courses see Undergraduate Bulletin p. 443

ADMISSIONS POLICY

The admissions policy as defined in the current NCA&TSU Undergraduate Bulletin will be invoked. To be admitted to the University as a regular student, an applicant must meet the following entrance requirements:

1. Be graduated or scheduled to graduate from an accredited high school.
(In exceptional cases admission by special examination is possible.)
2. Complete sixteen (16) acceptable units of secondary school credit.
3. Present a satisfactory score on the Scholastic Aptitude Test (SAT).

UNIT REQUIREMENTS

For admission to all undergraduate programs, the applicant must present sixteen (16) units of high school credit in the following academic fields:

*Subjects	Number of Units
English -----	4
Mathematics** -----	3
Social Science (preferably U.S. History) -----	2
Science (Physical, Biological, & laboratory course) ----	3
Electives * -----	4
Total	16

* It is recommended that prospective students complete at least two course units in one foreign language, and that they take one foreign language course and one mathematics course unit in the twelfth grade.

** Students who plan to major in Engineering, Mathematics and Physics must have two units of Algebra, one unit of Plane Geometry and one-half unit of Trigonometry.

COURSES PRE-REQUISITE/COREQUISITES REQUIREMENTS

1. A minimum grade of “C” in ENGL-100, GEEN-100, GEEN-160, GEEN-161, GEEN-163, CHEM-106, MATH-131, MATH-132, MATH-231, MATH-431, PHYS-241, PHYS-242, INEN-260, INEN-270, and MEEN-313, is required to satisfy Pre-requisite requirements of subsequent courses.
2. A minimum grade of “C” is required to satisfy Pre-requisite requirements of subsequent ELEN courses.

GENERAL REQUIREMENTS FOR GRADUATION

A candidate for a degree in the Department of Electrical and Computer Engineering must satisfy the following minimum requirements:

1. Complete a minimum of 128 semester hours excluding deficiency courses and remedial work for the Bachelor’s Degree.
2. Earn an average grade point of 2.0 for every semester hour undertaken including hours passed or failed. After completing the number of credit hours required for graduation, if the student is deficient in grade points, he or she must take additional courses to secure these points. The student must also obtain a minimum of “C” grade in all pre-requisites courses and a minimum GPA of 2.0 in the ELEN/COMP courses.

3. The Major GPA computation uses the highest ELEN/COMP course grades including advanced undergraduate/graduate courses taken as part of the undergraduate program.
4. Complete a minimum of three semesters as a full-time student in residence at the University. This requirement includes the two semesters prior to the period when the student completes his or her requirements for graduation. At least one-half of the credits in the student's major field must be earned at the University. Exception to either of the provisions may be made upon the recommendation of the Chairperson of the Department with the approval to the College Dean.
5. The College of engineering course repetition policy is that each engineering student may repeat an engineering course **only twice**. This includes all courses that are repeated for any reason, including the following:
 - a. The course is dropped after the last day to add a course.
 - b. The course is changed to audit status.
 - c. An unsatisfactory grade is received in the course.
 - d. A student may petition to repeat a course for a third time as a result of extenuating circumstances, but the student must gain the approval of the Department Chairperson as well as the Dean of the College of Engineering.

GRADUATION UNDER A GIVEN HANDBOOK

A student may expect to earn a degree in accordance with the requirements of the curriculum outlined in the Handbook in force when he or she first entered the University, provided the courses are being offered. Moreover, he or she must complete these requirements within six years. On the other hand, he or she may graduate under any subsequent Handbook published while he or she is a student. If a student elects to meet the requirements of a Handbook other than the one in force at the time of his or her original entrance he or she must meet all requirements of the Handbook he or she elects.

GRADUATION WITH HONORS

Graduation honors are awarded to candidates who complete all requirements for graduation in accordance with the following stipulations:

- a. Those who maintain a general average within the range of 3.00 to 3.24 will receive CUM LAUDE.
- b. Those who maintain a general average within the range of 3.25 to 3.49 will receive MAGNA CUM LAUDE.
- c. Those who maintain a general average within the range of 3.50 to 4.00 will receive SUMMA CUM LAUDE. A minimum of 59 percent of the credit hours completed must be earned at NCA&T State University in order to be considered for honors. The computation for honors is based upon all courses taken at this University.

FACULTY ADVISER

When a student is majoring in Electrical Engineering, he or she is assigned a faculty adviser. The adviser:

- a. Provides information, advice, and recommendation in academic and related areas,
- b. Directs the student to sources which explain in detail academic regulations, course Prerequisites and graduation requirements,

- c. Helps the new student to understand the degree to which one should assume responsibility for one's own program planning,
- d. Provides vocational guidance and occupational information in one's area of specialty, and
- e. Refers the student to the appropriate individual, office or agency when further assistance is indicated.

The Department Chairperson is also available to students wanting information about different curricula and to help in forming educational plans. Instructors are usually the best source of help to students having difficulty with particular subjects. Members of the faculty keep office hours and expect students to consult them individually whenever special assistance is needed. The Department wants to emphasize however that students have the primary responsibility for planning their individual programs and meeting graduation requirements.

CHANGES IN SCHEDULE

A change in a student's program may be made with the consent of his or her adviser and the Department Chairperson. Students may drop a course without penalty up until the official deadline for withdrawal. After that deadline, a student cannot withdraw from a course without withdrawing from the University for that semester.

