CAPER

Center for Advanced Power Engineering Research

Clemson University Power Engineering Curricula

Presented by:

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Clemson University

UNDERGRADUATE EDUCATION

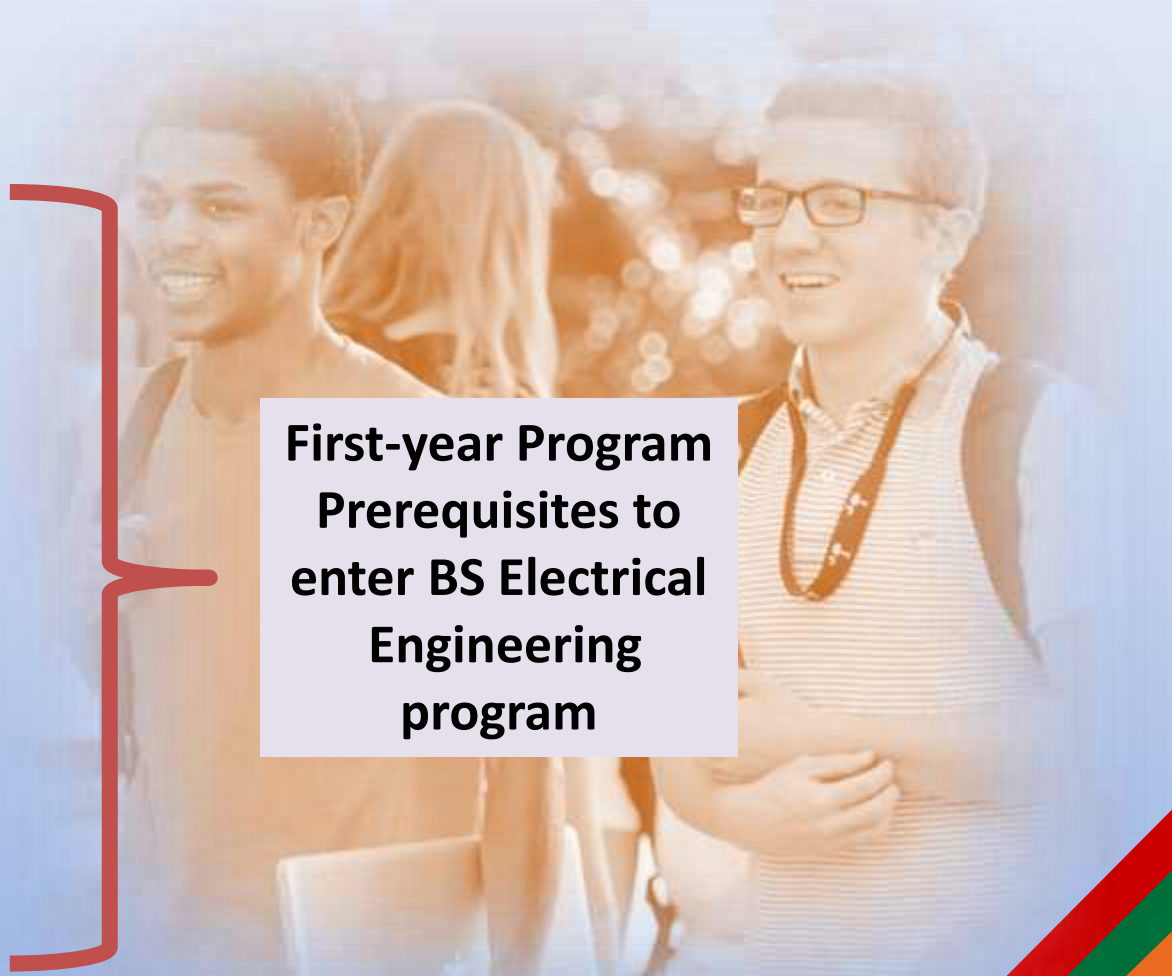
BS ELECTRICAL ENGINEERING

- 126 Credit Hours
- Common Freshman Program
- Required Power/Energy Conversion Course
- Three Senior Technical Electives
- Two-Semester Senior Design Sequence

