Electrical and Computer Engineering
Undergraduate Advising Handbook
for
ECE Undergraduate Students¹

¹Revision Date: February 21, 2018
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Introduction

The School of Electrical and Computer Engineering (ECE) has compiled this advising manual for undergraduate students to assist them with the selection of their courses. Students will receive advice throughout their stay at OSU from both faculty and staff. Pre-professional School students will receive advice from CEAT Student Services. Professional School students will receive advice from the ECE Advising Coordinator and from ECE faculty. That advice along with this manual will help students to complete their degree in a timely and orderly fashion. This manual is not intended to replace or supersede the official degree sheets for the BS in Electrical Engineering (BSEE) or the BS in Computer Engineering (BSCpE) degree programs. The student is expected to meet all requirements listed on the official Degree Requirement Sheet.

Each Professional School student is assigned to an ECE faculty member. That assignment can be found using Banner. Students are strongly encouraged to discuss all aspects of the curriculum, career, and technologies of electrical engineering or computer engineering with their faculty adviser. The ECE Advising Coordinator will assist students with non-ECE course selections, prerequisite compliance, degree checking, and other nuances associated with the ECE programs.

Students pursuing the B.S. degree in Electrical Engineering are required, prior to graduation, to have taken a set of area courses in a single sub-discipline in ECE. Sub-disciplines include a) communications (Com), controls systems, and digital signal processing (DSP), b) power and energy, c) computer and digital, and d) electronics and solid state. The set of courses is listed in this manual and include one 3000 level prerequisite course and three 4000 level depth courses. Students are encouraged to select an area that is closely aligned with their career goals. Faculty can provide advice about the alignment of goals with any given area.

Students pursuing the B.S. degree in Computer Engineering are by default taking a set of area courses in computer engineering along with additional courses in computer science.

For both electrical engineering students and computer engineering students, course advising sheets are provided in this manual to describe the flow of courses within the ECE School. Flow charts are also provided to show the flow of all courses for the BS degrees in electrical engineering or computer engineering.

This manual also lists the 2000, 3000, and 4000 level courses offered by the School along with their corresponding course catalog entries. A list of the ECE faculty is also provided in this manual along with their general area of specialization. In general, all faculty will be able to advise any undergraduate student, irrespective of the area of specialization selected by the student. However, students are encouraged to contact any faculty member to get detailed information about any area.
Electrical Engineering: Course Advising Sheet

I. Pre-Professional School Core Requirement (4 CH): ECEN 2714, ECEN 3233.

II. Junior Breadth Requirement (14 CH): ECEN 3314, ECEN 3513, ECEN 3613, ECEN 3714.

III. Area Requirement (9 CH): Choose a set of area courses from columns A, B, C, OR, D in the table below. Substitutions are allowed with ECE approval.

<table>
<thead>
<tr>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
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<tbody>
<tr>
<td>Com/Controls/DSP</td>
<td>ECEN 3723</td>
<td>ECEN 3723 or ECEN 3913</td>
<td>ECEN 3723 or ECEN 3913</td>
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<td>Power/Energy</td>
<td>ECEN 4413</td>
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<td>Computer/Digital</td>
<td>ECEN 4523 or ECEN 4533</td>
<td>ECEN 4133</td>
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<td>Electronics/Solid State</td>
<td>ECEN 4763</td>
<td>ECEN 4153</td>
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</table>

IV. Senior Breadth Requirement (6 CH): Choose any two ECEN 4000 level courses. Exclusions or with ECE approval: ECEN 4010, ECEN 4030. (Other courses, 3000 level or above, in engineering, engineering science, math, physics, chemistry, computer science, or statistics may be allowed with ECE approval.)

V. Controlled Elective (3 CH): Choose a) ENSC 2123, ENSC 2143, or ENSC 2213, b) any ENSC or ENGR course that is 3000 level or above, OR, c) choose any course, 3000 level or above, from ECEN, BAE, MAE, CIVE, IEM, PHYS, MATH, CHEM, STAT, or CS. Exclusions or with ECE approval (and in some cases, approval from other departments):

- ECEN 4030
- BAE 4001, BAE 4012, BAE 4400
- CHEM 4990
- CIVE 4010, CIVE 4041, CIVE 4043
- CS 3570, CS 4570, CS 4993
- IEM 4010, IEM 4020, IEM 4913, IEM 4931
- MAE 4010, MAE 4342, MAE 4344, MAE 4353, MAE 4354, MAE 4363, MAE 4374
• MATH 3403, MATH 3603, MATH 3910, MATH 3933, MATH 4033, MATH 4590, MATH 4900, MATH 4910
• PHYS 4010, PHYS 4712, PHYS 4993
• STAT 4053, STAT 4063, STAT 4910, STAT 4981, STAT 4991, STAT 4993

VI. EE Professional School Advanced Engineering Math and Design Requirements (10 CH): ECEN 4503, ECEN 4013, ECEN 4024.
### Suggested Course Plan

The anticipation at OSU and most institutions of higher education is that for one semester credit hour (SCH) the student spends one hour per week in lecture (two for lab courses) and two hours studying outside of class (one for lab courses). A three credit hour class requires, on average, about nine hours per week. This study plan is recommended for students who will devote full time to university studies and do not have excessive extracurricular activities or other obligations.

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**NOTES:**
1) CHEM 1515 may be substituted for CHEM 1414 and should be taken by all students considering medical school.
2) Students with less than a “B” in ENGL 1113 or 1313 must take ENGL 1213 or 1413 prior to ENGL 3323.
3) A total of at least 6 hours designated “H” and 6 hours designated “S” is required. Of these, 3 hrs must meet the International Dimension “I” component and 3 hrs must meet the Diversity “D” component.
4) ECEN 2714 replaces ENSC 2613 effective fall 2018.
5) CS 2433 may be taken instead of CS 2133.
6) General Physics I and II are key prerequisites and should be taken at the earliest possible time.
7) Must be at least 3 SCH.
8) 3 SCH chosen from the Area (Prereq) Requirement on the EE Course Advising Sheet.
9) 9 SCH during the senior year to meet Area (Depth) Requirement on the EE Course Advising Sheet.
10) 6 SCH during the senior year to meet the Senior Breadth requirement on the EE Course Advising Sheet.
11) 3 SCH during the senior year to meet the Controlled Elective requirement on the EE Course Advising Sheet.
### Professional School Entry Requirements:

- Completion of at least 60 college level semester credit hours (SCH).
- Completion of at least 12 SCH from OSU.
- Completion of specific courses: MATH 2144, 2153, 2163, 2233; PHYS 2014 and 2114; CHEM 1414; ENGR 1111; ENSC 2113, 3213; ECEN 2714, 3233; ENGL 1113 or 1313; CS 1113, 2133 or 2433.
- A grade of ‘C’ or better in each of those courses listed above.
- GPA Requirements for Professional School: Technical GPA: 2.70, OSU GPA: 2.60, OSU Technical GPA: 2.70.