CHANGING COLLEGE/SCHOOL WITHIN THE UNIVERSITY

Students may transfer from one College/School of the University to another with the written approval and acceptance of the Deans of the Colleges involved. The proper forms on which to apply for such a change are to be obtained from the Office of the Registrar and executed at least six weeks prior to the beginning of the transfer. When such a transfer is made the student must satisfy the current academic requirements of the College and/or department to which the student transfers. A minimum GPA of 2.5 is necessary for students transferring to Electrical and Computer Engineering.

CLASSROOM DISHONESTY

In cases of classroom dishonesty namely, cheating on examinations, plagiarizing or other forms of dishonesty in course work, the following procedures are followed:

1. The instructor should report the problem to the Department Chairperson in writing detailing the circumstances with copies of supporting materials attached.
2. The faculty member shall give the appropriate form of reprimand as defined below.
 - a. First time offenders will be awarded a "F" on the exam, report, etc., with a letter placed in the student's file, indicating that they have been found cheating in class.
 - b. Second time offenders will be awarded an "F" for the class, with a letter placed in the file and a copy sent to the placement center.
 - c. Third time offenders will be dropped from the Department of Electrical and Computer Engineering.
3. The student may appeal to the College of Engineering Grade Appeal Board, which may make recommendations, as the board deems appropriate.
4. All faculty will be made aware of all offenders.
5. All recommendations from the Department Office will reference the cheating incident for all second and third time offenders.

POLICY on DISRUPTIVE STUDENTS in the CLASSROOM

During instances when students exhibit disruptive behavior in the classroom, a faculty member should attempt to defuse the student(s)'s anger and/or resolve the problem while maintaining a tone of calmness and professional objectivity.

If the situation appears to be escalating out of control, the faculty member should go to, or request that another student in the class go to, the nearest administrative office to contact campus security for assistance in bringing the matter under control.

If a student(s)'s behavior in the classroom has been unreasonable or inappropriate, e. g., student used profanity, student threatened the faculty member or another student in the class, etc., then the faculty member may request that the student be administratively withdrawn from the course. This action is consistent with the policy of the University of North Carolina - *UNC-GA Policy on Disruptive Students in the classroom.*

PRE-REQUISITES/CO-REQUISITES/ADD-DROP

Pre-requisites are courses or levels of achievement that a student is expected to have completed successfully prior to enrolling in a course. Course Pre-requisites can be found in the University Undergraduate Bulletin or this Handbook.

It is the student's responsibility to satisfy Pre-requisites for any course enrolled in. A computerized Pre-requisite search may take place each semester. Failure to satisfy Pre-requisites will result in removal from enrollment in the course.

All students are required to show instructors proof of their Pre-requisites (semester taken and grade received) and co-requisites (semester taken) during the first week of classes.

Those students who do not meet Pre-requisite/co-requisite requirements should drop the course and add other courses if possible before the add-drop deadline. Such students will not be allowed to attend class lectures or take tests.

During the add-drop period, the academic advisers should check the Pre-requisites/co-requisites of the courses their advisees will be taking. No exceptions on Pre-requisites/co-requisites will be allowed on all courses listed in this ECE Handbook.

ACADEMIC EVALUATION POLICY (GRADING)

1. Evaluation of student's performance in a particular course or section is the prerogative of the faculty member responsible for that course or section. No grade assigned to a student in a particular course or section may be changed without the consent of the faculty member responsible for the course and section*
2. Each faculty member who assigns grades has the responsibility to implement grading procedures that are fair, equitable, and provide a reasonable evaluation of the student's performance in the course.
3. The responsible faculty member should inform each student at the beginning of the semester of the means which will be used for determining grades in each course or section.
4. Take-home quizzes or exams are discouraged by this Department for non-advanced undergraduate courses.

*Subject to the approval of the Chairperson and Dean

ACADEMIC RETENTION

All students are expected to make normal progress toward a degree. Normal progress means the completion of sixteen (16) or more semester hours each semester with a 2.0 grade point average or higher for full-time students. These sixteen (16) hours must consist of courses that count toward graduation for full-time students.

A student is eligible to continue to work toward an undergraduate degree until he has attended eleven (11) semesters as a full-time student (not including summer session) or until he has attempted 152 semester hours. At that point the student becomes ineligible to continue at the University.

A student who has received a grade of “C” or above in any course at this University may not repeat that course for a higher grade unless approved by the Dean of the College. However, a student may repeat courses in which a “D” or “F” has been earned. When this is done only the higher grade will count toward meeting course and degree requirements.

COURSE LOAD

The normal course load is sixteen (16) or seventeen (17) credit hours. A full-time undergraduate student is required to carry a minimum of twelve (12) credit hours.

MAXIMUM COURSE LOAD AT THE UNIVERSITY

The maximum course load that a student may carry at the University is eighteen (18) credit hours, unless the student has cumulative grade point average of 3.0 or higher; or has a semester grade point average of 3.0 or higher in twelve (12) or more hours the immediate past semester.

The maximum course load that a student may carry who has a cumulative grade point average of 3.0 or higher is twenty-one (21) hours.

MAXIMUM COURSE LOAD FOR STUDENTS ON ACADEMIC PROBATION

The maximum course load that a student may carry who is on academic probation is twelve (12) semester hours.

