

## **Welcome Note from the Department Head**

On behalf of the faculty and staff, welcome to Fayetteville, to the University of Arkansas – the flagship university of the State of Arkansas, and to the Department of Electrical Engineering. This department is one of seven in the College of Engineering ([www.engr.uark.edu](http://www.engr.uark.edu)).

The Department of Electrical Engineering was established in 1897, has been offering the Bachelor of Science degree since its establishment in 1897, and has been continuously accredited since 1936. This was the very first electrical engineering department in the United States to be reviewed and accredited under ABET criteria 2000. We appreciate the fact that you have chosen to pursue your degree in a department that offers a high-quality educational program. The department also offers the masters' degree (M.S.E.E. and M.S.E.) and the Doctor of Philosophy (Ph.D.) degrees.

The department is staffed by professional, qualified educators, administrators, and staff who are dedicated to providing you with an enjoyable experience while you pursue a quality education. It is our goal to provide you with a rewarding educational and research experience in order that you are properly prepared to begin your career as a practicing engineer who can compete with electrical engineering graduates from any other university in the world.

The University of Arkansas, College of Engineering, and Department of Electrical Engineering offer numerous scholarships for qualified candidates. Students continuing into graduate studies can apply for teaching or research assistantships. Moreover, outstanding students, with excellent academic records and GRE scores, will be considered for many prestigious fellowships. They offer competitive stipend and tuition.

Best wishes for success in achieving your academic goals. The faculty and staff are available to provide assistance during your tenure with the department, and if I can be of help in any way, please do not hesitate to ask.

Sincerest regards,

Samir El-Ghazaly

Department Head

## **What is Electrical Engineering?**

Electrical engineering is a professional engineering discipline that in its broader sense covers the study and application of electricity, electronics and electromagnetism. Electrical engineers are in charge of designing and utilizing electrical components, integrated circuits, integrated chips, computer chips, and electronic assemblies to benefit mankind. Fields of electrical engineering are artificial intelligence, computer hardware and software, control systems, digital electronics, electric power and energy systems, electronics including microelectronics, mixed signal electronics, nanotechnology, optoelectronics, signal processing, and telecommunications.

The electrical engineering graduate is at the forefront of technologies leading to the dramatic increase in accelerated use of electric power, applications of real time embedded control systems for smart highways, the dominating influence of the computer on modern society, global communications, the miniaturization of electronics, smart vehicles and smart gadgets, the use of wireless chemical and biological nano-sensors for hazard detection, and a host of other developments. The increased use of electronic equipment for communication, control, measurement, and networking has spread into such diverse areas as agricultural production, automotives, computer networks and hardware, health care, information technology, manufacturing, marketing, recreation, renewable energy, transportation, underwater and space explorations, and many others. This widespread and expanding use of electrical and electronic equipment in virtually all fields has made electrical engineering the largest of all scientific disciplines and assures a continuing demand for electrical engineering graduates throughout business and government. Information regarding the average salary of an electrical engineer is available on the Electrical Engineering website ([www.eleg.uark.edu/1628.php](http://www.eleg.uark.edu/1628.php).)

## **Mission of the Electrical Engineering Department**

The University of Arkansas, the state land grant university, is a nationally competitive, student-centered, teaching and research university serving Arkansas and the world. As such, our mission encompasses education, research, and service ([www.uark.edu](http://www.uark.edu)).

The educational mission of the department is conducted through both the undergraduate and graduate programs ([www.ee.uark.edu](http://www.ee.uark.edu)). The educational objectives for the undergraduate program, which leads to a Bachelor of Science degree in Electrical Engineering, are to produce graduates who:

1. Are recruited in a competitive market and valued as reliable and competent employees by a wide variety of industries, in particular electrical engineering industries;
2. Succeed, if pursued, in graduate studies such as, engineering, science, law, medicine, business, and other professions;
3. Understand the need for life-long learning and continued professional development for a successful and rewarding career; and
4. Accept responsibility for leadership roles, in their profession, in their communities, and in the global society.