- This flowchart is only an advising instrument. When conflicts occur, the official 2017-2018 Degree Requirement Sheet takes precedence. Always check for the most current version of this flowchart.

- Admission to Professional School is required to take upper level ECEN-prefix courses. Please refer to the OSU Catalog corresponding to your matriculation date for detailed admission requirements.

### Electrical Engineering Course Plan (EE)

#### Semester 5

- **16 Credit Hours**
  - ENGL 3323 Technical Writing: 3/0
  - ENGL1113
  - ECEN 3714 Network Analysis: 3/2
  - MATH 3013 Linear Algebra: 3/0
  - MATH2153
  - ECEN 3714 Electr Dev & Appl: 3/2
  - ECEN3714
  - ECEN 3314 Electr Dev & Appl: 3/2
  - ECEN3714
  - PHYS 3313
  - ECEN 3613 EM Fields: 3/0
  - ECEN2714 MATH2233
  - "H" Elective (3)
  - "S/I/D" Elective (3)
  - Note 3,7

#### Semester 6

- **16 Credit Hours**
  - IEM 3503 Engr Economics: 3/0
  - MATH2153
  - ECEN 3513 Signal Analysis: 3/0
  - ECEN3513
  - ECEN 3314 Electr Dev & Appl: 3/2
  - ECEN3513
  - ECEN Area Prereq (3)
  - ECEN Area Prereq (3)
  - Note 8
  - Note 7,9

#### Semester 7

- **15 Credit Hours**
  - ECEN2714
  - ENSC3213
  - ECEN3233
  - ECEN3314
  - ECEN3714
  - ENGL3323
  - ECEN 4013 Design Engr Sys: 1/4
  - ECEN4013
  - ECEN 4503 Random Signals: 3/0
  - ECEN4503
  - ECEN Area Depth (3)
  - ECEN Area Depth (3)
  - Note 7,9
  - Note 7,10

#### Semester 8

- **13 Credit Hours**
  - ECEN 4013
  - ECEN4024
  - ECEN 4024 Capstone Design: 1/8
  - ECEN4024
  - ECEN Area Depth (3)
  - ECEN Area Depth (3)
  - Note 7,9
  - Note 7,10
  - Controlled Elective (3)
  - Controlled Elective (3)
  - Note 7,11

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**Rev. 1.1 12_12_2017**
Computer Engineering: Course Advising Sheet

I. Pre-Professional School Core Requirement (4 CH): ECEN 2714, ECEN 3233.

II. Junior Breadth Requirement (14 CH): ECEN 3314, ECEN 3513, ECEN 3613, ECEN 3714.

III. Area Requirement (18 CH): ECEN 4213, ECEN 4243, ECEN 4303, CS 3653, CS 4323, CS 4343.

IV. Senior Breadth Requirement (3 CH): Choose one of the following courses: ECEN 4233, ECEN 4273, ECEN 4283.

V. Controlled Elective (3 CH): Choose a) ENSC 2113, ENSC 2123, ENSC 2143, or ENSC 2213, b) any ENSC or ENGR course that is 3000 level or above, OR, c) choose any course, 3000 level or above, from ECEN, BAE, MAE, CIVE, IEM, PHYS, MATH, CHEM, STAT, or CS. Exclusions or with ECE approval (and in some cases, approval from other departments):

- ECEN 4030
- BAE 4001, BAE 4012, BAE 4400
- CHEM 4990
- CIVE 4010, CIVE 4041, CIVE 4043
- CS 3570, CS 4570, CS 4993
- IEM 4010, IEM 4020, IEM 4913, IEM 4931
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- PHYS 4010, PHYS 4712, PHYS 4993
- STAT 4053, STAT 4063, STAT 4910, STAT 4981, STAT 4991, STAT 4993

VI. EE Professional School Advanced Engineering Math and Design Requirements (10 CH): ECEN 4503, ECEN 4013, ECEN 4024.
**Suggested Course Plan**

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**NOTES:**

1) CHE 1515 may be substituted for CHEM 1414 and should be taken by all students considering medical school.
2) Students with less than a “B” in ENGL 1113 or 1313 must take ENGL 1213 or 1413 prior to ENGL 3323.
3) A total of at least 6 hours designated “H” and 6 hours designated “S” are required. Of these, 3 hrs must meet the International Dimension “I” component and 3 hrs must meet the Diversity “D” component.
4) ECEN 2714 replaces ENSC 2613 effective fall 2018.
5) General Physics I and II are key prerequisites and should be taken at the earliest possible time.
6) Choose from courses specified on the CpE Course Advising Sheet, section IV.
7) Must be at least 3 SCH.
8) 3 SCH during the senior year to meet the Controlled Elective requirement on the CpE Course Advising Sheet, section V.
### Professional School Entry Requirements:

- Completion of at least 60 college level semester credit hours (SCH).
- Completion of at least 12 SCH from OSU.
- Completion of MATH 2144, 2153, 2163, 2233; PHYS 2014 and 2114; CHEM 1414; ENGR 1111; ENSC 3213; ECEN 2714, 3233; ENGL 1113 or 1313; CS 1113, 2133, 2351.
- A grade of "C" or better in each of those courses listed above.
- An overall GPA of 2.6 or better at OSU.

**GPA Requirements for Professional School:**
- Technical GPA: 2.70
- OSU GPA: 2.60
- OSU Technical GPA: 2.70

This flowchart is only an advising instrument. When conflicts occur, the official 2017-2018 Degree Requirement Sheet takes precedence. Always check for the most current version of this flowchart.