Students with a GPA of less than 2.0 should be strongly advised to not exceed a maximum of 12 credit hours.

Academic advisers should emphasize to students that course load limits will be enforced by the Registrar’s Office. A student is automatically on academic probation if the cumulative grade point average is less than the minimum required based on the total number of semesters (including summer sessions) of attendance at the University. (See the University Bulletin requirement.)

DOUBLE MAJOR

Students who desire to obtain a double major, involving two departments or two Colleges/Schools must satisfy the major requirements for each department or College/School.

GRADING SYSTEM

Grades are assigned and recorded as follows:

Grades	Descriptions	Grade Points
A	Excellent	4
B	Good	3
C	Average	2
D	Below Average, but passing	1
F	Failure	0
I	Incomplete	
AP	Advanced placement	
CE	Credit by examination	
P	Passing	
S	Satisfactory (non-credit courses)	
U	Unsatisfactory (non-credit courses)	
AU	Audit	
W	Withdrew	

CLASSIFICATION OF STUDENTS

Students are classified on the basis of semester hours completed, excluding remedial and deficiency courses.

Classification	Semester Hours Completed
Freshman	0-29
Sophomore	30-59
Junior	60-89
Senior	90 or above

GRADE POINT AVERAGE (GPA)

The grade point average is obtained by dividing the total number of grade points earned by the total number of quality hours.

INCOMPLETE GRADE

Students are expected to complete all requirements of a particular course during the semester in which they are registered. However, if at the end of the semester, a small portion of the work remains unfinished and should be deferred because of some serious circumstances beyond the control of the student, an "I" (incomplete) grade may be submitted.

An "I" for a prolonged illness may be submitted only after the written approval of the Vice Chancellor for Student Affairs has been secured. An "I" for other causes may be submitted only with the approval of the Dean of the College.

Along with the recording of the incomplete grade, the instructor must also file with the Chairperson, the student's average grade and a written description of the work, which must be completed before the incomplete is removed.

PROCEDURE FOR THE REMOVAL OF AN INCOMPLETE GRADE

An incomplete grade must be removed within (6) weeks after the beginning of the next semester. If the student has not removed the incomplete within the time specified, the “I” becomes an “F”.

CHANGE OF GRADE

A request for a change of grade, for any reason, must be made within one year following the date the original grade was assigned by the faculty member.

CONCURRENT ENROLLMENT

A student enrolled in Electrical and Computer Engineering is strongly discouraged from enrolling in any other school or college.

SUMMER COLLEGES—OTHER COLLEGE OR UNIVERSITIES

A student wishing to transfer credit for summer work elsewhere at an accredited college should obtain approval of his course selections prior to taking the courses. He or she should present a summer catalog of the chosen institution and request for approval.

Summer courses may be taken at an accredited junior college only if completed prior to the conclusion of the student’s sophomore year at NCA&T. In general, students may transfer credit for a maximum of two courses each summer, as long as the residence requirement for graduation is met.

FINAL EXAMINATIONS AND EXCUSED ABSENCES

It is University policy that a final examination is given in every course. Absences from final examinations are excused only in very exceptional circumstances, such as serious illness certified by a medical official of the University or other conditions beyond the control of the student. A student who missed a final examination must contact the instructor within 24 hours after the scheduled time of the examination. Failure to contact and present an acceptable reason for his or her absence from the examination may result in the student receiving an “F” in the course. In all cases in which a student is absent from a final examination, and if the absence is excused, the student should arrange for a make-up examination with the instructor immediately.

MAJOR TESTS DURING FINAL WEEK OF SEMESTER

In order that students may complete semester projects, take lab tests, and prepare for final examinations, faculty members are urged to avoid giving major tests during the final week of the semester unless all students in the class agree.

FINAL EXAM REVIEW POLICY

The final exam papers are not returned to the students, but the instructor shall keep the unreturned papers at least until the first month of the next regular semester. During this period, any student shall have an opportunity to review the exam paper. The fact that in some instances it may be impossible to provide a student with the opportunity to review his or her final exam papers is not sufficient to justify a re-examination.

UNIVERSITY CLASS ATTENDANCE POLICY

Regular and punctual class attendance is the responsibility of the individual student. Moreover, the student is expected to have sufficient maturity to assume the responsibility for regular attendance and to accept the consequences of failure to attend.

The non-compulsory class attendance policy places responsibility on the student and the instructor:

STUDENT'S RESPONSIBILITY

1. The student is responsible for all material covered in each course for which he or she is registered. Absence from class does not relieve him or her of this responsibility.
2. The student is expected to be present for laboratory periods, scheduled examinations, and other activities that may require special preparation.
3. The student is responsible for initiating any request to make-up an examination, a laboratory exercise or other work missed because of a class absence. If the instructor requests a statement concerning the reason for the makeup, the student should obtain it from the appropriate officer (e.g., the University Physician, the vice Chancellor for Student Affairs). See University catalog for additional details.
3. The student is expected to report to each class at the beginning of the term with a validated schedule and a class admission card.

INSTRUCTOR'S RESPONSIBILITY

1. The instructor is responsible for explaining to the class any specific expectations concerning attendance at the beginning of the term.
2. The instructor is responsible for providing the student with a schedule of the examinations and other class requirements that will provide a basis of evaluating student performance.
3. All quizzes and tests must be announced at least 7 days in advance.
4. The instructor is expected to warn the student when his or her academic progress is adversely affected by excessive absence from class.

