

# ELECTRICAL SCIENCE, BA

2nd Major for College Students only.

College Students can apply for Electrical Science (ES) as a second major within the College. Under this program, a College student will receive one diploma from the College of Arts and Sciences with a dual major (note that this option is only for students in the College, not Engineering students).

**For more information:** <https://www.es.e.upenn.edu/undergraduate-2/second-majors-for-the-college/>

## Curriculum

Code	Title	Course Units
<b>Required Engineering Courses</b>		
CIS 1100 or ENGR 1050	Introduction to Computer Programming Introduction to Scientific Computing	1
CIS 1200 or CIS 2400	Programming Languages and Techniques I Introduction to Computer Systems	1
ESE 2150	Electrical Circuits and Systems	1.5
ESE 2180	Electronic, Photonic, and Electromechanical Devices	1.5
ESE 2240	Signal and Information Processing	1.5
<b>Area Electives</b>		
Three courses from the Advanced ESE Courses section of most recent EE CPG <sup>1</sup>		3-3.5
<b>Lab Elective</b>		
One course from the Design and Project Course section of most recent EE CPG <sup>1</sup>		1-1.5
<b>Specialization Elective</b>		
One additional 2000+ level ESE course <sup>2</sup>		1-1.5
<b>Required Minimal Mathematics and Natural Science Courses</b>		
PHYS 0140 or PHYS 0150 or PHYS 0170	Principles of Physics I (without laboratory) Principles of Physics I: Mechanics and Wave Motion Honors Physics I: Mechanics and Wave Motion	1
PHYS 0141 or PHYS 0151 or PHYS 0171	Principles of Physics II (without laboratory) Principles of Physics II: Electromagnetism and Radiation Honors Physics II: Electromagnetism and Radiation	1
MATH 1400	Calculus, Part I	1
MATH 1410	Calculus, Part II	1
MATH 2400 or ESE 2030	Calculus, Part III Linear Algebra with Applications to Engineering and AI	1
<b>Total Course Units</b>		<b>16.5-18</b>

<sup>1</sup> Most recent Electrical Engineering CPG (<https://catalog.upenn.edu/undergraduate/programs/electrical-engineering-bse/>)

<sup>2</sup> Excluding ESE 2030, ESE 3010, ESE 4020, and ESE 5420 (considered Math)

consult with their academic program regarding final certifications and requirements for graduation.