The department also participates in the Honors program to challenge gifted undergraduate students with a more in-depth academic program and research experience and to provide a structure for working more closely with faculty members and other students in a team environment ([www.honorscollege.uark.edu](http://www.honorscollege.uark.edu)).

The graduate program offers a Master of Science degree in Electrical Engineering (M.S.E.E.), a Master of Science Degree in Engineering (M.S.E.), and a Doctor of Philosophy degree in Engineering. Having received additional instruction and hands-on experience beyond the undergraduate level, an additional educational objective for the graduate program is to produce graduates that are prepared to promptly address critical issues and assume advanced positions in the profession, such as in management and R & D.

In summary, the Electrical Engineering program is designed to offer a high-quality path of instruction involving classroom, laboratory, and extracurricular activities that results in graduates qualified and prepared to meet the demands of a professional career in the present and future work places and able to assume a responsible place of leadership in a complex technological society.

The research mission of the department is conducted mainly through the graduate program. Internal and external funded research projects serve to:

1. Discover new knowledge, address technical problems, and develop new electrical/electronic technologies;
2. Provide the tools and resources which keep our faculty at the cutting edge of electrical engineering;
3. Provide financial support for graduate students and gifted undergraduate students; and
4. Improve the quality of life for the citizens of Arkansas and the world.

As mentioned above, the graduate program also supports the undergraduate program by giving qualified undergraduate students access to research laboratories with state-of-the-art equipment and software. Topics covered in graduate courses migrate into senior undergraduate elective courses and eventually into required undergraduate courses. See the Appendix of this handbook (which is in the full version available in the website) for research opportunities for undergraduate students.

Faculty, students, administrators, and staff conduct the service mission of the department. The electrical engineering program, including faculty, students, staff, and facilities, is a major resource of the state, region, and nation. Faculty members are encouraged to provide services to both the community and the profession. Thus, our faculty members are active in local, state, national, and international professional and service organizations, as well as public and private schools involving grades K-12. A full listing of the faculty, their areas of interest, and email addresses are shown in the Appendix (which is in the website).

## **The Electrical Engineering Undergraduate Curriculum**

The electrical engineering undergraduate curriculum is designed to provide students with knowledge of scientific principles and methods of engineering analysis to form a solid foundation for a career in design, research and development, manufacturing and processing, measurement and characterization, or management. The outcomes of the electrical engineering undergraduate curriculum are the following:

- a) an ability to apply knowledge of mathematics, science, and engineering;
- b) an ability to design and conduct experiments, as well as to analyze and interpret data;
- c) an ability to design a system, component, or process to meet desired needs;
- d) an ability to function on multi-disciplinary teams;

- e) an ability to identify, formulate, and solve engineering problems;
- f) an understanding of professional and ethical responsibility;
- g) an ability to communicate effectively;
- h) the broad education necessary to understand the impact of engineering solutions in a global and societal context;
- i) a recognition of the need for, and an ability to engage in life-long learning;
- j) a knowledge of contemporary issues;
- k) an ability to use the techniques, skills, and modern engineering tools (this specifically includes PSPICE and MATLAB) necessary for engineering practice.

The electrical engineering undergraduate curriculum is divided into three phases; the first year, the second and third years, and the senior year. The first year concentrates on developing a sound understanding of basic sciences and mathematics, and introduces general engineering concepts. The College of Engineering has adopted a common freshman year for all new freshmen with exception of those pursuing a Bachelor of Science in Chemical Engineering. For more information about the freshman year, please refer to the electrical engineering undergraduate curriculum in this handbook and also <http://www.engr.uark.edu/1469.htm>.