The Department of Electrical and Computer Engineering especially wants to emphasize that regular attendance to classes has much bearing on academic success.

TRANSFER STUDENTS

A student who wishes to transfer from another accredited college or university must meet the following requirements:

1. Must have a cumulative average of "C" or above
2. Transfer students who have attended an accredited college but have earned less than thirty-(30) semester hour of acceptable credits or equivalent must meet all freshman requirements. These students must have a cumulative average of "C" and they must be eligible to return to the institution last attended.
3. A minimum of 60 per cent of 128-credit hours (77) completed must be earned at NC A&T State University in order to be considered for graduation with honors.

Applications from transfer students cannot be considered until credentials are received from the College and all other institutions previously attended. In addition, there must be a statement of good standing and honorable dismissal from these institutions. Previous college records must show a cumulative average of “C” or above, no course is accepted in which a grade of below a “C-” was originally earned. Accepted courses are recorded to the student’s credit, but points are not calculated on the transferred courses. The grade point average for a transfer student is calculated on the courses taken at NCA&TSU. The maximum number of acceptable transfer credits is 80 semester hours.

INTERNATIONAL STUDENTS

North Carolina Agricultural and Technical State University welcomes and accepts applicants from qualified student who are not United States citizens. Such students must meet each of the following criteria.

1. Satisfy all requirements governing admissions for the College to which the application is made. The expected program of study from their Feeder College should be university preparatory and the leaving College certification marks must support academic promise.
2. Show proficiency in written and oral English usage. If English is not the first language of communication, the Test of English as a Foreign Language (TOEFL) is required and a satisfactory level of English Proficiency on both the total and part scores are required.
3. Can conform to all contract regulations of the United States Immigration and Naturalization Services and be eligible for F-1 Student Status as a freshman or transfer from another College.

The I-20, Certificate of Eligibility, will be prepared for all new international students who are admitted to the University and who have official documentation on file attesting to their ability to meet their College fees. The University has no financial aid for international students and permission to work is not usually granted by INS.

WITHDRAWAL FROM THE UNIVERSITY

A student who wishes to leave, or is asked to leave the University at any time during the semester shall file an official withdrawal form. This form may be obtained from the Counseling and Testing Center. It should be completed and executed in quadruplicate (quintuplicate for veterans), and taken to the Cashier’s Office. For failure to execute this form, a student incurs the penalty of receiving an “F” for each course in which he or she is enrolled that semester. Students who withdraw from the University within 15 calendar days of the beginning of the final examination period for the semester shall receive grades based upon their performance in classes up to the date of their withdrawal.

DIRECTORY OF ELECTRICAL AND COMPUTER ENGINEERING FACULTY

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DIRECTORY OF UNDERGRADUATE COURSES

Course Number	Course Title	Credits
ELEN-200	Electric Circuit Analysis I	3(3-0)
ELEN-201	Sophomore Colloquium I	0(1-0)
ELEN-202	Sophomore Colloquium II	0(1-0)
ELEN-200	Electric Circuit Analysis I	3(3-0)
ELEN-300	Electric Circuit Analysis II	3(3-0)
ELEN-301	Junior Colloquium I	0(1-0)
ELEN-302	Junior Colloquium II	0(1-0)
ELEN-306	Circuits and Systems Laboratory	2(1-3)
ELEN-320	Electronics I	3(3-0)
ELEN-327	Digital Logic	3(3-0)
ELEN-328	Digital Logic Laboratory	1(0-3)
ELEN-356	Stochastic Proc. and Random Variable	3(3-0)
ELEN-400	Linear Systems and Signals	3(3-0)
ELEN-410	Linear Control Systems	3(3-0)
ELEN-423	Digital System Design	3(3-0)
ELEN-425	Introduction to Electromagnetics	3(3-0)
ELEN-427	Introduction to Microprocessors	3(3-0)
ELEN-429	Digital System Design Lab	1(0-3)
ELEN-430	Power Systems, Energy Conversion and Electric Machinery	3(3-0)
ELEN-433	Microprocessor Laboratory	1(0-3)
ELEN-436	Power Systems, Energy Conversion and Electric Machinery Lab.	1(0-3)
ELEN-440	Electrical Circuits and Systems	3(2-3)
ELEN-449	Introduction to Communication Systems	3(3-0)
ELEN-450	Principles of Electromagnetic Waves	3(3-0)
ELEN-452	Wireless Communication Systems	3(3-0)
ELEN-459	Digital and Data Communications	3(3-0)
ELEN-460	Electronics II	3(3-0)
ELEN-466	Electronics II Laboratory	1(0-3)
ELEN-470	Properties of Materials for Electrical and Computer Engineering	3(3-0)
ELEN-475	Applied Engineering Analysis	3(3-0)
ELEN-598	Senior Design Project I	3(1-3)
ELEN-599	Senior Design Project II	3(1-3)
ELEN-602	Semiconductor Theory & Devices	3(3-0)
ELEN-606	Digital Electronics	3(3-0)
ELEN-608	Analog Electronics	3(3-0)
ELEN-610	Power Electronics	3(3-0)
ELEN-614	Integrated Circuit Fabrication Methods	3(3-0)
ELEN-615	Silicon Device Fabrication Laboratory	2(1-3)
ELEN-621	Embedded Systems Design	3(3-0)
ELEN-622	Embedded Systems Design Laboratory	2(1-3)
ELEN-623	Advanced Digital System Design	3(3-0)
ELEN-624	Computer Organization and Architecture Design	3(3-0)
ELEN-629	VLSI Design	3(3-0)
ELEN-630	VLSI Design Laboratory	2(1-3)
ELEN-650	Digital Signal Processing I	3(3-0)
ELEN-651	Digital Signal Processing Laboratory	2(1-3)
ELEN-656	Probability & Random Processing	3(3-0)
ELEN-657	Digital Image Processing	3(3-0)
ELEN-658	Digital Image Processing Laboratory	2(1-3)
ELEN-661	Power System Analysis	3(3-0)
ELEN-662	Power System Laboratory	2(1-3)
ELEN-668	Automatic Control Theory	3(3-0)
ELEN-669	Control Laboratory	2(1-3)
ELEN-674	Genetic Algorithms	3(3-0)
ELEN-678	Introduction to Artificial Neural Networks	3(3-0)
ELEN-679	Machine Intelligence Laboratory	2(1-3)
ELEN-685	Selected Topics in Engineering	3(3-0)
ELEN-686	Special Projects	Var. 1-3

