

New Program Proposal

Date Submitted: 10/22/24 10:17 am

Viewing: **BS-EPHY : Bachelor of Science in Engineering Physics**

Last edit: 10/22/24 10:17 am

Changes proposed by: psnopok

Program Status	Active		
Requestor	Name	Pavel Snopok	E-mail
	psnopok@iit.edu		
Origination Date	2024-10-22		
Is this an interdisciplinary program?	No		
Academic Unit	Physics		
College	Lewis College of Science and Letters		
Program Title	Bachelor of Science in Engineering Physics		
Effective Academic Year	2025 - 2026	Effective Term	
	Fall 2025		
Academic Level	Undergraduate		

If all courses in a subject in your department are required, please enter each subject followed by the number ranges in the "Quick Add" field in the pop up box when you click the green plus button below. For example: ARCH 100-499.

What courses will factor the major GPA?

PHYS 100 - Intro to the Profession
PHYS 123 - General Physics I: Mechanics
PHYS 221 - General Physics II: Electricity and Magnetism
PHYS 223 - General Physics III
PHYS 240 - Computational Science
PHYS 300 - Instrumentation Laboratory
PHYS 301 - Mathematical Methods of Physics
PHYS 304 - Thermodynamics and Statistical Physics
PHYS 308 - Classical Mechanics I
PHYS 405 - Fundamentals of Quantum Theory I

In Workflow

1. **PHYS Chair**
2. **Academic Affairs**
3. Undergraduate Academic Affairs
4. Director of Assessment
5. LS Dean
6. Marketing and Communications
7. Undergraduate Studies Committee Chair
8. Faculty Council Chair
9. Faculty Council Chair
10. Provost
11. President
12. Board of Trustees
13. Academic Affairs

Approval Path

1. 10/22/24 10:20 am
Pavel Snopok (psnopok):
Approved for PHYS Chair

PHYS 413 - Electromagnetism I
PHYS 427 - Advanced Physics Laboratory I
PHYS 485 - Physics Colloquium
MS 201 - Materials Science
MMAE 202 - Mechanics of Solids
MMAE 232 - Design for Innovation
MMAE 313 - Fluid Mechanics
ECE 308 - Signals and Systems
ECE 438 - Control Systems

Program Type Degree

Degree Type Bachelor of Science (BS)

CIP Code

14.1201 - Engineering Physics/Applied Physics.

Is there more than one Academic Unit proposer?

No

Program Code BS-EPHY

Program Attribute

Total Program 125

Credit Hours

Program Narrative and Justification

Narrative description of how the institution determined the need for the program. For example, describe what need this program will address and how the institution became aware of that need. If the program is replacing a current program(s), identify the current program(s) that is being replaced by the new program(s) and provide details describing the benefits of the new program(s). If the program will be offered in connection with, or in response to, an initiative by a governmental entity, provide details of that initiative.

We propose to take the current Applied Physics B.S. program, reduce the overall credit hours and rename it to Engineering Physics. The principles behind this revised degree program is to provide a fundamental physics education with an applied focus that provides students the background to step into an industrial R&D career where a knowledge of engineering principles is of value. The Physics core consists of 41 credits including one semester each of upper division classical mechanics, electrodynamics, statistical physics, and quantum mechanics along with laboratory courses in electronics and instrumentation, advanced physics, and computational physics. In addition the program requires an engineering core of 15 credits which is designed to provide an engineering base of solid and fluid mechanics, control systems, signal processing, and design.

Narrative description of how the program was designed to meet local market needs, or for an online program, regional or national market needs. For example, indicate if Bureau of Labor Statistics data or State labor data systems information was used, and/or if State, regional, or local workforce agencies were consulted. Include how the course content, program length, academic level, admission requirements, and prerequisites were decided; including information received from potential employers about course content; and information regarding the target students and employers.

See above.

Narrative description of any wage analysis the institution may have performed, including any consideration of Bureau of Labor Statistics wage data related to the new program.

No analysis, this is a replacement of the existing B.S. in Applied Physics program.

Narrative description of how the program was reviewed or approved by, or developed in conjunction with, one or more of the following: a) business advisory committees; b) program integrity boards; c) public or private oversight or regulatory agencies (not including the state licensing/authorization agency and accrediting agency); and d) businesses that would likely employ graduates of the program. For example, describe the steps taken to develop the program, identify when and with whom discussions were held, provide relevant details of any proposals or correspondence generated, and/or describe any process used to evaluate the program.

N/A

Admission Entry Details

Available Fall Admit	Yes	Available Spring Admit	Yes	Available Summer Admit
No				
Available On Campus	Yes No		Available Online	
Available Full-Time	Yes		Available Part-Time	
Yes				
Available International	Yes Yes		Available Domestic	

What are the enrollment estimates?

Year 1	5	Year 2	7	Year 3	10
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Attach Additional Program Justification Document(s)

Academic Information

Advising

Since quality advising is a key component of good retention, graduation, and career placement, how will students be mentored? What student professional organizations will be formed? How will the department work with the Career Services office to develop industry connections?