Admission to Professional School is required to take upper level ECEN-prefix courses. Please refer to the OSU Catalog corresponding to your matriculation date for detailed admission requirements.
ECEN Courses for the BSEE and BSCpE Degrees

- ECEN 2714 - Fundamentals of Electric Circuits
- ECEN 3113 - Energy, Environment and Economics
- ECEN 3233 - Digital Logic Design
- ECEN 3314 - Electronic Devices and Applications
- ECEN 3513 - Signal Analysis
- ECEN 3613 - Electromagnetic Fields
- ECEN 3623 - Mathematical Foundations of Electromagnetics and Photonics
- ECEN 3714 - Network Analysis
- ECEN 3723 - Systems I
- ECEN 3903 - Introduction to Semiconductor Devices
- ECEN 3913 - Solid State Electronic Devices
- ECEN 4013 - Design of Engineering Systems
- ECEN 4024 - Capstone Design
- ECEN 4133 - Power Electronics
- ECEN 4153 - Power System Analysis and Design
- ECEN 4213 - Embedded Computer Systems Design
- ECEN 4233 - High Speed Computer Arithmetic
- ECEN 4243 - Computer Architecture
- ECEN 4273 - Software Engineering
- ECEN 4283 - Computer Networks
- ECEN 4303 - Digital Integrated Circuit Design
- ECEN 4313 - Linear Electronics Circuit Design
- ECEN 4353 - Communication Electronics
- ECEN 4413 - Automatic Control Systems
- ECEN 4503 - Random Signals and Noise
- ECEN 4523 - Communication Theory
- ECEN 4533 - Data Communications
- ECEN 4613 - Microwave Engineering
- ECEN 4703 - Active Filter Design
- ECEN 4743 - Introduction to Biomedical Engineering Modeling and Systems
- ECEN 4763 - Introduction to Digital Signal Processing
- ECEN 4773 - Real Time Digital Signal Processing
- ECEN 4823 - Design of Optical Systems
- ECEN 4843 - Design of Lasers and Systems
Catalog Entries

Select the Course Number to get further detail on the course. Select the desired Schedule Type to find available classes for the course.

**ECEN 2111 - Experimental Methods I**

Basic electrical measurements and instrumentation techniques and devices. Use of voltmeters, ammeters, oscilloscopes, impedance bridges to study resistive, inductive, and capacitive circuit elements in steady state and transient operation. Reinforces ENSC 2013 and introduces design of instrumentation networks. Serves as introduction for non-majors. Previously offered as ECEN 3013. Prerequisite(s): PHYS 2114, Co-requisite(s): ENSC 2013.

1.000 Credit hours
2.000 Lab hours

**Levels:** Undergraduate  
**Schedule Types:** Lab

Elect & Computer Engr Department

**Course Attributes:**  
College of Eng Arch & Tech, Lower Division Requirement

**ECEN 2714 - Fundamentals of Electric Circuits**

Circuit analysis techniques including equivalent networks and mesh/node formulation of network equations; operational amplifiers; RL, RC and RLC transient and steady-state circuit analysis; energy and power; electrical measurements and instrumentation. Prerequisite(s): MATH 2153 and PHYS 2114.

4.000 Credit hours
3.000 Lecture hours
2.000 Lab hours

**Levels:** Undergraduate  
**Schedule Types:** Lab, Lecture, Combined lecture and lab

Elect & Computer Engr Department

**Course Attributes:**  
College of Eng Arch & Tech, Lower Division Requirement

**ECEN 3020 - Supervised Research Project**

Supervised research project for qualified students. May be repeated no more than three times for a total of three credit hours. Offered for variable credit. No credit hours, maximum of 3 credit hours. Prerequisite(s): Consent of Instructor and ECEN department head.

1.000 Credit hours
1.000 Other hours

**Levels:** Undergraduate  
**Schedule Types:** Independent Study

Elect & Computer Engr Department

**Course Attributes:**  
College of Eng Arch & Tech, Upper Division Requirement

**ECEN 3113 - Energy, Environment and Economics**

Topics relevant to understanding the close relationship between energy use, its impact on the environment, and overall economic implications. Green energy technologies (wind, solar, hydro) will be considered along with conventional techniques. Both conventional and non-conventional energy technologies will be discussed. Prerequisite(s): ECEN 3714. Degree program requires admission to Professional School prior to enrollment.

3.000 Credit hours
3.000 Lecture hours

**Levels:** Undergraduate  
**Schedule Types:** Lecture

Elect & Computer Engr Department

**Course Attributes:**  
College of Eng Arch & Tech, Upper Division Requirement

**ECEN 3223 - Digital Logic Design**


3.000 Credit hours
2.000 Lecture hours
2.000 Lab hours

**Levels:** Undergraduate  
**Schedule Types:** Lab, Lecture, Combined lecture and lab

Elect & Computer Engr Department

**Course Attributes:**
ECEN 3314 - Electronic Devices and Applications
Semiconductor electronic components including MOSFETs, BJTs, JFETs, and OpAmps. Emphasis on device models and use of solid state electronic devices to analyze, synthesize and design amplifiers and switching circuits. Spice simulations are extensively utilized. Basic building blocks for analog and digital applications. Theoretical concepts and methods are demonstrated and reinforced through laboratory exercises. Course previously offered as ECEN 3313. Prerequisite(s): ECEN 2714. Degree program requires admission to Professional School prior to enrollment.
4.000 Credit hours
3.000 Lecture hours
2.000 Lab hours

Levels: Undergraduate
Schedule Types: Lab, Lecture, Combined lecture and lab

Elec & Computer Engr Department

Course Attributes:
College of Eng Arch & Tech, Upper Division Requirement

ECEN 3513 - Signal Analysis
Degree program requires admission to Professional School prior to enrollment. Deterministic signals, Fourier series and Fourier transforms, impulse response, convolution and correlation. Sampling theorem, Analog modulation techniques. Prerequisite(s): ECEN 2714
3.000 Credit hours
3.000 Lecture hours

Levels: Undergraduate
Schedule Types: Lecture

Elec & Computer Engr Department

Course Attributes:
College of Eng Arch & Tech, Upper Division Requirement

ECEN 3613 - Electromagnetic Fields
Time-harmonic and transient response of transmission lines. Maxwell's equations and their applications to engineering problems in electrostatics, magnetostatics, time-harmonic fields and plane wave propagation. Prerequisite(s): ENSC 2714 with a minimum grade of "C" or better, MAATH 2163 and MAATH 2233.
3.000 Credit hours
3.000 Lecture hours

Levels: Undergraduate
Schedule Types: Lecture

Elec & Computer Engr Department

Course Attributes:
College of Eng Arch & Tech, Upper Division Requirement

ECEN 3623 - Mathematical Foundations of Electromagnetics and Photonics
Mathematical and computational treatment of fundamental electromagnetic theory, with applications to microwave engineering, photonics and semiconductor design. Energy and power, Laplace and Poisson equations; wave equation, including reflection, refraction, and diffraction; and classical electromagnetic radiation at macroscopic and microscopic levels. Prerequisite(s): ECEN 3613 and degree program requires admission to Professional School prior to enrollment.
3.000 Credit hours
2.000 Lecture hours
2.000 Lab hours