UNDERGRADUATE EDUCATION

General Engineering

Chem 1	Engl. Comp.
Engr. Principles	Calculus 1
Gen Ed	
MATLAB	Calculus 2
Physics 1	Gen Ed
ECE Science Requirement (Chem 2)	



First-year Program Prerequisites to enter BS Electrical Engineering program

CAPER

Sophomore Year

Fall Semester		Cr
CPSC 1110/1111	Intro to Programming in C	3
ECE 2010	Logic and Computing Devices	2
ECE 2020	Electric Circuits I	3
ECE 2090	Logic Lab	1
ECE 2110	Electrical Engineering Lab I	1
MATH 2060	Calculus III	4
PHYS 2210	Physics with Calculus II	3
		17

Spring Semester		Cr
ECE 2120	Electrical Engineering Lab II	1
ECE 2620	Electric Circuits II	3
ECE 2720	Computer Organization	3
ECE 2730	Computer Organization Lab	1
MATH 2080	Differential Equations	4
	Humanities/Social Science Req.[2, 4]	3
		15

Junior Year

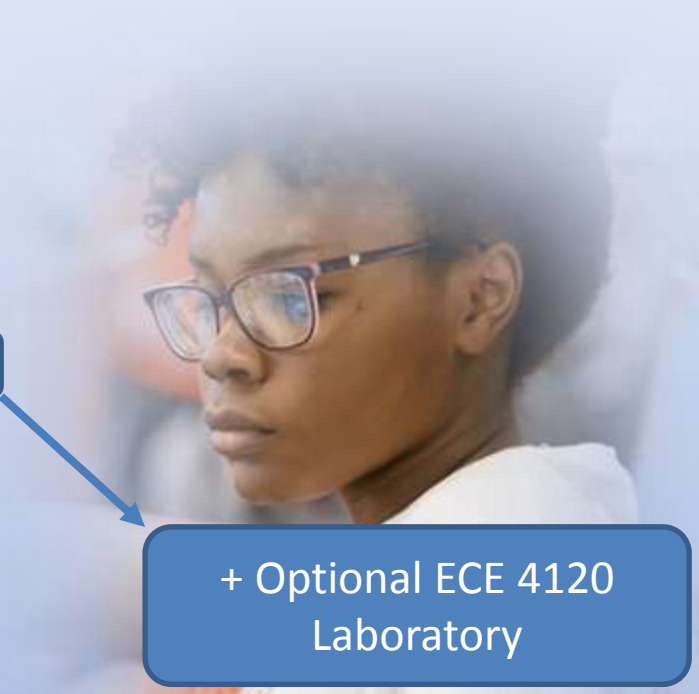
Fall Semester		Cr
ECE 3110	Electrical Engineering Lab III	1
ECE 3200	Electronics I	3
ECE 3300	Signals, Systems and Transforms	3
ECE 3600	Electric Power Engineering	3
ECE 3800	Electromagnetics	3
	Advanced Mathematics Req.[5]	3
		16

Spring Semester		Cr
ECE 3120	Electrical Engineering Lab IV	1
ECE 3170	Random Signal Analysis	3
ECE 3210	Electronics II	3
ECE 3710	Microcontroller Interfacing	3
ECE 3720	Microcontroller Interfacing Lab	1
ECE 3810	Fields, Waves and Circuits	3
ENGL 3140	Technical Writing	3
		17

Junior Year

Fall Semester		Cr
ECE 3110	Electrical Engineering Lab III	1
ECE 3200	Electronics I	3
ECE 3300	Signals, Systems and Transforms	3
ECE 3600	Electric Power Engineering	3
ECE 3800	Electromagnetics	3
	Advanced Mathematics Req.[5]	3
		16

