

**University of Northern Iowa  
Department of Physics**

**B.S. Physics/Engineering Dual Degree Program (3+2)**

**Introduction and Purpose**

Qualified students may pursue a dual-degree major leading to a B.S. Physics degree from the University of Northern Iowa (UNI) and a B.S. Engineering degree from Iowa State University (ISU). This requires three years of attendance at UNI followed by two years of attendance at ISU. Students who are on track to successfully complete the B.S. Physics requirements after three years at UNI are guaranteed admittance into an engineering program at ISU if they have:

- A grade-point average of at least 2.5 in physics, mathematics and science course work required for the B.S. Physics degree at UNI and
- An overall grade-point average of at least 2.0 in all courses (major, Liberal Arts Core and electives) that count toward the B.S. degree.

The dual degree combines the skills in analysis and computation acquired in the study of physics with the practical knowledge and experience characteristic of an engineer. The wide range of skills and abilities acquired in this dual-degree program make for a highly flexible worker with the capacity to model, calculate, code, design and build. These are precisely the skills needed to succeed in an industrial workplace where technology changes rapidly.

**Main Features of the Program**

In the first three years while at UNI, students in the major must complete at least 90 semester credit hours of course work. Students are expected to complete the UNIFI/General Education requirements. Credit, but no grades, for UNI courses passed with a grade of C or better will be transferred to ISU as credit for equivalent courses there, even though they may not be required by the engineering curriculum selected by the student. Engineering courses completed toward a B.S. Engineering degree at ISU can be transferred to UNI to satisfy any remaining required or elective credits of the physics major. Such transfers must be approved by the Head of the UNI Department of Physics. The internship or research requirement for the B.S. Physics degree may be satisfied by comparable practical experience at ISU that has been approved by the Physics Department Head.

The following table contains a partial list of courses required by all engineering programs at ISU and their UNI equivalents. (Most are also required by the B.S. Physics program.) These courses should be taken at UNI to minimize the number of courses that need to be taken at ISU.

**Course Equivalencies**

ISU	Cr	ISU Course Name	UNI	UNI Course Name	Cr
Chem 177(L)	4	General Chemistry I	CHEM 1110	General Chemistry I	4
English 150	3	Critical Thinking & Comm.	ENGLISH 1005	College Writing & Research	3
English 250	3	WOVE Composition	ENGLISH 2015	Craft of Academic Writing	3

Math 165	4	Calculus I	MATH 1420	Calculus I	4
Math 166	4	Calculus II	MATH 1421	Calculus II	4
Math 265	4	Calculus III	MATH 2422	Calculus III	4
Math 266	3	Elem Diff Equations	MATH 3425	Differential Equations	3
Phys 221	4	Classical Physics I	PHYSICS 1701	Physics I for Sci. & Eng.	4
Phys 222	4	Classical Physics II	PHYSICS 1702	Physics II for Sci. & Eng.	4

## UNI Requirements

1. UNIFI/General Education Requirements: 37 hrs (MATH 1420 & PHYSICS 1701 satisfy 7 hrs)
2. B.S. Physics Required Courses: 59 hrs; natural science electives: 4 hrs. (Electives to be chosen with assistance from Physics advisor.)
3. Internship/Research: Can be taken at UNI or during 2 years at ISU

Students should declare their interest in the 3+2 program as early as possible by informing their advisor or the Physics Department Head. In the spring semester of their first year at UNI, students should contact the Office of Engineering Student Services at ISU. Staff will provide initial assistance and direct students to a departmental advisor for discipline-specific guidance. The engineering advisor at ISU will assist the student in selecting UNI courses that will be accepted by ISU to satisfy requirements in the engineering program of interest. Further, as previously indicated, appropriate engineering courses taken at ISU can be transferred back to UNI to fulfill any remaining physics requirements, with the approval of the Physics Department Head.

In the list below are examples of program-specific technical electives that could be taken while at UNI and that will transfer to ISU. The student should discuss with the engineering advisor other UNI courses that could transfer to ISU as equivalents of technical electives.

### Course Equivalencies

ISU	Cr	ISU Course Name	UNI	UNI Course Name	Cr
Biol 211 (L) & 212(L)	8	Principles of Biology I & II (L)	BIOL 2051 & 2052	General Biology	8
SpCm 212	3	Fundamentals of Public Speaking	COMM 2255 or 1000	Public Speaking or Oral Communication	3
Math 317	3	Linear Algebra Appl	MATH 2500	Linear Algebra for Applica.	3
Chem 178(L)	4	General Chem II (L)	CHEM 1120	General Chemistry II	4
Chem 331	3	Organic Chem I	CHEM 2210	Organic Chemistry I	3
Stat 104	3	Intro to Stat Mthds	STAT 1772	Intro to Statistical Methods	3

A Plan of Study for the initial three years at UNI is presented below for your convenience.