Following the freshman year, students enter the heart of the EE undergraduate curriculum. The sophomore year provides a transition into electric circuits and digital systems, and largely completes the required mathematics. This leads to the junior year containing the majority of the *required* technical courses within electrical engineering. The senior year is composed primarily of technical electives, both within and outside electrical engineering, where students can explore several areas of interest. At this time, the student in conjunction with *his or her adviser* may select technical electives to concentrate in one or more of the technical specializations within electrical engineering, namely, circuits, communications, controls, digital or computer hardware, electromagnetics, electronics, microelectronics, mixed-signal, nanotechnology, power, and sensors. This final year permits the student to tailor a program suited to his or her individual career objectives. Students progressively build their design experience throughout the curriculum and demonstrate this ability in Electrical Engineering Design I and II.

For those students enrolled in the Honors program, their design experience culminates in the Honors Electrical Engineering Design I and II, and the senior honors thesis. In addition, Honors sections of several electrical engineering courses provide further information on special issues in the electrical engineering discipline.

Lastly, the curriculum also introduces students to subjects in the humanities, social sciences, and professional success and ethics so they may better understand the interaction of technology and society.

The graduation requirement in electrical engineering is 125 semester hours. A full listing, flowchart, and specific details of the present curriculum are given below.

Though faculty advisors are quite knowledgeable about the technical aspects of an engineering education, other students are a good resource when it comes to charting a path through the curriculum. Students are advised to inquire in order to be well informed about various curriculum issues.

**ELECTRICAL ENGINEERING CURRICULUM  
2009-2010**

**Freshman Year**

1 GNEG 1111 Intro to Engineering I	1 GNEG 1121 Introduction to Engineering II
4 MATH 2554 Calculus I	4 MATH 2564 Calculus II
3 CHEM 1103 University Chemistry I	4 XXXX XXX4 Freshman Science Elective <sup>1</sup>
4 PHYS 2054 University Physics I	3 XXXX XXX3 University Core Elective <sup>2</sup>
<u>3</u> ENGL 1013 Composition I	<u>3</u> ENGL 1023 Technical Composition II
15 semester hours	15 semester hours

**Sophomore Year<sup>3</sup>**

3 ELEG 2103 Electric Circuits I	4 CSCE 2004 Programming Foundations I
1 ELEG 2101L Electric Circuits I Lab	3 ELEG 2113 Electric Circuits II
4 ELEG 2904 Digital Design I	1 ELEG 2111L Electric Circuits II Lab
4 MATH 2574 Calculus III	4 MATH 3404 Differential Equations
<u>4</u> XXXX XXX4 Sophomore Science Elective <sup>4</sup>	<u>3</u> History Government Requirement
16 semester hours	15 semester hours

**Junior Year<sup>5</sup>**

3 ELEG 3123 System and Signal Analysis	3 ELEG 3223 Electronics II
1 ELEG 3121L System & Signal Lab	1 ELEG 3221L Electronics II Lab
3 ELEG 3213 Electronics I	3 ELEG 3303 Energy Conversion
1 ELEG 3211L Electronics I Lab	1 ELEG 3301L Energy Conversion Lab
3 ELEG 3923 Microprocessor System Design	3 ELEG 3703 Electromagnetics
0 ELEG 3920L Microprocessor Sys Design Lab	3 Humanities/Social Science elective
4 CSCE 2014 Programming Foundations II	3 Math/Science Elective
<u>0</u> ENGL 2003 Advanced Composition	<u>    </u>
15 semester hours	17 semester hours

**Senior Year**

1 ELEG 4061 EE Design I	1 ELEG 4071 EE Design II
3 ELEG 4143 Stochastic Signal Processing	6 Electrical Eng Technical Elective
3 Electrical Engineering Technical Elective	3 Technical Elective
3 Engineering Science Elective	3 Upper level humanities/social science elective
3 Technical Elective	3 Humanities/Social Science Elective
<u>3</u> Upper-level Humanities-Social Science Elective	<u>    </u>
16 semester hours	16 semester hours

