

PHYS 214, Electricity and Magnetism.....	3
PHYS 214L, Electricity and Magnetism Laboratory.....	1
PHYS 217, Heat, Light, and Sound.....	3
PHYS 217L, Experimental Heat, Light, and Sound.....	1
PHYS 315, Modern Physics.....	3
PHYS 315L, Experimental Modern Physics.....	2
PHYS 454, Intermediate Modern Physics I.....	3
PHYS 455, Intermediate Modern Physics II.....	3
PHYS 461, Intermediate Electricity and Magnetism I.....	3
PHYS 462, Intermediate Electricity and Magnetism II.....	3
PHYS 475, Advanced Experimental Modern Physics.....	3
PHYS 495, Mathematical Methods of Physics I.....	3
Physics elective.....	3

**Mechanical Engineering (43 credits)**

C E 301, Mechanics of Materials.....	3
M E 102, Introduction to Mechanical Engineering.....	1
M E 159, Graphical Communication and Design.....	2
M E 236, Engineering Mechanics I.....	3
M E 237, Engineering Mechanics II.....	3
M E 240, Thermodynamics.....	3
M E 260, Mechanical Engineering Problem Solving.....	3
M E 328, Engineering Analysis I.....	3
M E 329, Engineering Analysis II.....	3
M E 333, Intermediate Dynamics.....	3
M E 338, Fluid Mechanics.....	3
M E 341, Heat Transfer.....	3
M E 426, Design Project Laboratory I.....	3
M E 427, Design Project Laboratory II.....	3
M E 449, Senior Seminar.....	1
Engineering elective.....	3

**Mathematics (15 credits)**

MATH 191, Calculus and Analytic Geometry I.....	3
MATH 192, Calculus and Analytic Geometry II.....	3
MATH 291, Calculus and Analytic Geometry III.....	3
MATH 392, Ordinary Differential Equations.....	3
Math elective from M E list.....	3

**Natural Science (4 credits)**

CHEM 111, General Chemistry I.....	4
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**Additional General Education requirements (28 credits)**

ENGL 111G, Rhetoric and Composition.....	4
ENGL 218G, Technical and Scientific Communication.....	3
Critical thinking/analysis elective (non-computer).....	3
Historical perspective elective.....	3
Human thought elective.....	3
Social analysis elective.....	3
Literature/fine arts elective.....	3
Viewing a Wider World electives*.....	6

\*Viewing a Wider World courses may not be taken in engineering or physics.

## ELECTRICAL and COMPUTER ENGINEERING

### The Klipsch School of Electrical and Computer Engineering

**College Associate Professor Professor Krist Petersen, interim department head**

**Associate Professor Paul Furth, associate department head**

**College Associate Professor Sheila Horan, freshman adviser**

**Professors** Black, (emeritus), Carden (emeritus), Castillo, Flachs (emeritus), Giles, Stephen Horan, Johnson\*, Jordan (emeritus), Kazda (emeritus), Kersting (emeritus), Ludeman (emeritus), Merrill (emeritus), Ng, Ramirez-Angulo, Ranade, Reinfelds (emeritus), Smolleck\*, Steelman\* (emeritus), Stochaj, Taylor (emeritus); **Associate Professors**, DeLeon, Furth, Jedlicka, Paz, Prasad, Voelz; **Assistant Professors** Borah, Cook, Creusere, Huang, Lyman, Mitra;

**College Associate Professors** Sheila Horan, Petersen; **College Assistant Professor** Phippen; **Adjunct Professor** Vorontsov; **Adjunct Assistant Professors** Ellis, Garcia; **Adjunct Instructors** Boehmer, Geyer  
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\*Registered Professional Engineer (NME)

### DEGREE: Bachelor of Science in Electrical Engineering

The undergraduate program of the Klipsch School is fully accredited by the Accreditation Board for Engineering and Technology (ABET) and stresses the development of analytical tools and physical concepts required to prepare students for immediate employment or graduate study. The program is flexible, allowing students to choose course work in the interest areas of communications, computers, control systems, digital design, electric energy systems, electromagnetics and microwave engineering, micro-electronics, photonics, signal processing, telemetry, and space systems engineering.