DESCRIPTIONS OF UNDERGRADUATE ELECTRICAL AND COMPUTER ENGINEERING COURSES

DEPARTMENT CODE = ELEN

ELEN-200 Electric Circuit Analysis I **Credit 3(3-0)**

This course covers circuit analysis using Kirchhoff's Laws, Loop and Nodal Analysis, Thevenins, and Nortons Theorems, etc., for resistive circuits with DC sources. The transient behavior of first and second order (RC, RL, and RLC) circuits, ideal operational amplifiers and steady state sinusoidal analysis. Co-requisite: Math 431.

ELEN-201 Sophomore Colloquium I **Credit 0(1-0)**

This course provides the students with exposure to current issues in Electrical and Computer Engineering.

ELEN-202 Sophomore Colloquium II **Credit 0(1-0)**

This course provides the students with exposure to current issues in Electrical and Computer Engineering.

ELEN-300 Electric Circuit Analysis II **Credit 3(3-0)**

This course is a continuation of ELEN-200. It covers sinusoidal steady state solutions of linear circuits in the time and frequency domain. Laplace transforms, transfer functions, Fourier series, Bode plots, passive and active filters, transformers, two-port circuits, and polyphase circuits. Pre-requisites: ELEN-200 and MATH-431.

ELEN-301 Junior Colloquium I **Credit 0(1-0)**

This course provides the students with exposure to current issues in Electrical and Computer Engineering.

ELEN-302 Junior Colloquium II **Credit 0(1-0)**

This course provides the students with exposure to current issues in Electrical and Computer Engineering

ELEN-300 Circuits and Systems **Credit 3(3-0)**

This course covers sinusoidal steady state solutions of linear circuits in the time and frequency domain. Laplace transforms, transfer functions, Fourier series, Bode plots, passive and active filters, transformers, two-port circuits, and three-phase circuits. Pre-requisite: ELEN 200 and MATH 431

ELEN-306 Circuits and Systems Laboratory **Credit 2(1-3)**

This course covers the proper use of laboratory instrumentation, principles of measurements, experimental verification of transient and steady state response, frequency response, and resonance of systems with passive and active elements. Computer simulations and theoretical analyses of networks are compared with laboratory experimental results using actual circuits. Co-requisite: ELEN-300.

ELEN-320 Electronics I **Credit 3(3-0)**

This course is an introduction to electronic circuit design. It covers basic amplifiers, diode circuits, dc biasing and mid-frequency response of bipolar junction transistor (BJT) and field effect transistor (FET) amplifiers. The terminal behavior, and linear and nonlinear modeling of these devices are emphasized. Pre-requisite: ELEN-200.

ELEN-327 Digital Logic **Credit 3(3-0)**

This course covers the study of fundamental combinational and sequential logic circuit analysis and design. Combinational concepts covered include Boolean algebra, K-maps, basic logic gates, and small/medium scale integrated circuits. Sequential concepts covered include basic latches/flip-flops, counters, memory registers, and basic synchronous systems. Pre-requisite: ELEN-200.

ELEN-328 Digital Logic Laboratory **Credit 1(0-3)**

This course deals with the implementation of basic combinational and sequential logic systems. Small and medium scale integrated circuits utilized in addition to programmable logic devices. Co-requisite: ELEN-327