Spring Semester		Cr
ECE 3120	Electrical Engineering Lab IV	1
ECE 3170	Random Signal Analysis	3
ECE 3210	Electronics II	3
ECE 3710	Microcontroller Interfacing	3
ECE 3720	Microcontroller Interfacing Lab	1
ECE 3810	Fields, Waves and Circuits	3
ENGL 3140	Technical Writing	3
		17



+ Optional ECE 4120 Laboratory

Senior Year

Fall Semester		Cr
ECE 4090	Intro to Linear Control Systems	3
ECE 4270	Communications Systems	3
ECE 4950/4951	Integrated Systems Design I	2
	EE Technical Elective[6]	3
	Communications Requirement[7]	3
		14

Spring Semester		Cr
ECE 4960	Integrated Systems Design II	2
	Humanities/Social Science Req.[2]	3
	EE Technical Elective[6]	3
	EE Technical Elective[6, 8]	3
	Special Requirement[9]	3
		14

Special Requirement Options:

a. A 3-credit approved Humanities/Social Sciences course (see listing here: www.clemson.edu/cecas/current-students/humanities_policy.html); or

b. An additional 3-credit, 4000-level course from the EE Technical Elective List *or* the CpE Technical Elective List; or

c. An additional 3-credit MATH course from the following list: MATH 4120 Intro (Intro to Modern Algebra), MATH 4340 (Advanced Engineering Math), or MATH 4350 (Complex Variables), MATH 4400 (Linear Programming), MATH 4410 (Intro to Stochastic Models), *or* MATH 4350 (Advanced Calculus); or

d. ELE 3010 Executive Leadership and Entrepreneurship I (prerequisite MGT 2010).