### Electrical Engineering Program Education Objectives

The Klipsch School is dedicated to providing a quality, hands-on, educational experience. Upon graduation, students will have the technical, communication, and critical thinking skills necessary to begin a fulfilling career and/or pursue graduate studies in electrical and computer engineering. Baccalaureate graduates of the Klipsch School are:

- able to apply engineering, science, and mathematical skills to meet the technical challenges in electrical engineering
- experienced in the design process: conceptualization, solution, formulation, implementation, and verification
- able to communicate effectively and operate in diverse teams
- aware of their professional and ethical responsibilities as practicing engineers
- prepared for productive employment and/or the pursuit of an advanced degree

### Requirements (total credits 128)

#### Electrical Engineering (54 credits)

E E 111, Introduction to Electrical and Computer Engineering <sup>1,2</sup> .....	4
E E 161, Computer-Aided Problem Solving <sup>1, 2, 3</sup> .....	4
E E 211, AC Circuits <sup>1, 2</sup> .....	4
E E 221, Electronics <sup>1, 2</sup> .....	4
E E 261, Digital Design <sup>1, 2</sup> .....	4
E E 311, Signals and Systems <sup>1, 2</sup> .....	4
E E 315, Electromagnetics <sup>1, 2</sup> .....	4
E E 332, Introduction to Electric Power Engineering <sup>1, 2</sup> .....	4
E E 341, Systems <sup>1, 2</sup> .....	4
EE Electives*.....	12
Capstone Elective*.....	6

#### Mathematics (21 credits)

MATH 191, Calculus I <sup>2</sup> .....	3
MATH 192, Calculus II <sup>2</sup> .....	3
MATH 291, Calculus III <sup>2</sup> .....	3
E E 301, Vector Principles <sup>2</sup> .....	3
MATH 392, Differential Equations.....	3
Statistics Elective*.....	3
Math Elective*.....	3

#### Natural Science (12 credits)

CHEM 111, General Chemistry I <sup>1</sup> .....	4
PHYS 215, General Physics I <sup>1,2</sup> .....	4
PHYS 216 or 217, General Physics II <sup>1,2</sup> .....	4

#### Engineering (13 credits)

E E 461, Program Management.....	3
Engineering elective*.....	3
Technical elective*.....	6

#### General Education (28 credits)

ENGL 111G, Rhetoric and Composition <sup>2</sup> .....	4
ENGL 218G, Technical and Scientific Communication.....	3
COMM 265G, Principles of Human Communication.....	3
Historical Perspective Elective*.....	3
Human Thought Elective*.....	3
Literature/Fine Arts Elective*.....	3
ECON 251G, Macroeconomics, or ECON 252G, Microeconomics.....	3

Viewing a Wider World Electives\* .....6  
 Free elective .....1

- 1 Including laboratory
- 2 A grade of C or better is required
- 3 Must be completed with a grade of C or better prior to enrolling in any E E course numbered 300, or above
- \* Lists of approved electives are available from the Klipsch School office

**THE FRESHMAN YEAR**

Students must be eligible to take MATH 191 before beginning their electrical engineering studies. A typical first year of study for E E students includes the following 29 credits:

CHEM 111, General Chemistry I .....4  
 E E 111, Introduction to Electrical and Computer Engineering.....4  
 E E 161, Computer-Aided Problem Solving .....4  
 E E 261, Digital Design I .....4  
 ENGL 111G, Rhetoric and Composition.....4  
 MATH 191, Calculus I\* .....3  
 MATH 192, Calculus II.....3  
 General Education Elective .....3

\*Eligibility for MATH 191 must be established by taking the Math Placement Exam, administered by the Math Learning Center

**INTEREST AREAS**

Through the proper choice of math, science, and engineering electives in the junior and senior years, it is possible for the student to specialize in an area of interest. These areas include:

1.) *Communications, Telemetry, and Signal Processing*

Students study space communication systems, wireless systems, telemetry, or signal processing. Scholarships and employment opportunities are available in the Manuel Lujan Center for Telemetry and Telecommunications.

2.) *Electric Energy Systems*

Elective courses in power systems acquaint the student with the design, analysis, and operation of power systems. Courses are offered in high voltage transmission lines, distribution systems, rotating machines, and digital computer analysis of the steady state operation and short circuit conditions of a power system.