- ELEN-356 Stochastic Processes and Random Variables** **Credit 3(3-0)**
This course covers sample space and events, conditional probabilities, independent events, Bayes formula, discrete random variables, expectation of random variables, joint distribution, conditional expectation, Markov chains, stationary processes, ergodicity, correlation and power spectrum of stationary processes, and Gaussian processes.
- ELEN-400 Linear Systems and Signals** **Credit 3(3-0)**
This course is a continuation of ELEN 300. It covers the fundamental theory of signals, systems and signal processing in the time-domain as well as frequency-domain. The topics include convolution integral, Fourier Series, Fourier Transform, Zero-input response, and Zero-state response.
Pre-requisite: ELEN-300.
- ELEN-410 Automatic Control Systems** **Credit 3(3-0)**
This course is an introduction to automatic control theory. It covers system modeling, state-space representation, stability of feedback control systems, time domain analysis, root locus, and compensator design. Pre-requisite: ELEN-300.
- ELEN-423 Digital System Design** **Credit 3(3-0)**
This course covers digital system datapath and control unit design and analysis at the register transfer level of abstraction. Arithmetic logic circuits and associated signal coding, high-performance computational structures (i.e. pipelining, datapath parallelism, etc.), system bus design, I/O and interrupt hardware design are also covered. Synthesis of a hardware description language (HDL) for a target FPGA/CPLD device or technology is covered in this course. Pre-requisite: ELEN 327, ELEN 328, Co-requisite: ELEN-429.
- ELEN-425 Introduction to Electromagnetics** **Credit 3(3-0)**
This course covers vector analysis including vector algebra, coordinate systems transformation, and vector calculus. These tools are utilized to solve electrostatic and magnetostatic problems. Maxwell's equations are developed for non-time-varying conditions. Pre-requisite: MATH-231.
- ELEN-427 Introduction to Microprocessors** **Credit 3(3-0)**
This course introduces the fundamentals of microprocessors, microcomputers, and microcontrollers. Both software and hardware concepts are dealt with. Software concepts include assembly language, machine code, flowcharts, and development/debugging techniques. Hardware concepts included communication ports, interrupts, memory, and common microcontroller subsystems. Pre-requisite: ELEN-327.
- ELEN-429 Digital System Design Laboratory** **Credit 1(0-3)**
Students are introduced to the resource allocation issues (i.e. floor planning, routing, number of logic blocks, etc.) associated with the realization of the assigned projects for the available synthesis algorithms and Field Programmable Gate Arrays or Complex Programmable Logic devices. The relationship between the functionality and timing behavior of the synthesized design over a range of system complexity and a variety of device architectures is also studied. Techniques to meet timing specifications are also covered in this course. Co-requisite: ELEN-429.
- ELEN-430 Power Systems, Energy Conversion and Electrical Machinery** **Credit 3(3-0)**
This course covers fundamentals of electric power systems as an interconnection of energy conversion and transmission devices; electric machinery; transformers and other components of a power system.
Pre-requisites: ELEN-300 and ELEN-425.
- ELEN-433 Microprocessor Laboratory** **Credit 1(0-3)**
This course provides practical experience in microprocessor hardware and software, interfacing, and applications. Microprocessor evaluation boards and simulators are utilized throughout the course.
Pre-requisite: ELEN-328; Co-requisite: ELEN-427.
- ELEN-440 Electrical Circuits and Systems** **Credit 3(3-0)**
This course covers power and energy concepts; basic R, RC, RL, and RLC circuits; three phase circuits; ideal transformers and ideal op amp circuits. Pre-requisites: MATH-431 and PHYS-242.

- ELEN-449 Introduction to Communication Systems** **Credit 3(3-0)**
This course covers the fundamental principles of modulation theory including amplitude, single- and double-sideband, frequency, phase, pulse amplitude, pulse duration, pulse code modulation methods; and their applications to communication systems with random signals and noise. Pre-requisite: ELEN-400.
- ELEN-450 Principle of Electromagnetic Waves** **Credit 3(3-0)**
This course covers the fundamentals of electrodynamics as applied to radio frequency, microwave and optical engineering. Pre-requisite: ELEN-425.
- ELEN-452 Wireless Communication Systems** **Credit 3(3-0)**
This course is an introductory level of wireless communications. Fundamental theory and analysis of wireless mobile communication systems are introduced, including characterization of radio propagation, channel modeling and coding, and a summary of wireless communication standards and multiple access techniques. Also covered are an overview of information networks and a comparison of wireless and conventional communication systems. Pre-requisite: ELEN-400.
- ELEN-459 Digital and Data Communications** **Credit 3(3-0)**
This course is an introduction to digital and data communications. The fundamental theory and applications of modern communication systems are discussed, including a general overview of the data communications area, telephone systems, channel coding, concept of data link protocols, interface standard, modems, multiplexing, multiple access and Integrated Services Digital Network (ISDN). Pre-requisite: ELEN-400.
- ELEN-460 Electronics II** **Credit 3(3-0)**
This course is a continuation of Electronics I. It covers the frequency response of single-stage and multi-stage transistors amplifiers, power amplifiers and the basics of analog integrated circuits. Pre-requisite: ELEN-320.
- ELEN-466 Electronics II Lab** **Credit 1(0-3)**
This course covers principles of semiconductor electronic circuits; single stage and multi-stage amplifier circuits, frequency response of transistor amplifiers; operational amplifiers circuits, and other selected analog circuits. Pre-requisite: ELEN-306; Co requisite: ELEN-460.
- ELEN-470 Properties of Material of Electrical and Computer Engineering** **Credit 3(3-0)**
This course covers the effects of atomic, molecular, and crystal structure on the electrical and physical properties of conducting, insulating and semiconductor materials used in electrical and computer engineering. Pre-requisite: ELEN-425.
- ELEN-475 Applied Engineering Analysis** **Credit 3(3-0)**
This course covers applications of linear algebra, complex variable, and discrete mathematics in solving engineering problems. Pre-requisites: MATH-231 and MATH-431
- ELEN-598 Senior Design Project I** **Credit 3(1-3)**
This is part I of a two-part capstone design course for the undergraduate Electrical and Computer Engineering program. Each team (typically four students) select a design project from topics suggested by faculty or industry. The teams are responsible for (i) designing and developing project specifications, (ii) planning a budget, and (iii) monthly progress reports. Teamwork, technical writing, communications, and project management are stressed throughout the semester. Pre-requisites: ELEN- 433 and ELEN-466 or consent of instructor
- ELEN-599 Senior Design Project II** **Credit 3(1-3)**
This is a continuation of ELEN-598, Design Project I. Each team is responsible for (i) implementing the design, (ii) demonstrating a workable prototype, (iii) monthly progress reports, and (iv) a formal report on the project. Teamwork, technical writing, communications, and project management are stressed throughout the semester. Pre-requisite: ELEN-598