Technical Electives

POWER ENGINEERING

RENEWABLE ENERGY & ELECTRIC VEHICLES

Subject	Course	Course Title	Semester Offered[1]	Pre-requisites[2]
Computer Systems & Architecture	ECE 2220	Systems Prog. Concepts for Computer Engineering	Fall & Spring	CPSC 1110[2]
	ECE 4420	Knowledge Engineering	Fall	ECE 3220[2] and ECE 3520[2]
	ECE 4680/4681	Embedded Computing	Spring	ECE 2230[2] and ECE 3710[2]; Co-req ECE 4681
	ECE 4730	Introduction to Parallel Systems	Fall or Spring	ECE 3220[2] or ECE 3290[2]
Biomedical Systems	BIOE 3700/3701	Bioinstrumentation and Bioimaging	Fall & Spring	MATH 2080 and ECE 2020 or ECE 2070; Co-req BIOE 3701
	BIOE 4310/4311	Medical Imaging	Spring	MATH 2080 and ECE 2020 or ECE 2070; Pre or co-req BIOE 3700; Co-req BIOE 4311
	BIOE 4350	Computer Modeling of Multiphysics Problems	Spring	MATH 2080
	BIOE 4710	Biophotonics	Check w/ Dept.	MATH 2080, PHYS 2210, and ECE 2070 or ECE 3200
Communication Systems & Networks	ECE 4300	Digital Communications	Fall or Spring	ECE 3170[2] and ECE 3300[2], and consent of instructor
	ECE 4380	Computer Communications	Spring	Senior Standing in EE or CpE
	ECE 4400	Performance Analysis of Local Computer Networks	Spring	ECE 2720[2] and ECE 3170[2]
Digital Signal Processing	ECE 4420	Knowledge Engineering	Fall	ECE 3220[2] and ECE 3520[2]
	ECE 4670	Introduction to Digital Signal Processing	Fall & Summer	ECE 3300[2]
Applied Electromagnetics	ECE 4360	Microwave Circuits	Fall	ECE 3810[2], pre or co-req MATH 3110[2] or MATH 4340[2]
	ECE 4460	Antennas and Propagation	Spring	ECE 3300[2], ECE 3810[2], and MATH 3110[2] or MATH 4340[2]
	ECE 4320	Instrumentation	Spring	ECE 3210[2], pre or co-req MATH 3110[2] or MATH 4340[2]
Electronics	ECE 4040	Semiconductor Devices	Fall	ECE 3200[2], pre or co-req MATH 3110[2] or MATH 4340[2]
	ECE 4060	Intro to Microelectronics Processing	Fall	ECE 3200[2], pre or co-req MATH 3110[2] or MATH 4340[2]
	ECE 4220/4221	Electronic System Design I	Spring	ECE 3210[2], ECE 3300[2], ECE 3600[2], ECE 3710[2] and ECE 3810[2] Co-req ECE 4221
	ECE 4320	Instrumentation	Spring	ECE 3210[2], pre or co-req MATH 3110[2] or MATH 4340[2]
	ECE 4370	Microelectromechanical Systems	Spring	CH 1020 and PHYS 1220 and Senior Standing in EE or CpE
	ME 3100	Thermodynamics and Heat Transfer	Spring	MATH 2060 and PHYS 2210
Intelligent Systems	ECE 4420	Knowledge Engineering	Fall	ECE 3220[2] and ECE 3520[2]
	ECE 4550	Robot Manipulators	Summer	MATH 2060[2] and MATH 3110[2]
	ECE 4570	Fundamentals of Wind Power	Summer	ECE 2070[2] or ECE 3200[2]
	ECE 4600	Computer-Aided Analysis & Design	Spring	ECE 2620[2], MATH 3110[2] and MATH 4340[2]
	ECE 4670	Introduction to Digital Signal Processing	Fall & Summer	ECE 3300[2]
	ECE 4680/4681	Embedded Computing	Spring	ECE 2230[2] and ECE 3710[2]; Co-req ECE 4681
Power	ECE 4180	Power Systems Analysis	Fall	ECE 3600[2] and ECE 3800[2]
	ECE 4190	Electric Machines and Drives	Spring	ECE 3210[2], ECE 3600[2], and ECE 3800[2], pre or co-req MATH 4340[2]
Renewable Energy & Electric Vehicles	ECE 4190	Electric Machines and Drives	Spring	ECE 3210[2], ECE 3600[2], and ECE 3800[2], pre or co-req MATH 4340[2]
	ECE 4200	Renewable Energy Penetration on the Power Grid	Spring	ECE 2070[2] or ECE 3200[2]
	ECE 4570	Fundamentals of Wind Power	Summer	ECE 2070[2] or ECE 3200[2]
	ECE 4610	Fundamentals of Solar Energy	Fall	ECE 3200[2]
Other Course Options[3]	ECE 4050[3]	Design Projects	Fall & Spring	ECE 3300[2] or ECE 4090[2], and consent of project supervisor
	ECE 4910[3] H	Honors Research	Fall & Spring	Consent of instructor
	ECE 4920[3]	Special Problems	Fall & Spring	Consent of instructor
	ECE 4930[3]	Selected Topics	Fall & Spring	Consent of instructor
	ECE 4990[3]	Creative Inquiry	Fall & Spring	Consent of faculty member/mentor
	ECE 4990[3] H	Honors Creative Inquiry	Fall & Spring	Consent of faculty member/mentor

Power Systems Electives

ECE 4180:
Power Systems Analysis

ECE 4190:
Electric Machines and Drives

ECE 4930:
Smart Grid

ECE 4930:
Power Electronics

Renewable Energy & Electric Vehicle Electives

ECE 4200:
Renewable Energy Integration into the Power Grid

ECE/ME 4570:
Fundamentals of Wind Power

ECE 4610:
Fundamentals of Solar Energy

UNDERGRADUATE RESEARCH and EXPERIENTIAL OPPORTUNITIES

At any given time, 25% of all Clemson undergrads participate in research.