3.) *Electromagnetics and Microwave Engineering*

Students study electromagnetic fields, wave propagation, antennas, waveguides, transmission lines, lasers, and optics. Practical experience is available in the high-frequency and antenna laboratories and anechoic chamber.

4.) *Micro-Electronics*

Students study discrete analog as well as digital and analog VLSI electronics, preparing them for design, analysis, and testing of complex circuits. During the senior year, VLSI students will design a chip to be fabricated.

5.) *Photonics*

Students may concentrate in the fields of fiber optics, lasers, optical communications, imaging, and optical signal processing.

6.) *Control Systems*

Work in the systems area provides the student with a background in modeling, analysis, design, simulation, and control of complex systems. These systems may be associated with engineering, ecology, transportation, natural resources, environment, or other areas.

7.) *Space Systems Engineering*

Elective courses prepare the student for employment opportunities in the aerospace industry. Students are introduced to the complexities of a space systems life cycle and the disciplines required to design, integrate, and operate large systems.

**COMPUTER ENGINEERING SPECIALIZATION**

The school offers a special program for students interested in computer engineering. Students wishing to become involved in this rapidly growing field will find courses in the Klipsch School, as well as the Computer Science Department which cover the following areas:

- Integrated Circuits and Applications
- Digital Logic and System Design
- High Performance Computer Design

- Digital Signal Processing
- Digital Control and Instrumentation Systems
- Computer Architecture
- Data Networks
- Software Engineering
- Operating Systems

These courses offer the student an opportunity to obtain an in-depth knowledge of digital systems and practical experience in the design, operation, programming, and applications of digital computers.

**RELATED AREAS OF STUDY**

Electrical and computer engineering students wishing to broaden their educational experience may elect to earn additional bachelors degrees in

- Engineering Physics
- Physics
- Mathematics
- Computer Science

Klipsch School students may also choose to earn a minor in one or more of the following fields:

- Physics
- Mathematics
- Computer Science

Students must consult with an academic adviser in the offering department for specific requirements related to additional degrees and minors.

**DESIGNATED MINORS**

Students from outside the Klipsch School may earn a minor in Electrical or Computer Engineering.

**MINOR: Electrical Engineering (total credits 22)**

**Prerequisites<sup>1</sup> (12 credits) all may be transferred**

MATH 191, Calculus I<sup>4</sup> .....3  
 MATH 192, Calculus II<sup>4</sup> .....3  
 MATH 291, Calculus III<sup>4</sup> .....3  
 MATH 392, Differential Equations<sup>4</sup> .....3

**Lower Division (12 credits) maximum of 8 transfer credits**

E E 111, Introduction to Electrical and Computer Engineering<sup>2, 3, 4</sup> .....4  
 E E 211, AC Circuits<sup>2,4</sup> .....4  
 E E 221, Electronics I<sup>2, 4</sup> .....4

**Upper Division (10 credits) no transfer credit accepted**

E E 311, Signals and Systems<sup>2, 4</sup> .....4  
 Electives \* .....6

<sup>1</sup> Certain electives may require additional prerequisites.

<sup>2</sup> Including laboratory

<sup>3</sup> E E 201 may be substituted

<sup>4</sup> A grade of C or better is required

\*Lists of approved electives are available from the Klipsch School office

**MINOR: Computer Engineering (total credits 21)**

**Prerequisites<sup>1</sup> (9 credits) all may be transferred**

E E 111, E E 201, or an equivalent DC Circuits course<sup>4</sup> .....3  
 MATH 191, Calculus I<sup>4</sup> .....3  
 MATH 192, Calculus II<sup>4</sup> .....3

**Lower Division (8 credits) all may be transferred**

E E 161, Computer Aided Problem Solving<sup>2, 3, 4</sup> .....4  
 E E 261, Digital Design I<sup>2, 4</sup> .....4

**Upper Division (13 credits) no transfer credit accepted**

E E 361, Digital Design II .....3  
 E E 363, Computer Architecture I<sup>2</sup> .....4  
 Electives\* .....6

<sup>1</sup> Certain electives may require additional prerequisites

<sup>2</sup> Including laboratory

<sup>3</sup> A challenge exam is required before transfer credit is accepted

<sup>4</sup> A grade of C or better is required

\*Lists of approved electives are available from the Klipsch School office