ELEN-624 Computer Organization and Architecture Design Credit 3(3-0)

This course covers the design of modern uniprocessors and their memory, and Input/Output (I/O) subsystems. Performance, microarchitecture, and design philosophies used to realize pipeline, superscalar, Reduced Instruction Set Computer (RISC) and Complete Instruction Set Computer (CISC) processors will be studied. Pre-requisite: ELEN 427 or consent of instructor.

ELEN-629 Very Large Scale Integrated Circuit (VLSI) Design Credit 3(3-0)

This course will study CMOS technology and device characteristics in order to develop layout design rules for VLSI circuit building blocks, such as inverters and logic gates. Layout techniques for complex gates and designing combinational and sequential logic circuits will be introduced. Pre-requisite: ELEN-427 or consent of instructor.

ELEN-630 VLSI Design Laboratory Credit 2(1-3)

This is an introduction of Computer Aided Design (CAD) tools for integrated circuit design and verification. These CAD tools include; geometric pattern generators, design rule checkers, circuit simulators, and Programmable Logic Array (PLA) generators. A student design project is part of the laboratory requirements. Pre-requisite: ELEN-627; Co-requisite: ELEN-629.

ELEN-650 Digital Signal Processing I Credit 3(3-0)

This course covers fundamental theory of digital signal processing such as digital filtering spectral analysis, and detection/post detection processing. Methods of generating the coefficients of digital filters will be derived. Alternate structures for filters such, as infinite impulse response and finite impulse response will be compared. The effect of finite register length will be covered.

Pre-requisites: ELEN-400 or consent of instructor.

ELEN-651 Digital Signal Processing Lab Credit 2(1-3)

This laboratory course covers experiments and student projects related to the practical application of digital signal processing techniques for data acquisition, digital filtering, control, spectral analysis, communications, etc. Co-requisite: ELEN-650 or consent of instructor.

ELEN-656 Probability and Random Processes Credit 3(3-0)

This course covers sample space, events, conditional probabilities, independent events, Bayes' formula, discrete random variables, expectation of random variables, joint distribution, conditional expectation, Markov chains, stationary processes, ergodicity, correlation and power spectrum of stationary processes, and Gaussian processes. Pre-requisite: ELEN-400.

ELEN-657 Digital Image Processing Credit 3(3-0)

This course deals with concepts and techniques for digital image analysis and processing. Topics include image representation, image enhancement, edge extraction, image segmentation, geometric structure, feature extraction, knowledge representation, and image understanding. Pre-requisite: ELEN-400 or consent of instructor.

ELEN-658 Digital Image Processing Laboratory Credit 2(1-3)

This laboratory course will demonstrate many important and practical applications of digital image processing techniques. The experiments include image enhancement, feature extraction, Hough transform, various transforms in spatial and frequency domains, image understanding and quantization. Co-requisite: ELEN- 657.

ELEN-661 Power Systems Analysis Credit 3(3-0)

This course studies power system representation, transmission lines, symmetrical and asymmetrical faults, electric power flow, power systems control and stability. Pre-requisite: ELEN- 430

ELEN-662 Advanced Power Systems Laboratory Credit 2(1-3)

In this laboratory course, basic concepts, transmission lines, power flow, faults, and transient and steady state stability will be investigated. Pre-requisite: ELEN- 436 or consent of instructor.

ELEN-668 Modern Control Theory Credit 3(3-0)

This course introduces the theory of linear systems represented by state equations. Topics include Linear algebra, Jordan canonical form, solutions of state equations, relationship to transfer functions, stability, controllability, and pole placement design. Pre-requisite: ELEN-410 or consent of instructor.

ELEN-669 Control Laboratory **Credit 2(1-3)**

This laboratory course demonstrates methods of system analysis and control design. Verification of control system analysis and design in both the time domain and frequency domain will be studied. Co-requisite: ELEN-668 or consent of instructor.

ELEN-674 Genetic Algorithms **Credit 3(3-0)**

This course covers the theory and applications of genetic algorithms. Genetic algorithms combine a Darwinian survival-of-the-fittest with a randomized, yet structured, information exchange to form an improved search mechanism with surprising robustness. Engineering applications of genetic algorithms for design and control will be presented. Pre-requisite: ELEN 410 or consent of instructor.

ELEN-678 Introduction to Artificial Neural Networks **Credit 3(3-0)**

This course introduces neural network design and development. Emphasis is on designing and implementing information processing systems that autonomously develop operational capabilities in adaptive response to an information environment. Pre-requisite: ELEN-400 or consent of instructor.