Levels: Undergraduate
Schedule Types: Lab, Lecture, Combined lecture and lab

Elec & Computer Engr Department

Course Attributes:
College of Eng Arch & Tech, Upper Division Requirement

ECEN 3714 - Network Analysis
Laplace transform, transfer functions, magnetically coupled circuits and two-port networks. Theoretical concepts and methods are demonstrated and reinforced through laboratory exercises. Course previously offered as ECEN 3713. Prerequisite(s): ECEN 2714 with a minimum grade of "C" or better and MAATH 2233.
4.000 Credit hours
3.000 Lecture hours
2.000 Lab hours

Levels: Undergraduate
Schedule Types: Lab, Lecture, Combined lecture and lab

Elec & Computer Engr Department

Course Attributes:
College of Eng Arch & Tech, Upper Division Requirement

ECEN 3723 - Systems I
Physical and mathematical modeling of electrical and mechanical dynamic systems. Transient response of first and second order systems. Laplace transform techniques for solving differential equations, transfer functions, frequency response and resonance. Course previously offered as ECEN 3413. Prerequisite(s): ENSC 2113 and ENSC 2714 with a minimum grade of "C" or better, and MAATH 2233.
3.000 Credit hours
3.000 Lecture hours

Levels: Undergraduate
Schedule Types: Lecture

Elec & Computer Engr Department

Course Attributes:
ECEN 3903 - Introduction to Semiconductor Devices

Crystal structure, the quantum theory of solids. The physics of semiconductor materials and the junction, with an emphasis on applications to semiconductor devices. Same course as PHYS 3313.
Prerequisite(s): PHYS 2114 or equivalent.
3.000 Credit hours
3.000 Lecture hours

Levels: Undergraduate
Schedule Types: Lecture

Elect & Computer Engr Department:

Course Attributes:
College of Eng Arch & Tech, Upper Division Requirement

ECEN 3913 - Solid State Electronic Devices

Solid state physics basis of modern electronic devices. Introductory quantum mechanics. Energy bands in solids. Electronic properties of semiconductors. Junction diodes, Bipolar transistors. Field effect transistor. Prerequisite(s): UCEN 2174 with a minimum grade of "C" or better and either PHYS 3313 or ECLN 3903. Degree program requires admission to Professional School prior to enrollment. 
3.000 Credit hours
3.000 Lecture hours

Levels: Undergraduate
Schedule Types: Lecture

Elect & Computer Engr Department:

Course Attributes:
College of Eng Arch & Tech, Upper Division Requirement

ECEN 4010 - Technical Problems and Engineering Design

Individual independent study projects selected in consultation with the instructor; analysis or design problems, literature searches and computer simulations may be involved. Offered for variable credit, 1-12 credit hours, maximum of 12 credit hours. Prerequisite(s): Consent of instructor.
1.000 TO 12.000 Credit hours
1.000 TO 12.000 Other hours

Levels: Graduate, Undergraduate
Schedule Types: Independent Study

Elect & Computer Engr Department:

Course Attributes:
College of Eng Arch & Tech, Upper Division Requirement

ECEN 4013 - Design of Engineering Systems

Complete design cycle for several small design projects, each including establishing objectives, synthesis, analysis, construction, testing and evaluation. Use of modern lab equipment and fabrication techniques. Development of communication skills. Prerequisite(s): ECEN 3913, ECEN 3914, ECEN 3914, ECEN 3333 and ENSC 3213. ENGI 3303 as co-requisites. Degree program requires admission to professional school prior to enrollment.
3.000 Credit hours
1.000 Lecture hours
4.000 Lab hours

Levels: Undergraduate
Schedule Types: Lab, Lecture, Combined lecture and lab

Elect & Computer Engr Department:

Course Attributes:
College of Eng Arch & Tech, Upper Division Requirement

ECEN 4024 - Capstone Design

Continuation of ECEN 4013. Student project teams design, build, test and present results for realistic projects from university and industrial sponsors. Formulation of specifications, consideration of alternative solutions, feasibility considerations, detailed system descriptions, economic factors, safety, reliability, aesthetics, ethics and social impact. Course previously offered as ECEN 4024. Prerequisite(s): ECEN 4013; degree program requires admission to Professional School prior to enrollment.
6.000 Credit hours
3.000 Lecture hours
2.000 Lab hours

Levels: Undergraduate
Schedule Types: Lab, Lecture, Combined lecture and lab

Elect & Computer Engr Department:

Course Attributes:
College of Eng Arch & Tech, Upper Division Requirement

ECEN 4030 - Undergraduate Professional Practice

Experience in application of electrical engineering principles to typical problems encountered in industry. Solutions to the problems by student participation in the role of engineer or engineering intern. Offered for variable credit, 1-8 credit hours, maximum of 8 credit hours. Prerequisites: Approval of ECEN department head.
1.000 TO 8.000 Credit hours
1.000 TO 8.000 Other hours

Levels: Undergraduate
Schedule Types: Independent Study

Elect & Computer Engr Department:

Course Attributes:
College of Eng Arch & Tech, Internship or Practicum, Eligible for SAFW, Upper Division Requirement
ECEN 4133 - Power Electronics

Power electronic devices, components, and their characteristics; DC to AC conversion; fundamentals of inverters and waveshaping devices; application aspects; control aspects; characteristics and state-of-the art of advanced power inverter and power conditioning topologies. Prerequisite(s): Degree program requires admission to Professional School prior to enrollment.
3.000 Credit hours
3.000 Lecture hours

Levels: Graduate, Undergraduate
Schedule Types: Lecture

Elec & Computer Engr Department

Course Attributes:
College of Eng Arch & Tech, Upper Division Requirement

ECEN 4153 - Power System Analysis and Design

Power system component models from circuit theory, formulation and design of the load flow model and the optimum economic generator allocation problems utilizing computer methods. Prerequisite(s): Degree program requires admission to Professional School prior to enrollment.
3.000 Credit hours
3.000 Lecture hours

Levels: Graduate, Undergraduate
Schedule Types: Lecture

Elec & Computer Engr Department

Course Attributes:
College of Eng Arch & Tech, Upper Division Requirement

ECEN 4213 - Embedded Computer Systems Design

Degree program requires admission to Professional School prior to enrollment. Design of microprocessor-based systems through proper integration of hardware and software. Serial and parallel communications, sensor interfacing, computer control of external devices, and color graphics hardware. Design of PASCAL and assembly language modules for optimum real-time system performance. Prerequisite(s): ENSC 3213 and CS 1113
3.000 Credit hours
2.000 Lecture hours
2.000 Lab hours

Levels: Graduate, Undergraduate
Schedule Types: Lab, Lecture, Combined lecture and lab