Advising and mentoring will be carried over from the current B.S. in Applied Physics program.

Program Resources

Which program resources are necessary to offer this program?

Proposed Catalog Entry

Admission
Requirements

Course Requirements

Required Courses

Physics Requirements		(41)
PHYS 100	Intro to the Profession	2
PHYS 123	General Physics I: Mechanics	4
PHYS 221	General Physics II: Electricity and Magnetism	4
PHYS 223	General Physics III	4
PHYS 240	Computational Science	3
PHYS 300	Instrumentation Laboratory	4
PHYS 301	Mathematical Methods of Physics	3
PHYS 304	Thermodynamics and Statistical Physics	3
PHYS 308	Classical Mechanics I	3
PHYS 405	Fundamentals of Quantum Theory I	3
PHYS 413	Electromagnetism I	3
PHYS 427	Advanced Physics Laboratory I	3
PHYS 485	Physics Colloquium	1

PHYS 485	Physics Colloquium	1
Engineering Core Requirements		(18)
MS 201	Materials Science	3
MMAE 202	Mechanics of Solids	3
MMAE 232	Design for Innovation	3
MMAE 313	Fluid Mechanics	3
ECE 308	Signals and Systems	3
ECE 438	Control Systems	3
Mathematics Requirements		(18)
MATH 151	Calculus I	5
MATH 152	Calculus II	5
MATH 251	Multivariate and Vector Calculus	4
MATH 252	Introduction to Differential Equations	4
Engineering Electives		(9)
Select 9 credits from the approved list of Engineering electives <small>BME 309, BME 422, BME 433, BME 438, CAE 286, CAE 287, CAE 312, CAE 419, CAE 470, ECE 403, ECE 408, ECE 437, ECE 447, MMAE 302, MMAE 320, MMAE 323, MMAE 485</small>		9
Technical Electives		(6)
Select six credit hours, approved by the advisor, from Engineering or 400-level Physics courses		6
Chemistry Requirement		(4)
CHEM 124	Principles of Chemistry I with Laboratory	4
Computer Science Requirement		(2)
Select one of the following:		2
CS 104	Introduction to Computer Programming for Engineers	2
CS 105	Introduction to Computer Programming	2
CS 115	Object-Oriented Programming I	2
Interprofessional Projects (IPRO)		(6)
See Illinois Tech Core Curriculum, section E		6
Humanities and Social Science Requirements		(21)
See Illinois Tech Core Curriculum, sections B and C		21
Total Credit Hours		125

Bachelor of Science in Applied Physics

Curriculum

		Year 1	
Semester 1	Credit Hours	Semester 2	Credit Hours
PHYS 100	2	MS 201 ¹	3
PHYS 123	4	PHYS 221	4
CHEM 124	4	MATH 152	5
MATH 151	5	Humanities 200-level Course	3
		Humanities or Social Sciences Elective	3
	15		18
		Year 2	
Semester 1	Credit Hours	Semester 2	Credit Hours
PHYS 223	4	PHYS 240	3
MATH 251	4	PHYS 304	3
Specialization Course ²	4	MATH 252	4
Social Sciences Elective	3	Specialization Course ²	4
Computer Science Course ³	2	Humanities Elective (300+)	3
	17		17
		Year 3	
Semester 1	Credit Hours	Semester 2	Credit Hours
PHYS 300 ⁴	4	PHYS 309	3
PHYS 301	3	Technical Elective ⁵	3
PHYS 308	3	I PRO Elective I	3
Specialization Course ²	3	Specialization Course ²	4
Social Sciences Elective (300+)	3	Humanities Elective (300+)	3
	16		16
		Year 4	
Semester 1	Credit Hours	Semester 2	Credit Hours
PHYS 405	3	PHYS 406	3
PHYS 413	3	PHYS 414	3
PHYS 427	3	PHYS 485	1
I PRO Elective II	3	Technical Elective ⁵	3
Specialization Course ²	3	Specialization Course ²	3
Social Sciences Elective (300+)	3	Specialization Course ²	3
	18		16

Total Credit Hours: 133

1

[MS 201](#) is only required for the aerospace engineering and mechanical engineering specializations. For other specializations, students should choose one of the specialization course options.

2

A minimum of 27 credit hours are required in a specific engineering, math, or science discipline. See the Specializations tab for a few examples of engineering specializations. Courses should be chosen in consultation with an academic adviser.

³
Choose from: [CS 104](#), [CS 105](#), or [CS 115](#) based on your specialization.

⁴
For students who choose the electrical engineering specialization, [PHYS 300](#) is satisfied by [ECE 211](#), [ECE 213](#), and [ECE 218](#).

⁵
See the Specializations tab for technical electives listed in some approved engineering specializations.

