

# Electrical Engineering and Physics

This dual program will appeal to students with broad interests in both fundamental physical sciences and applied engineering methods. Graduates, equipped with analytical problem-solving skills and technical knowledge, will be well prepared to pursue careers in a wide range of fields within industry, government, and higher education.

## Major Requirements

### Double Major: Electrical Engineering & Physics

Degree Type: B.S.E.E.

Minimum Degree Credits to Graduate: 136

### General Education Requirements for Baccalaureate Degree

- A list of approved general education courses is available here (<http://bulletin.ndsu.edu/past-bulletin-archive/2017-18/academic-policies/undergraduate-policies/general-education/#genedcoursestext>) .
- General education courses may be used to satisfy requirements for both general education and the major, minor, and program emphases, where applicable. Students should carefully review the major, minor, and program emphases requirements for minimum grade restrictions, should they apply.

Code	Title	Credits
<b>Communication (C)</b>		12
ENGL 110	College Composition I	
ENGL 120	College Composition II	
COMM 110	Fundamentals of Public Speaking	
Upper Division Writing <sup>†</sup>		
<b>Quantitative Reasoning (R) <sup>†</sup></b>		3
<b>Science and Technology (S) <sup>†</sup></b>		10
<b>Humanities and Fine Arts (A) <sup>†</sup></b>		6
<b>Social and Behavioral Sciences (B) <sup>†</sup></b>		6
<b>Wellness (W) <sup>†</sup></b>		2
<b>Cultural Diversity (D) <sup>**†</sup></b>		
<b>Global Perspectives (G) <sup>**†</sup></b>		
Total Credits		39

\* May be satisfied by completing courses in another General Education category.

† May be satisfied with courses required in the major. Review major requirements to determine if a specific upper division writing course is required.

## Major Requirements

Code	Title	Credits
<b>Electrical Engineering Core Requirements</b>		
ECE 111	Introduction to Electrical and Computer Engineering	3
ECE 173	Introduction to Computing <sup>*</sup>	4
ECE 275	Digital Design <sup>*</sup>	4
ECE 311	Circuit Analysis II	4
ECE 320	Electronics for Computer Engineers	3
ECE 321	Electronics for Electrical Engineers	2
ECE 331	Energy Conversion	4
ECE 341	Random Processes	3
ECE 343	Signals & Systems	4
ECE 351	Applied Electromagnetics	4
ECE 376	Embedded Systems	4
ECE 401	Design I	1
ECE 403	Design II	2

ECE 405	Design III	3
<b>ECE Electives</b>		
Select 6 credits of ECE 400 level electives (excluding 494 & 496).		6
<b>Physics Core Requirements</b>		
PHYS 171	Introductory Projects in Physics *	1
PHYS 251	University Physics I *	4
PHYS 251L	University Physics I Laboratory *	1
PHYS 251R	University Physics I Recitation *	1
PHYS 252	University Physics II *	4
PHYS 252L	University Physics II Laboratory *	1
PHYS 252R	University Physics II Recitation *	1
PHYS 350	Modern Physics *	3
PHYS 355	Classical Mechanics *	3
PHYS 360	Modern Physics II *	3
PHYS 370	Introduction to Computational Physics *	3
PHYS 462	Thermal and Statistical Physics *	3
PHYS 485	Quantum Mechanics I *	3
Select one from the following: *		3-4
PHYS 411 & 411L	Optics for Scientists & Engineers and Optics for Scientists and Engineers Lab (or ECE 411 & ECE 411L))	
PHYS 413	Lasers for Scientists and Engineers	
PHYS 415	Elements of Photonics	
Physics Electives: Select one from the following *		3
PHYS 215	Research For Undergraduates (2 credit minimum)	
PHYS 481	Condensed Matter Physics	
PHYS 486	Quantum Mechanics II	
PHYS 489	Senior Project II	
MSUM Astronomy Courses (AST 300-400 level - with dept. permission)		
<b>Mathematics Courses Required</b>		
MATH 129	Basic Linear Algebra *	3
MATH 165	Calculus I *	4
MATH 166	Calculus II *	4
MATH 265	Calculus III *	4
MATH 266	Introduction to Differential Equations *	3
<b>Other Required Courses</b>		
EE 206	Circuit Analysis I *	4
ENGR 402	Engineering Ethics and Social Responsibility	1
<b>Select one upper division writing course from the following:</b>		3
ENGL 320	Business and Professional Writing	
ENGL 321	Writing in the Technical Professions	
ENGL 324	Writing in the Sciences	
ENGL 459	Researching and Writing Grants and Proposal	
Total Credits		114-115

\* No grade less than a 'C' accepted in these courses and before enrolling in ECE 300 level courses, excluding ECE 311.

#### Degree Requirements and Notes:

- A student must complete at least 60 semester credits of professional level course work in his/her program while in residence and enrolled in the College of Engineering. Students transferring into the College of Engineering from programs with professional accreditation are exempt from this residency requirement but are subject to the residency requirement of NDSU.
- In order to graduate, an EE/PHYS student must have at least a 2.00 GPA in all required EE, ECE, and PHYS courses taken at NDSU. Elective ECE and PHYS courses are not included in this GPA requirement.

- Transfer Students: Transfer courses with grades less than a 'C' in Biology, Chemistry, Computer Science, Mathematics, Physics, and any type of engineering class will not be accepted as a major in this program.
- All Students: See footnote regarding a grade of 'C' required in identified courses.

Freshman			
Fall	Credits	Spring	Credits
PHYS 171	1	ECE 111	3
Gen Ed Wellness	2	ENGL 120 (Will satisfy gen ed category C)	3
COMM 110 (Will satisfy gen ed category C)	3	MATH 129	3
ECE 173	4	MATH 166	4
ENGL 110 (Will satisfy gen ed category C)	4	PHYS 251 (Will satisfy gen ed category S)	4
MATH 165 (Will satisfy gen ed category R)	4	PHYS 251L (Will satisfy gen ed category S)	1
		PHYS 251R	1
	18		19
Sophomore			
Fall	Credits	Spring	Credits
EE 206	4	PHYS 370	3
MATH 265	4	ECE 311	4
ECE 275	4	MATH 266	3
PHYS 252 (Will satisfy gen ed category S)	4	Gen Ed Humanities/Fine Arts	3
PHYS 252L (Will satisfy gen ed category S)	1	PHYS 350	3
PHYS 252R	1		
	18		16
Junior			
Fall	Credits	Spring	Credits
ECE 320	3	ECE 331	4
ECE 321	2	ECE 343	4
PHYS 355	3	ECE 351	4
PHYS 360	3	ECE 376	4
PHYS 462	3	ECE 401	1
ENGL 320, 321, 324, or 459 (Will satisfy gen ed category C)	3		
	17		17
Senior			
Fall	Credits	Spring	Credits
ECE 403	2	ECE 405	3
ENGR 402	1	ECE Elective	3
PHYS 485	3	ECE Elective	3
ECE 341	3	Gen Ed Humanities/Fine Arts	3
PHYS Elective	2	Gen Ed Social & Behavioral Sciences	3
ECE/PHYS Elective	3		

Gen Ed Social & Behavioral Sciences	3	
	17	15
Total Credits: 137		