**TOTAL: 125 semester hours**

<sup>1</sup>Freshman Science Elective - CHEM 1123/1121L – University Chemistry II or PHYS 2074 – University Physics II

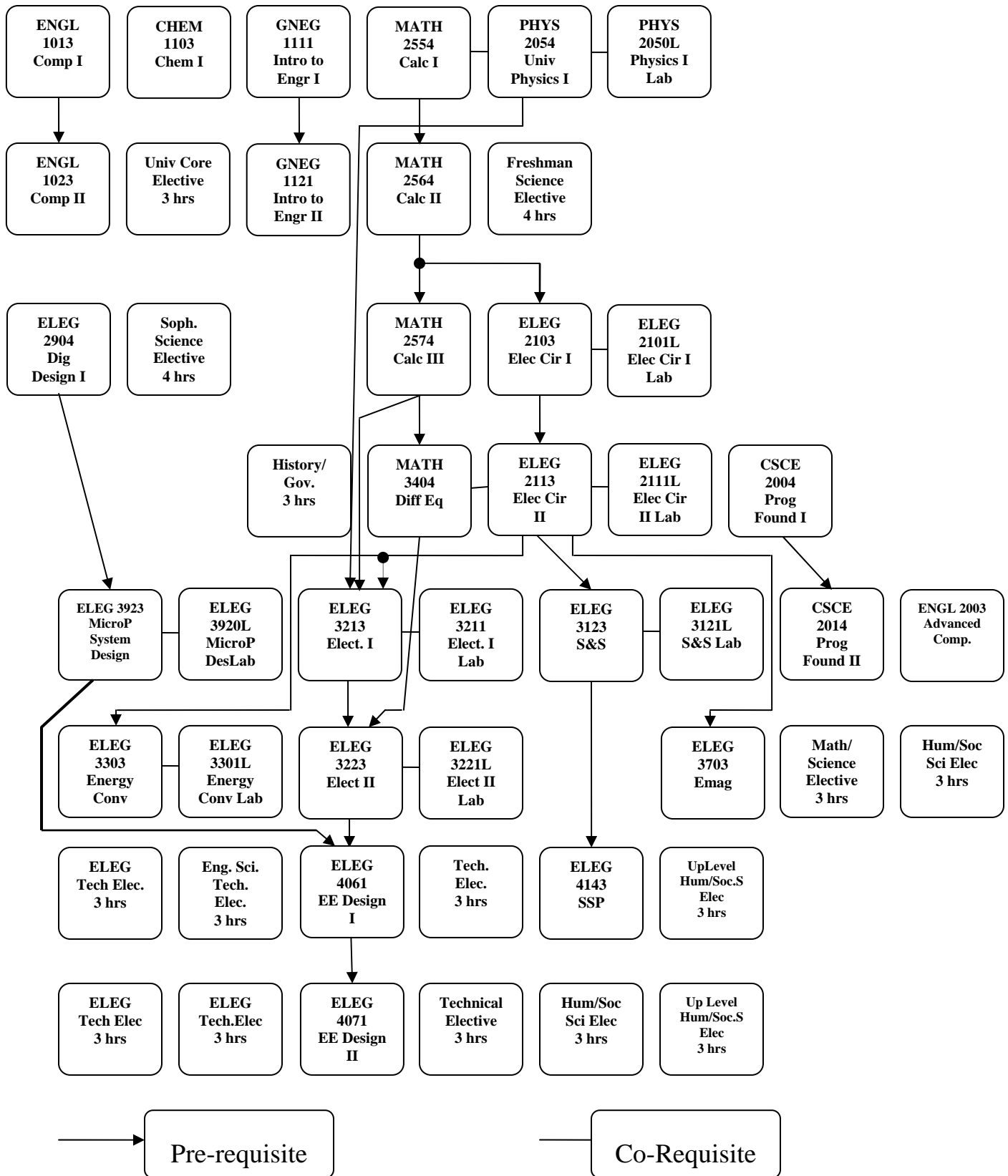
<sup>2</sup>Approved Humanities/Social Science course