Elec & Computer Engr Department

Course Attributes:
College of Eng Arch & Tech, Upper Division Requirement

ECEN 4233 - High Speed Computer Arithmetic

Course covers computer arithmetic as applied to general purpose and application-specific processors. Focus is on developing high-speed arithmetic algorithms and understanding their implementation in VLSI technology at the gate level. Prerequisite(s): ECEN 3233; degree program requires admission to Professional School prior to enrollment.
3.000 Credit hours
3.000 Lecture hours

Levels: Graduate, Undergraduate
Schedule Types: Lecture

Elec & Computer Engr Department

Course Attributes:
College of Eng Arch & Tech, Upper Division Requirement

ECEN 4243 - Computer Architecture

Degree program requires admission to Professional School prior to enrollment. Functional organization and hardware design of digital computer systems with emphasis on microprocessor-based systems, CPU organization, features of microprocessors including advanced 32-bit CPUs, memory system design including cache, virtual memory, error detection and correction, I/O operations, including direct memory access and peripheral interface design. Prerequisite(s): ENSC 3213 and ECEN 3233
3.000 Credit hours
2.000 Lecture hours
2.000 Lab hours

Levels: Graduate, Undergraduate
Schedule Types: Lab, Lecture, Combined lecture and lab

Elec & Computer Engr Department

Course Attributes:
College of Eng Arch & Tech, Upper Division Requirement

ECEN 4273 - Software Engineering

Degree program requires admission to Professional School prior to enrollment. Functional organization and hardware design of digital computer systems with emphasis on microprocessor-based systems, CPU organization, features of microprocessors including advanced 32-bit CPU’s memory system design including cache, virtual memory, error detection and correction, I/O operations, including direct memory access and peripheral interface design. Same course as CS 4273. Prerequisite(s): ENSC 3213 or CS 1113, CS 3443.
3.000 Credit hours
3.000 Lecture hours

Levels: Graduate, Undergraduate
Schedule Types: Lecture

Elec & Computer Engr Department

Course Attributes:
College of Eng Arch & Tech, Upper Division Requirement
ECEN 4283 - Computer Networks

Degree program requires admission to Professional School prior to enrollment. Computer networks, distributed systems and their systematic design. Introduction to the use, structure, and architecture of computer networks. Networking experiments to describe network topology, OSI reference model. Some course as CS 4283. Prerequisite(s): ENSC 3113 or CS 3443.

3.000 Credit hours
3.000 Lecture hours

Levels: Graduate, Undergraduate
Schedule Types: Lecture

Elec & Computer Engr Department

Course Attributes:
College of Eng Arch & Tech, Upper Division Requirement

ECEN 4303 - Digital Integrated Circuit Design

Theory of digital and electronics circuits. Digital logic families TTL, ILT, ECL, NMOS, CMOS, GaAs. Large signal models for transistors. Implementation at RAM and ROM. Circuit design for LSI and VLSI. Prerequisite(s): ECEN 3233 and ECEN 3314; degree program requires admission to Professional School prior to enrollment.

3.000 Credit hours
3.000 Lecture hours

Levels: Graduate, Undergraduate
Schedule Types: Lecture

Elec & Computer Engr Department

Course Attributes:
College of Eng Arch & Tech, Upper Division Requirement

ECEN 4313 - Linear Electronics Circuit Design

Class A and B small-signal, push-pull power, complementary symmetry, differential and operational amplifiers, utilizing field-effect transistors, bipolar transistors, tunnel diodes and integrated circuits. Emphasis on amplification in electronic devices, design and analysis of wide-band amplifier circuitry. Prerequisite(s): ECEN 3314; degree program requires admission to Professional School prior to enrollment.

3.000 Credit hours
3.000 Lecture hours

Levels: Graduate, Undergraduate
Schedule Types: Lecture

Elec & Computer Engr Department

Course Attributes:
College of Eng Arch & Tech, Upper Division Requirement

ECEN 4353 - Communication Electronics

Design of tuned voltage and power amplifiers, oscillators and mixers, modulation and detection, and parametric amplifiers. Prerequisite(s): ECEN 3314; degree program requires admission to Professional School prior to enrollment.

3.000 Credit hours
3.000 Lecture hours

Levels: Graduate, Undergraduate
Schedule Types: Lecture

Elec & Computer Engr Department

Course Attributes:
College of Eng Arch & Tech, Upper Division Requirement

ECEN 4413 - Automatic Control Systems

Properties of feedback control systems, mathematical models of basic components, state-variable models of feedback systems, time-domain analysis, stability, transform analysis, frequency-domain techniques, root-locus design of single input single output systems and simple compensation techniques. Same course as MAE 4053. Prerequisite(s): ECEN 3728 or MAE 3728; degree program requires admission to Professional School prior to enrollment.

3.000 Credit hours
3.000 Lecture hours

Levels: Graduate, Undergraduate
Schedule Types: Lecture

Elec & Computer Engr Department

Course Attributes:
College of Eng Arch & Tech, Upper Division Requirement

ECEN 4503 - Random Signals and Noise

Analysis of electrical systems using elementary concepts of probability, random variables and random processes. Frequency and time domain response of linear systems driven by random inputs. Statistical properties of electrical noise. Analysis and design of optimum linear systems. Prerequisite(s): ECEN 3513, ECEN 3714; degree program requires admission to Professional School prior to enrollment.

3.000 Credit hours
3.000 Lecture hours

Levels: Graduate, Undergraduate
Schedule Types: Lecture

Elec & Computer Engr Department

Course Attributes:
College of Eng Arch & Tech, Upper Division Requirement

ECEN 4523 - Communication Theory
Catalog Entries https://ssb.okstate.edu/OSU/bwckctlg.p_display_courses

Noise in modulation systems. Digital data transmission. Design of optimal receivers. Introduction to information theory. Prerequisites: ECEN 3513 and ECEN 4503. Degree program requires admission to Professional School prior to enrollment.

3.000 Credit hours
3.000 Lecture hours

Levels: Graduate, Undergraduate
Schedule Types: Lecture

Elect & Computer Engr Department

Course Attributes:
College of Eng Arch & Tech, Upper Division Requirement

ECEN 4533 - Data Communications

Degree program requires admission to Professional School prior to enrollment. Signal detection in noise. Tradeoffs between bandwidth signal-to-noise ratio and rate of information transfer. Transmission multiplexing and error handling. Elements of computer network design. Data link protocols. Prerequisites: ECEN 4503 as co-requisite.