## Plan of Study

The following plan of study is a suggested guide to best prepare students to complete a B.S. Physics degree from UNI as well as a B.S. Engineering degree from ISU in a total of five years. Students will be able to select from a wide range of engineering disciplines such as civil, electrical, mechanical, and computer engineering at ISU. Course descriptions can be found in the [UNI Course Catalog](#).

<b>Bachelor of Science, Physics: 3+2</b>				
<b>Freshman Year</b>	<b>Fall Semester</b>		<b>Spring Semester</b>	
	Calculus I*	4	Calculus II	4
	First-Year Projects in Physics	1	Physics II for Sci. & Eng.	4
	Physics I for Sci. & Eng.+	4	UNIFI: Oral Communication	3
	UNIFI: Written Communication	3	UNIFI: Human Condition (Global)	3
	UNIFI: Human Expression	3		
	<b>Total Hours:</b>	<b>15</b>	<b>Total Hours:</b>	<b>14</b>
<b>Sophomore Year</b>	<b>Fall Semester</b>		<b>Spring Semester</b>	
	Calculus III	4	Modern Physics	4
	Physics III: Theory & Simulation	3	Modern Physics Lab	2
	Introduction to Electronics	4	General Chemistry I <sup>#</sup>	4
	UNIFI: Responsibility	3	Linear Algebra	3
	UNIFI: Human Con. (Domestic)	3	UNIFI: Connect	3
	<b>Total Hours:</b>	<b>17</b>	<b>Total Hours:</b>	<b>16</b>
<b>Junior Year</b>	<b>Fall Semester</b>		<b>Spring Semester</b>	
	Classical Mechanics	4	Computational Physics	3
	Electrodynamics	4	General Chemistry II	4
	Physics Seminar	1	Thermodynamics	4
	Differential Equations	3	Math Methods of Physics	3
	UNIFI: Connect	3	UNIFI: Connect	3
	<b>Total Hours:</b>	<b>15</b>	<b>Total Hours:</b>	<b>17</b>

\*Satisfies UNIFI: Quantitative Reasoning

+Satisfies UNIFI: Scientific Reasoning with lab

#Satisfies UNIFI: Connect

## Required Physics and Math Courses at ISU

Engineering Program at ISU	Math and Physics Courses Required	Equivalent Courses at UNI
Mechanical	Calculus I Calculus II Introduction to Classical Physics I Introduction to Classical Physics II Calculus III Elementary Differential Equations and Laplace Transformations	Calculus I (MATH 1420) Calculus II (MATH 1421) Physics I for S & E (PHYSICS 1701) Physics II for S & E (PHYSICS 1702) Calculus III (MATH 2422) Differential Equations (MATH 3425) AND Math Methods (PHYSICS 2700)
Electrical	Calculus I Calculus II Introduction to Classical Physics I Introduction to Classical Physics II Calculus III Matrices and Linear Algebra	Calculus I (MATH 1420) Calculus II (MATH 1421) Physics I for S & E (PHYSICS 1701) Physics II for S & E (PHYSICS 1702) Calculus III (MATH 2422)
Computer	Calculus I Calculus II Introduction to Classical Physics I Introduction to Classical Physics II Calculus III Elementary Differential Equations and Laplace Transformations Prob and Stats for Computer Science	Calculus I (MATH 1420) Calculus II (MATH 1421) Physics I for S & E (PHYSICS 1701) Physics II for S & E (PHYSICS 1702) Calculus III (MATH 2422) Differential Equations (MATH 3425) AND Math Methods (PHYSICS 2700)
Civil-General	Calculus I Calculus II Introduction to Classical Physics I Calculus III Elementary Differential Equations	Calculus I (MATH 1420) Calculus II (MATH 1421) Physics I for S & E (PHYSICS 1701) Calculus III (MATH 2422) Differential Equations (MATH 3245)
Civil-Environmental	Calculus I Calculus II Introduction to Classical Physics I Elementary Differential Equations	Calculus I (MATH 1420) Calculus II (MATH 1421) Physics I for S & E (PHYSICS 1701) Differential Equations (MATH 3245)
Construction	Calculus I Calculus II Introduction to Classical Physics I Introduction to Classical Physics II Calculus III (Mech. emphasis only) Introduction to Statistics for Engineers Elementary Differential Equations (for Building or Heavy/Highway emphasis) Elementary Differential Equations and Laplace Transformations (for Electrical or Mechanical emphasis)	Calculus I (MATH 1420) Calculus II (MATH 1421) Physics I for S & E (PHYSICS 1701) Physics II for S & E (PHYSICS 1702) Calculus III (MATH 2422)  Differential Equations (MATH 3245)  Differential Equations (MATH 3425) AND Math Methods (PHYSICS 2700)