<sup>3</sup>Students who have earned 45 hours must take the Rising Junior Exam

<sup>4</sup>PHYS 2074 if student took CHEM 1123/1121L in Freshman Year. Otherwise, CHEM1123/1121L or approved 4 hours in Science

<sup>5</sup>Students are required to take ENGL 2003 or gain exemption

# ELECTRICAL ENGINEERING 2009-2010 CURRICULUM FLOW CHART



List of Required Courses with Pre and Co Requisites for ELEG					
Year/Semester	Number	Course Title	Area	Prerequisites	Corequisites
<b>Freshman Year</b>					
Freshman 1	GNEG 1111	Intro to Engineering I			
Freshman 1	MATH 2554	Calculus I			PHYS 2054
Freshman 1	CHEM 1103	Chemistry I			
Freshman 1	PHYS 2054	University Physics I			MATH 2554, PHYS 2050L
Freshman 1	PHYS 2050L	Physics I Lab			PHYS 2054
Freshman 1	ENGL 1013	Comp I			
Freshman 2	GNEG 1121	Intro to Engineering II		GNEG 1121	
Freshman 2	MATH 2564	Calculus II		MATH 2554	
Freshman 2	XXXX XXX4	Freshman Science Elective <sup>1</sup>		See Note 1	
Freshman 2	XXXX XXX3	University Core Elective <sup>2</sup>		See List	
Freshman 2	ENGL 1023	Technical Composition II		ENGL 1013	
<b>Sophomore Year<sup>3</sup></b>					
Sophomore 1	ELEG 2103	Electric Circuits I		MATH 2564	ELEG 2101L
Sophomore 1	ELEG 2101L	Electric Circuits I Lab			ELEG 2103
Sophomore 1	ELEG 2904	Digital Design I			
Sophomore 1	MATH 2574	Calculus III		MATH 2564	
Sophomore 1	XXXX XXX4	Sophomore Science Elective <sup>4</sup>		See Note 4	
Sophomore 2	CSCE 2004	Programming Foundations I			
Sophomore 2	ELEG 2113	Electric Circuits II		ELEG 2103	ELEG 2111L
Sophomore 2	ELEG 2111L	Electric Circuits II Lab			ELEG 2113
Sophomore 2	MATH 3404	Differential Equations		MATH 2574	
Sophomore 2	XXXX XXX3	History/Government Requirement		See List	
<b>Junior Year<sup>5</sup></b>					
Junior 1	ELEG 3123	System and Signal Analysis		ELEG 2113	ELEG 3121L
Junior 1	ELEG 3121L	System and Signal Lab			ELEG 3123
Junior 1	ELEG 3213	Electronics I		ELEG 2113, MATH 2574, PHYS 2074	ELEG 3211L
Junior 1	ELEG 3211L	Electronics I Lab			ELEG 3213
Junior 1	ELEG 3923	Microprocessor System Design		ELEG 2904	ELEG 3920L
Junior 1	ELEG 3920L	Microprocessor System Design Lab			ELEG 3923
Junior 1	CSCE 2014	Programming Foundations II		CSCE 2004	
Junior 1	ENGL 2003	Advanced Composition		See Note 5	
Junior 2	ELEG 3223	Electronics II		ELEG 3213	ELEG 3221L
Junior 2	ELEG 3221L	Electronics II Lab			ELEG 3223
Junior 2	ELEG 3303	Energy Conversion		ELEG 2113	ELEG 3301L
Junior 2	ELEG 3301L	Energy Conversion Lab			ELEG 3303
Junior 2	ELEG 3703	Electromagnetics		ELEG 2113	
Junior 2	XXXX XXX3	Humanities/Social Science elective			
Junior 2	XXXX XXX3	Math/Science Elective		See List	