3.000 Credit hours
3.000 Lecture hours

Levels: Graduate, Undergraduate
Schedule Types: Lecture

Elect & Computer Engr Department

Course Attributes:
College of Eng Arch & Tech, Upper Division Requirement

ECEN 4613 - Microwave Engineering

Aspects of propagation, transmission, and radiation of microwave energy. Plane wave propagation; lossless and lossy media, reflection, refraction, and polarization. Transmission line theory; lumped element model, characteristic impedance, impedance matching, and transient response. Theory of waveguides and cavity resonators. Microwave network theory and S-parameters. Introduction to radiating systems. Prerequisites: ECEN 3513; degree program requires admission to Professional School prior to enrollment.

3.000 Credit hours
3.000 Lecture hours

Levels: Graduate, Undergraduate
Schedule Types: Lecture

Elect & Computer Engr Department

Course Attributes:
College of Eng Arch & Tech, Upper Division Requirement

ECEN 4703 - Active Filter Design

Introduction to passive filters; operational amplifiers as network elements; filter specifications; design of active filters. Laboratory design projects and computer simulations. Prerequisite(s): ECEN 3613; degree program requires admission to Professional School prior to enrollment.

3.000 Credit hours
3.000 Lecture hours

Levels: Graduate, Undergraduate
Schedule Types: Lecture

Elect & Computer Engr Department

Course Attributes:
College of Eng Arch & Tech, Upper Division Requirement

ECEN 4743 - Introduction to Biomedical Engineering Modeling and Systems

An overview of the field of biomedical engineering and an introduction of the modeling approaches implemented in biomedical engineering. Topics include bio-electronics, biomechanics, compartmental modeling, bio-signal processing, biomedical optics, etc. The course will demonstrate a few of major fields of activity in which biomedical engineers are engaged and modeling approaches are implemented. Prerequisite(s): ECEN 3714, ECEN 4763; degree program requires admission to Professional School prior to enrollment.

3.000 Credit hours
3.000 Lecture hours

Levels: Graduate, Undergraduate
Schedule Types: Lecture

Elect & Computer Engr Department

Course Attributes:
College of Eng Arch & Tech, Upper Division Requirement

ECEN 4763 - Introduction to Digital Signal Processing

Introduction to discrete linear systems using difference equations and z-transforms. Discrete Fourier analysis. Design of digital filters. Sampling theorem. Applications of digital signal processing. Prerequisite(s): ECEN 3513; degree program requires admission to Professional School prior to enrollment.

3.000 Credit hours
3.000 Lecture hours

Levels: Graduate, Undergraduate
Schedule Types: Lecture

Elect & Computer Engr Department

Course Attributes:
College of Eng Arch & Tech, Upper Division Requirement

ECEN 4773 - Real Time Digital Signal Processing

DSP processor architectures and programming. A/D, D/A, polled and interrupt-driven I/O. Realtime implementation of FIR/IIR filters, the FFT, and other DSP algorithms on special purpose DSP hardware from Motorola, Texas Instruments and others. Link between DSP theory and practical implementation. Prerequisite(s): ECEN 4763 or equivalent; degree program requires admission to Professional School prior to enrollment.
ECEN 4823 - Design of Optical Systems

Introduction to optics through the design, construction, and characterization of optical systems. Emphasis on geometrical optics and spectroscopy. Course previously offered as ECEN 3573. Prerequisite(s): PHYS 2114; degree program requires admission to Professional School prior to enrollment.

ECEN 4843 - Design of Lasers and Systems

Introduction of the design of lasers and optical systems based on lasers including the design, construction, and characterization of lasers. Gaussian beams and optics, laser gain materials, laser cavities, advanced optics. Course previously offered as ECEN 4813. Prerequisite(s): ECEN 3573, degree program requires admission to Professional School prior to enrollment.
## Fall Final Examination Schedule

<table>
<thead>
<tr>
<th>TIME OF THE EXAMINATION</th>
<th>MONDAY</th>
<th>TUESDAY</th>
<th>WEDNESDAY</th>
<th>THURSDAY</th>
<th>FRIDAY</th>
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<td>YES</td>
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</tbody>
</table>

**COMMON FINALS**

**Notes:**
- Classes and exams are subject to change. Check registrar.okstate.edu or scan the QR code below for the most current Evening Common Exam and Final Exam Schedule information.
- New freshmen and new transfer students will begin the enrollment process with the New Student Orientation and Enrollment Office, 321 Student Union, 1405744-3636, newstudents.okstate.edu.
- Notice to first-semester students: Credit earned by examination (such as AP or CLEP) will be recorded on a student's OSU transcript with a neutral grade of "CBE-P" (Pass) if the student earns the equivalent of a "C" or better on the examination. No grade is recorded if the student fails the exam.

### Enrollment Guide

**Fall 2018**

**Late enrollment fee assessed after:** August 17

**Class work begins:** August 19

**Last date to enroll (nonrestrictive):** August 27

### Enrollment Dates

**Date to Enroll**

- **Overall Earned Hours**
  - March 26: Priority + Graduate Students
  - March 27: 115 or more
  - March 29: 110 or more
  - March 30: 105 or more
  - April 1: 100 or more
  - April 2: 90 or more
  - April 3: 85 or more
  - April 4: 80 or more
  - April 5: 75 or more
  - April 6: 70 or more
  - April 7: 65 or more
  - April 8: 60 or more
  - April 9: 50 or more
  - April 10: 45 or more
  - April 11: 40 or more
  - April 12: 35 or more
  - April 13: 30 or more
  - April 14: 25 or more
  - April 15: 20 or more
  - April 16: 15 or more
  - April 17: 10 or more
  - April 18: 5 or more
  - April 19: 3 or more
  - April 20: 2 or more
  - April 21: 1 or more

**Fall Dates to Remember**

- **Class work begins:** Monday, August 20
- **100% Refund, Nonrestrictive Drop/Add Deadline:** Monday, August 27
- **Partial Refund, Restrictive Drop/Add Deadline:** Friday, August 31
- **University holiday:** Monday, September 3
- **Six week (mid-term) grades due at noon from faculty:** Wednesday, October 3
- **Students' Fall Break (NO CLASSES):** Friday, October 19
- **Deadline to file graduation application:** Thursday, November 1 (for name to appear in fall commencement program)
- **W Drop/Withdraw Deadline:** Friday, November 9
- **First Day of Students' Thanksgiving Break (NO CLASSES):** Wednesday, November 21
- **University holiday:** Thursday-Friday, November 22-23
- **W/F Withdraw Deadline:** Friday, November 30
- **Pre-finals week:** Monday-Friday, December 3 - December 7
- **Final exams:** Monday-Friday, December 10-14
- **Commencement:** Friday-Saturday, December 14-15
- **Final grades due electronically at noon from faculty:** Wednesday, December 19

A University holiday falls within the semester. If the scheduled classes do not meet, additional class time or assignments may make up the difference.