ELEN-679 Machine Intelligence Laboratory **Credit 2(1-3)**

This laboratory course covers the design and development of intelligent, autonomous, physical agents. Emphasis will be placed on machine intelligence experiments and simulations with visual sensors, tactile sensors, robotic manipulators and autonomous inexpensive mobile robots. Co-requisite: ELEN-678; Pre-requisite: ELEN-433 or consent of instructor.

ELEN-685 Selected Topics in Electrical and Computer Engineering **Credit 3(3-0)**

This lecture course is used to introduce engineering topics of current interest to students and faculty. The subject matter will be identified before the beginning of the course. Pre-requisite: Consent of instructor.

ELEN-686 Special Projects **Credit Var. 1-3**

This is an investigation of an engineering topic, which is arranged between a student and a faculty member. Project topics may be analytical and/or experimental and should encourage independent study. Pre-requisite: Consent of instructor.

ELECTRICAL ENGINEERING WORK SHEET

Fall 2005 Handbook

NAME: _____ SS#: _____

Entering Date: _____ Advisor: _____

Math (15 cr hrs.):

MATH-131	Calculus I	Pre = Placement Exam	4cr ()
MATH-132	Calculus II	Pre = MATH-131	4cr ()
MATH-431	Introd to Diff Eq	Pre = MATH-132	3cr ()
MATH-231	Calculus III	Pre = MATH-431	4cr ()

Basic Science (12 cr hrs):

CHEM-106	General Chemistry	Pre = none	3cr ()
CHEM-116	Chem Lab	Co = CHEM-106	1cr ()
PHYS-241	Gen Physics I	Co = MATH-132, PHYS-251	3cr ()
PHYS-251	Physics Lab	Pre = PHYS-241, Co = PHYS-242	1cr ()
PHYS-242	Gen Physics II	Pre = PHYS-241, Co = PHYS-252	3cr ()
PHYS-252	Physics Lab	Co = PHYS-242	1cr ()

Humanities, Soc Sci, African-Amer, and Global Studies (21 cr hrs.):

ENGL-100	Ideas and Their Expr I	Pre = Placement Exam	3cr ()
ENGL-101	English Writing Elective	Pre = ENGL-100	3cr ()
XXXX-XXX	Global Studies	Elective _____	3cr ()
XXXX-XXX	African-Amer Studies	Elective _____	3cr ()
ECON-200/1	Economics 200/1		3cr ()
XXXX-XXX	Humanities Elective	Elective _____	3cr ()
XXXX-XXX	Humanities Elective	Elective _____	3cr ()

Health or Physical Education (2 cr hrs): _____ 2cr ()

General Engineering (6 cr hrs.):

GEEN-100	Engineering Design and Ethics		2cr ()
GEEN-102	Introd. to Computer Prog.		2cr ()
GEEN-103	Computer for Engineers		2cr ()

Mechanical & Industrial Engineering (8 cr hrs.):

MEEN-xxx		Pre = MATH-132, PHYS-241	3cr ()
INEN-260	Engr Econ Analysis	Pre = MATH-131	2cr ()
INEN-270	Engr Statistics I	Pre = MATH-132	3cr ()

ELECTRICAL ENGINEERING WORK SHEET (cont)

Electrical and Computer Engineering (41 cr hrs.):

ELEN-200	Electric Circuit Analysis I	Co = MATH-431	3cr ()
ELEN-300	Electric Circuit Analysis II	Pre = ELEN-200; Co = MATH-231	3cr ()
ELEN-306	Circuits Lab II	Co = ELEN-300	2cr ()
ELEN-320	Electronics I	Pre = ELEN-200	3cr ()
ELEN-327	Digital Logic	Pre = ELEN-200	3cr ()
ELEN-328	Digital Logic Laboratory	Co = ELEN-327	1cr ()
ELEN-400	Linear Systems and Signals	Pre = ELEN-300	3cr ()
ELEN-425	Introd. to Electromagnetics	Pre = MATH-231	3cr ()
ELEN-427	Introd. to Microprocessors	Pre = ELEN-327	3cr ()
ELEN-430	Power Systems	Pre = ELEN-300, ELEN-325	3cr ()
ELEN-433	Microprocessor Laboratory	Co = ELEN-427	1cr ()
ELEN-460	Electronics II	Pre = ELEN-320	3cr ()
ELEN-466	Electronics II Lab	Pre = ELEN-306, Co = ELEN-460	1cr ()
ELEN-475	Applied Engg. Analysis	Pre = MATH-231, MATH-431	3cr ()
ELEN-598	Senior Design Project I	Pre = ELEN-433 and ELEN-466	3cr ()
ELEN-599	Senior Design Project II	Pre = ELEN-598	3cr ()

Plus (15 cr. hrs.) from:

ELEN-410, 449, 470 (1)	_____	3cr ()
ELEN-4xx, ELEN-6xx (3)	_____	3cr ()
	_____	3cr ()
	_____	3cr ()
MEEN-337, MEEN-413 (1)	_____	3cr ()

Plus two Adv. ELEN Elective (6 cr. hrs.) and one Adv. ELEN Lab (2 cr. hrs.):

ELEN-6xx	_____	6cr ()
ELEN-6xx	_____	6cr ()
ELEN-6xx Laboratory:	_____	<u>2cr ()</u>
Total:		128 cr

Comments: _____

Note: "Pre" = Pre-requisite course(s); "Co" = corequisite course(s).

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