Senior Year					
Senior 1	ELEG 4061	EE Design 1		ELEG 3223, 3923	
Senior 1	ELEG 4143	Stochastic Signal Processing		ELEG 3123	
Senior 1	ELEG XXX3	Electrical Engineering Technical Elective			
Senior 1	XXXX XXX3	Engineering Science Elective		See List	
Senior 1	XXXX XXX3	Technical Elective			
Senior 1	XXXX XXX3	Upper-level H/SS Elective			
Senior 2	ELEG 4071	EE Design II		ELEG 4061	
Senior 2	ELEG XXX3	Electrical Engineering Technical Elective			
Senior 2	XXXX XXX3	Technical Elective			
Senior 2	XXXX XXX3	Upper-level H/SS Elective			
Senior 2	XXXX XXX3	Humanities/Social Science Elective			

<sup>1</sup>Freshman Science Elective - CHEM 1123/1131L - University Chemistry II or PHYS 2074 - University Physics II

<sup>2</sup>Approved Humanities/Social Science course

<sup>3</sup>Students who have earned 45 hours must take the Rising Junior Exam

<sup>4</sup>PHYS 2074 if student took CHEM 1123/1121L in Freshman Year. Otherwise, CHEM 1123/1121L or approved 4 hrs in Science

<sup>5</sup>Students are required to take ENGL 2003 or gain exemption

## NOTES FOR 2009-2010 ELECTRICAL ENGINEERING UNDERGRADUATE CURRICULUM

### TECHNICAL COMPOSITION

ENGL 1023, Composition II, has some sections addressing **technical** composition. Therefore, the EE faculty highly recommends all EE students, including transfer students, to enroll in the “technical” sections, if possible.

### COMMON FRESHMAN YEAR

Please refer to <http://www.engr.uark.edu/1469.htm> for a description of the common freshman year. PHYS 2074 – University Physics II or CHEM 1123/1121L – University Chemistry II are approved Freshman Science Electives; students together with their advisors must select only one.

### SOPHOMORE SCIENCE ELECTIVE

PHYS 2074 – University Physics II if student took CHEM 1123/1121L – University Chemistry II as a Freshman Science Elective, or approved 4 hours in the Sciences if student took PHYS 2074 – University Physics II as a Freshman Science Elective. The approved 4 hours in the Sciences are:

CHEM 1123 and CHEM 1121L, University Chemistry II  
BIOL 1543 and 1541L, Principles of Biology  
BIOL 2213 and 2211L, Human Physiology

### HUMANISTIC-SOCIAL SCIENCE ELECTIVES

- \* Minimum requirement of 18 hours for everyone; 6 hours must be approved upper level courses (See COE website for the list of approved courses)
- \* Follow any of Options 1, 2 or 3 as described later in the **Plan of Study to Meet Core Requirement** (See the Appendix which is on the website)
- \* No more than 6 hours can be taken from the same department

### ADVANCED COMPOSITION

Students must pass ENGL 2003 - Advanced Composition unless exemption can be gained as described in the UA Catalog of Studies: (1) by demonstrating a satisfactory writing ability on the Advanced Composition Exemption Examination, (2) by completing ENGL 2013 (Essay Writing), or (3) by achieving a grade of “A” or “B” in ENGL 1013 and a grade of “A” in ENGL 1023 in courses taken at the University of Arkansas, Fayetteville.

### TECHNICAL ELECTIVES

- \* 15 hours total required with at least **9 of the 15 hours must be ELEG 4000 or ELEG 5000 level courses**
- \* Not more than 6 hours may be ELEG 488V or ELEG 489V courses
- \* 6 of the 15 hours may be upper (3000 or above) level courses in Math, Engineering or the sciences after the approval of an ELEG advisor; history courses in the Math and the sciences (e.g., MATH 3133) are not eligible for technical elective credit.
- \* Students who have (1) Talked to the departmental co-op coordinator, Dr. Randy Brown, about the intention of taking three GNEG 3811 courses for 3 hours of non-ELEG technical electives, and (2) the grades in these courses were A or B, may get credit for three hours of non-ELEG technical electives. Please, consult the department regarding this if you have any further questions.
- \* Students cannot use ELEG 3903, ELEG 3913, or ELEG 3933 to meet this requirement.