### Drop/Add and Withdraw Deadline Details:

- **100% Refund, Nonrestrictive Drop/Add Deadline:**
  - add a course (nonrestrictive)
  - drop a course with 100% refund and no grade

- **Partial Refund, Restrictive Drop/Add Deadline:**
  - add a course (requires drop/add card with instructor and advisor signatures)
  - drop a course with partial refund and grade of "W"

- **W Drop/Withdraw Deadline:**
  - drop a course with automatic grade of "W"
  - withdraw from all classes with automatic grades of "W" (requires completed Withdrawal Form)

- **W/F Withdraw Deadline:**
  - withdraw from all classes with assigned grades of "W" or "F" (requires completed Withdrawal Form)

*Drop/Add and Withdraw Deadline Details:

- **100% Refund, Nonrestrictive Drop/Add Deadline:**
  - add a course (nonrestrictive)
  - drop a course with 100% refund and no grade

- **Partial Refund, Restrictive Drop/Add Deadline:**
  - add a course (requires drop/add card with instructor and advisor signatures)
  - drop a course with partial refund and grade of "W"

- **W Drop/Withdraw Deadline:**
  - drop a course with automatic grade of "W"
  - withdraw from all classes with automatic grades of "W" (requires completed Withdrawal Form)

- **W/F Withdraw Deadline:**
  - withdraw from all classes with assigned grades of "W" or "F" (requires completed Withdrawal Form)
Registration and Enrollment
1. Find your expected enrollment/registration date for the upcoming semester in this enrollment guide.
2. Schedule a meeting with your academic adviser to plan your class schedule. You won’t be able to enroll until your adviser clears you for registration. Contact your adviser early, as advising appointments fill quickly.
3. From Student Self Service, check. Prepare for Registration (under Registration) to view if you are eligible to register for classes. This site will notify you of factors that may prevent you from being eligible to register, such as holds. You can also view your registration time ticket details here (once it’s been assigned in early March) and registration permits/overrides that have been granted to you.
4. If you browse for classes, be sure to click the “tab to add course to your wish list” to save your selected prerequisites and other class restrictions that may prevent you from registering.
5. You can plan your schedule in Self Service using Plan Ahead under the Registration menu. Plans created here will be available when you register for classes (on the Plans tab).
6. If you register in a class with variable credit hours, it will default to the lowest number of credit hours. Use the Schedule and Options tab of Registration to change credit hours in a variable credit class. Detailed instructions can be found in register.okstate.edu/XE/Registration change.
7. Find more details on Self Service Registration at registrar.okstate.edu/XE/Registration.
8. Find instructions for viewing your class schedule in various ways at registrar.okstate.edu/content/viewing-my-class-schedule.

Short Class Schedules
Students who wish to enroll in a course must enroll before the start of the course. Proportionate drop and withdraw dates apply to block and short courses. Go to registrar.okstate.edu and click on ‘Short Courses with Unique Drop/Add Deadlines’ link for these deadlines or scan the QR code below.

Evening Common Exam Schedule Examination Schedule 5:30 pm - 6:30 pm

<table>
<thead>
<tr>
<th>Course</th>
<th>Dates</th>
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<tbody>
<tr>
<td>BOL 1114</td>
<td>Sep 17, Oct 15, Nov 19</td>
</tr>
<tr>
<td>CHEM 1215</td>
<td>Sep 13, Oct 11, Nov 8</td>
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<tr>
<td>CHEM 1314</td>
<td>Sep 12, Oct 10, Nov 7</td>
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<td>CHEM 1414</td>
<td>Sep 11, Oct 9, Nov 6</td>
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<td>CHEM 1515</td>
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<tr>
<td>ENSC 2113</td>
<td>Sep 26, Oct 24, Nov 28</td>
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<td>FIN 3113</td>
<td>Sep 27, Nov 1</td>
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<td>GEOG 1114</td>
<td>Oct 4, Nov 29</td>
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<td>MATH 1483</td>
<td>Sep 13, Oct 18, Nov 15</td>
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<td>MATH 1513</td>
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<tr>
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<tr>
<td>PHYS 1214</td>
<td>Sep 20, Oct 18, Nov 15</td>
</tr>
<tr>
<td>PHYS 2110</td>
<td>Sep 17, Oct 15, Nov 12</td>
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<td>PHYS 2114</td>
<td>Sep 19, Oct 17, Nov 14</td>
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</tbody>
</table>

Tuula-based sections have a different common evening exam schedule. Do not consult your instructor and syllabus for more information on your common evening exam date and time.

NOTE: If a common exam is cancelled due to the university closing for inclement weather or other unforeseen events, the exam may be rescheduled at the instructor’s and department’s request. Exams from 5:30 – 6:30 pm are likely time slots for rescheduled common exams.

Students’ Rights to Privacy
The Family Educational Rights and Privacy Act of 1974 (‘Ferpa’ Amendment) was designed to protect the privacy of educational records, to establish the right of students to inspect and review their educational records in all offices, and to provide guidelines for the correction of inaccurate or misleading data through informal and formal hearings.

An OU student has the right to:
1. Inspect and review information contained in his or her educational records within 45 days of the day that the University receives a written request from the student.
2. Challenge the contents of the educational record.
3. Have a hearing if the outcome of a challenge is unsatisfactory.
4. Submit a written complaint to the educational record, which includes the location of all educational records.
5. Prevent disclosure, with certain exceptions, of personally identifiable information from the educational record.
6. File a complaint with the U.S. Department of Education concerning alleged failures by the University to comply with the requirements of FERPA. The name and address of the office that administers FERPA is Family Policy Compliance Office, U.S. Department of Education, 400 Maryland Avenue, SW, Washington, D.C. 20202-5001.

Withholding Disclosure of Information. Currently enrolled students may withhold disclosure of information. A student may request a written request with the Office of the Registrar not to release personally identifiable information, including directory information, to any officials and to any third party, including by making a written request to the registrar to maintain the records. The University assumes that if a parent or student specifically requests the withholding of directory information, the request will be honored for the remainder of the academic year. The University will provide information regarding access to records.

Access to Records. Students may inspect and review their educational records by making a written request to the registrar to maintain the records. The University assumes that if a parent or student specifically requests the withholding of directory information, the request will be honored for the remainder of the academic year. Students may not reclassify records if a parent or student specifically requests the withholding of directory information, the request will be honored for the remainder of the academic year.