- Honors Thesis Research
- Creative Inquiry – multi-semester, student led research
- Special Topics/Problems Courses

- Cooperative Education and Internships

CAPER

Online BSEE Degree Completion Program

- Enables students to combine Clemson online courses with courses taken elsewhere to complete the BSEE degree.
- Clemson offers most, but not all 126, credit hours required for the BSEE degree online.
- Prospective students must complete a set of prerequisite courses with at least a B average before submitting an application to the program.
- Intended for those who work full time with an organization that does engineering work
- EPCE serves as the liaison to the energy industry for this program.

Online Course Offerings – Summer 2017

Summer Session I

(May 16 – June 22)

ECE 2020 – Electric Circuits I
ECE 2720 – Computer Organization
ECE 3200 – Electronics I
ECE 3300 – Signals and Systems
ECE 3710 – Microcontroller Interfacing
ECE 3800 – Electromagnetics
ECE 4090 – Intro to Linear Control Systems
ECE 4420 – Knowledge Engineering
ECE 4570 – Wind Power

Summer Session II

(June 27 – August 6)

ECE 1010 – Robots in Business and Society
ECE 2010 – Logic and Computing Devices
ECE 2070 – Basic Electrical Engineering
ECE 2620 – Electric Circuits II
ECE 3170 – Random Signal Analysis
ECE 3210 – Electronics II
ECE 3520 – Programming Systems
ECE 3600 – Electric Power Engineering
ECE 3810 – Fields, Waves and Circuits
ECE 4270 – Communications Systems
ECE 4550 – Robot Manipulators

GRADUATE EDUCATION

CLEMSON
HOLCOMBE DEPARTMENT OF ELECTRICAL AND COMPUTER ENGINEERING

College of ENGINEERING, COMPUTING and APPLIED SCIENCES

CAPER

Electrical Engineering:

- **Master of Science**
- **Master of Engineering**
- **Doctorate of Philosophy**

Focus Areas

- Photonics & Applied Electromagnetics
- Communications Systems and Networks
- Digital Signal Processing
- Electronics
- Intelligent Systems
- Power & Energy Systems

Graduate Power Courses:

ECE 6180 – Power System Analysis
ECE 6190 – Electric Machines and Drives
ECE 6610 – Fundamentals of Solar Energy
ECE 6200 – Renewable Energy Penetration
ECE 8170 – Power System Transients
ECE 8070 – Comp. Methods for Power
ECE 8160 – Electric Power Distribution
ECE 8240 – Power System Protection
ECE 8260 – Solar Cells
ECE 6570 – Fundamentals of Wind Power
ECE 8630 – Power System Stability
ECE 8020 – Electric Motor Control
ECE 8620 – Real Time Comp. Appl. in Pwr Syst.
ECE 8930 – Special Topics

ENERGY CERTIFICATE PROGRAMS

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CAPER

ENERGY CERTIFICATE PROGRAMS

- Renewable Energy
- Power System Engineering
- Advanced Power System Engineering

Developed to allow industrial personnel to broaden their knowledge in renewable energy generation and/or power systems engineering – also open to qualified Clemson students

Can be used to help satisfy the continuing education requirements for Registered Professional Engineers in many states

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ENERGY CERTIFICATE PROGRAMS – Undergraduate or Post-Baccalaureate

Renewable Energy	Power System Engineering
ECE 4200 Renewable Energy Int. on the Power Grid	**ECE 3600** Electric Power Engineering
ECE 4570 Fundamentals of Wind Power	**ECE 4180** Power System Analysis
ECE 4610 Fundamentals of Solar Energy	**ECE 4190** Electric Machines and Drives

ENERGY CERTIFICATE PROGRAMS - Graduate

Advanced Power Systems Engineering

Students must possess a B.S. in Electrical Engineering, and successfully complete 4 out of the 5 classes below:

ECE 8160
Electric Power Distribution System Engineering

ECE 8170
Power System Transients

ECE 8240
Power System Protection

ECE 8620
Real Time Computer Application in Power Systems

ECE 8630
Power System Dynamics and Stability

QUESTIONS?

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