### MATH/SCIENCE ELECTIVES

BIOL 1543 & 1541L, Principles of Biology  
BIOL 2213 & 2211L, Human Physiology  
CHEM 1123 & 1121L, University Chem II  
CHEM 3504, Physical Chemistry I  
CHEM 3603, Organic Chemistry I  
MATH 3083, Linear Algebra  
MATH 3353, Numerical Methods  
MATH 3423, Advanced Applied Math  
MATH 4443, Complex Variable for Appl.

MEEG 2703, Computer Methods in ME  
PHYS 2094, University Physics III  
PHYS 3133, Analytical Mechanics  
PHYS 3544, Optics  
PHYS 3614, Modern Physics  
STAT 4003 Statistical Methods

### ENGINEERING SCIENCE ELECTIVES

A 3 hour engineering science elective required from one of the following courses:

MEEG 2023 Introduction to Mechanics  
MEEG 2303 Introduction to Materials  
MEEG 2403 Thermodynamics

### GPA REQUIREMENTS

All students must have at least a 2.0 grade-point average on: (i) all courses in Electrical Engineering (excluding ELEG laboratories), (ii) all engineering courses, and (iii) all work presented for the degree. No more than 15% of the **coursework taken at UA-Fayetteville** and presented for the degree can be “D” grades.

## **ELECTRICAL ENGINEERING HONORS PROGRAM**

To graduate with Honors in Electrical Engineering, a student must be a member of the Honors College, have a minimum cumulative GPA of 3.50, and complete a **minimum of 12 hours of honors credit** of which **6 hours must be Electrical Engineering** courses which include the following courses:

ELEG 4061H – Honors Electrical Engineering Design I  
ELEG 4071H – Honors Electrical Engineering Design II  
ELEG 4001H – Senior Thesis

### **Electrical Engineering Honors Courses**

**ELEG 3XX3H:** Honors section of ELEG required junior courses.

#### **ELEG 4061H: Electrical Engineering Design I**

Design and application in electrical engineering.

#### **ELEG 4071H: Electrical Engineering Design II**

Design and application in electrical engineering.

#### **ELEG 4001H: Honors Senior Thesis**

#### **ELEG 488VH: Honors Special Problem**

Individual study and research on a topic mutually agreeable to the student and a faculty member.

#### **ELEG 4XX3H: ELEG technical elective (Honors section)**

Several ELEG technical electives have an Honors section. Please check the offering of these Honors Sections for a particular semester.

**ELEG 5XXX:** Any graduate level course

#### **ELEG 3083H: Honors Colloquium**

Special topics and issues in Electrical Engineering

#### **ELEG 388VH: Special Problems**

Individual study and research on a topic mutually agreeable to the student and faculty member.

**NOTE: The hardcopy of the Undergraduate Handbook finishes here.** Please, refer to the website [www.ee.uark.edu](http://www.ee.uark.edu), click on “Current Students” and then on “Undergraduate Handbook” for additional information on:

- Options 1, 2 and 3 for the Humanities/Social Science Electives
- Departmental Facilities
- Advising
- Registration
- Tutoring Services
- Rising Junior Exam
- Advanced Composition
- Degree Checks
- Activities and Organizations
- Cooperative Education
- Career Services
- Academic Ethics
- Attributes of Engineering Graduates
- Becoming a Registered Professional Engineer
- Computers and Calculators
- Electrical Engineering Faculty/Staff and Specialty Areas
- IEEE Code of Ethics
- BSEE Degree Check
- Current Research Opportunities for Electrical Engineering Undergraduate Students.