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Examination schedules in this guide are subject to change. Check registrar.okstate.edu/Exams or scan the QR code on the front for the most current Evening Common Exam and Final Exam Schedule information.

Building Designations

<table>
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<tr>
<th>Campus Map</th>
<th>Building Designations</th>
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<tr>
<td>AC</td>
<td>Athletic Center (Gallagher-Iba Arena)</td>
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<tr>
<td>Agr</td>
<td>Agricultural Hall</td>
</tr>
<tr>
<td>AR</td>
<td>Airport</td>
</tr>
<tr>
<td>ANH</td>
<td>Animal Sciences</td>
</tr>
<tr>
<td>ARC</td>
<td>Donald P. Reynolds School of Aeronautics</td>
</tr>
<tr>
<td>ATRC</td>
<td>Advanced Technology Research Center</td>
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<tr>
<td>BLD</td>
<td>Boswell Landslide Agriculture Labs</td>
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<tr>
<td>BCI</td>
<td>Barnett Center for the Visual Arts (Gardiner Hall)</td>
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<tr>
<td>BU</td>
<td>Bizzell Library</td>
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<tr>
<td>CRB</td>
<td>Classroom Building</td>
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<tr>
<td>CLEB</td>
<td>Coleman Hall</td>
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<tr>
<td>CM</td>
<td>Construction Technology Laboratory #2</td>
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<tr>
<td>CMCS</td>
<td>Crozier-Phillips Academic Center</td>
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<tr>
<td>CRG</td>
<td>College Recreation Center</td>
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<tr>
<td>CRC</td>
<td>Carter Center Annex</td>
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<tr>
<td>D</td>
<td>Dillard Hall</td>
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<tr>
<td>DL</td>
<td>Design and Manufacturing Lab</td>
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<tr>
<td>DM</td>
<td>Doherty Hall</td>
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<tr>
<td>EB</td>
<td>Edmond Low Library</td>
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<tr>
<td>ENM</td>
<td>E.C. Ball Hall</td>
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<tr>
<td>EC</td>
<td>Engineering North House</td>
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<tr>
<td>EN</td>
<td>Engineering Dining Unit</td>
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<td>ENO</td>
<td>Engineering South House</td>
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<tr>
<td>ERW</td>
<td>Environmental Health and Agricultural Products Center</td>
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<tr>
<td>ERT</td>
<td>4-1 Youth Development Building (Pottery Hall)</td>
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<tr>
<td>FE</td>
<td>Fire Prevention and Safety Lab</td>
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<td>GF</td>
<td>Griffin Hall</td>
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<td>GH</td>
<td>Great Hall</td>
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<td>HIB</td>
<td>Hammerly Student Center</td>
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<tr>
<td>HNS</td>
<td>Honors Hall</td>
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<tr>
<td>JPI</td>
<td>John Pi俶tor Miller Journalism &amp; Broadcast</td>
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<tr>
<td>LB</td>
<td>Lacie Hall</td>
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<tr>
<td>LSE</td>
<td>Life Science East</td>
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<td>M</td>
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<td>MEL</td>
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<td>Mechanical and Materials Science</td>
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<td>Murray Hall North</td>
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<td>NR</td>
<td>Nobel Research Center</td>
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<tr>
<td>OADD</td>
<td>Oklahoma Aeronautics Diagnostic Laboratory</td>
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<td>Petroleum Technology Classroom Building</td>
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<tr>
<td>PCI</td>
<td>Stricker Center for the Arts</td>
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<tr>
<td>SCI</td>
<td>Student Center for the Performing Arts</td>
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<td>SCO</td>
<td>Scott Hall</td>
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<td>SD</td>
<td>Student Union</td>
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<td>SOR</td>
<td>Student Orientation Center</td>
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<tr>
<td>TGR</td>
<td>Teaching Greenhouse</td>
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<tr>
<td>TAL</td>
<td>Tulsa Academy Lab Hall</td>
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<tr>
<td>T-BCB</td>
<td>B &amp; B Deck Track and Field Center</td>
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<tr>
<td>T-BC</td>
<td>Behlenkamp Advanced Technology Research Center (Tulsa)</td>
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<td>T-MCB</td>
<td>Main Classroom Bldg (Tulsa)</td>
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<tr>
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<td>North Classroom Bldg (Tulsa)</td>
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<td>T-SEM</td>
<td>University Services</td>
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<td>VMA</td>
<td>Visual Arts Annex</td>
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<td>VMTH</td>
<td>Veterinary Medicine Teaching Hospital</td>
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<td>Westin Wellness Center</td>
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<td>WGS</td>
<td>Westside Student Center</td>
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<td>WHI</td>
<td>Whitewater Hall</td>
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<td>WIL</td>
<td>Will Rogers Hall</td>
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<td>WNTZ</td>
<td>John Pi俶tor Miller Journalism &amp; Broadcast</td>
</tr>
<tr>
<td>WWC</td>
<td>World Wide Center for International Trade Development</td>
</tr>
</tbody>
</table>
ECE Faculty Contact List

Power and Energy

• Prof. Nishantha Ekneligoda (nishantha.ekneligoda@okstate.edu)
• Prof. Rama Ramakumar (rama.ramakumar@okstate.edu)
• Prof. Yuanxiong (Richard) Guo (richard.guo@okstate.edu)

Computer Engineering

• Prof. Cal Latino (carl.latino@okstate.edu)
• Prof. James Stine (james.stine@okstate.edu)
• Prof. Weihua Sheng (weihua.sheng@okstate.edu)
• Prof. Yanmin Gong (yanmin.gong@okstate.edu)

Electronics

• Prof. Chris Hutchens (c.hutchens@okstate.edu)

Control Systems, Communications and Signal Processing

• Prof. Gary Yen (gyen@okstate.edu)
• Prof. Guoliang Fan (guoliang.fan@okstate.edu)
• Prof. Keith Teague (teague@okstate.edu)
• Prof. Sabit Ekin (sabit.ekin@okstate.edu)
• Prof. Subhash Kak (subhash.kak@okstate.edu)

Electromagnetics, Optics and THz Science

• Prof. Chuck Bunting (reverb@okstate.edu)
• Prof. Daqing Piao (daqing.piao@okstate.edu)
• Prof. John O’Hara (oharaj@okstate.edu)
• Prof. James West (jwest@okstate.edu)
• Prof. Jeffrey Young (jl.young@okstate.edu)
• Prof. Jerzy Krasinski (krasins@okstate.edu)
• Prof. Weili Zhang (wwzhang@okstate.edu)