Specialization
Requirements

Aerospace Engineering

Required course		(27)
MS 201	Materials Science	3
Students should take the following courses:		
MMAE 200	Course MMAE 200 Not Found	3
MMAE 202	Mechanics of Solids	3
MMAE 304	Mechanics of Aerostructures	3
MMAE 311	Compressible Flow	3
MMAE 312	Aerodynamics of Aerospace Vehicles	3
MMAE 313	Fluid Mechanics	3
MMAE 320	Thermodynamics	3
MMAE 372	Aerospace Materials Lab	3
The three credit hours of technical electives may be chosen from the following:		
MMAE 352	Aerospace Propulsion	3
MMAE 410	Aircraft Flight Mechanics	3
MMAE 411	Spacecraft Dynamics	3
MMAE 412	Spacecraft Design I	3
MMAE 414	Aircraft Design I	3
MMAE 443	Systems Analysis and Control	3
Total Credit Hours		27

Electrical Engineering

Students should take the following courses:

ECE 211	Circuit Analysis I	3
ECE 213	Circuit Analysis II	4
ECE 218	Digital Systems	4
ECE 308	Signals and Systems	3
ECE 311	Engineering Electronics	4
ECE 319	Fundamentals of Power Engineering	4
MATH 333	Matrix Algebra and Complex Variables	3
The remaining six credit hours may be chosen from the following:		6
ECE 408	Introduction to Computer Networks	3
ECE 411	Power Electronics	4
ECE 412	Hybrid Electric Vehicle Drives	4
ECE 417	Power Distribution Engineering	3
ECE 418	Power System Analysis	3
ECE 429	Introduction to VLSI Design	4
ECE 436	Digital Signal Processing I with Laboratory	3-4
or ECE 437	Digital Signal Processing I	
ECE 438	Control Systems	3
ECE 446	Advanced Logic Design	4
Total Credit Hours		31

In addition, three credit hours of technical electives may be chosen from the ECE courses listed above if the required course, [PHYS 300](#), is satisfied by [ECE 211](#), [ECE 213](#), and [ECE 218](#).

Mechanical Engineering

Required course		(21-28)
MS 201	Materials Science	3
Students should take the following courses:		
MMAE 202	Mechanics of Solids	3
MMAE 232	Design for Innovation	0 OR 3
MMAE 302	Advanced Mechanics of Solids	3
MMAE 313	Fluid Mechanics	3
MMAE 319	Mechanical Laboratory I	0 OR 4

<u>MMAE 323</u>	Heat and Mass Transfer	3
<u>MMAE 332</u>	Design of Machine Elements	3
The remaining three credit hours may be chosen from below. The applied physics technical elective may be chosen from below as well.		3
<u>MMAE 419</u>	Mechanical Laboratory II	4
<u>MMAE 432</u>	Design of Mechanical Systems	3
<u>MMAE 440</u>	Introduction to Robotics	3
<u>MMAE 443</u>	Systems Analysis and Control	3
<u>MMAE 485</u>	Manufacturing Processes	3
Total Credit Hours		21-28

Program Outcomes and Assessment Process

What are your learning objectives in this program? Please list each learning objective in the boxes below:

Note: These should be the same as described in your assessment plan at the bottom of this form.

Demonstrate understanding of classical physics by being able to solve problems at an advanced undergraduate level.

Demonstrate understanding of electricity and magnetism by being able to solve problems at an advanced undergraduate level.

Demonstrate understanding of quantum mechanics by being able to solve problems at an advanced undergraduate level.

Demonstrate understanding of thermal and statistical physics by being able to solve problems at an advanced undergraduate level.

Model physical systems using advanced mathematics and apply mathematical techniques correctly.

Design, write, execute, and troubleshoot computational code which models physical phenomena.

Demonstrate the ability to design and instantiate mechanical systems and scientific experiments.

Demonstrate understanding of control systems and signals by being able to solve problems at an advanced undergraduate level

Upload your assessment plan here:

Undergraduate Program Requirements

What courses will factor the major GPA?

Undergraduate Degree Requirements

Minimum credit hours 125

Specialization required?
No

Minor required?
No

Proposed General Curriculum

List Major Course Requirements

PHYS 100	Intro to the Profession	2
PHYS 123	General Physics I: Mechanics	4
PHYS 221	General Physics II: Electricity and Magnetism	4
PHYS 223	General Physics III	4
PHYS 240	Computational Science	3
PHYS 300	Instrumentation Laboratory	4
PHYS 301	Mathematical Methods of Physics	3
PHYS 304	Thermodynamics and Statistical Physics	3
PHYS 308	Classical Mechanics I	3
PHYS 405	Fundamentals of Quantum Theory I	3
PHYS 413	Electromagnetism I	3

PHYS 427	Advanced Physics Laboratory I	3
PHYS 485	Physics Colloquium	1
PHYS 485	Physics Colloquium	1
MS 201	Materials Science	3
MMAE 202	Mechanics of Solids	3
MMAE 232	Design for Innovation	0 OR 3
MMAE 313	Fluid Mechanics	3
ECE 308	Signals and Systems	3
ECE 438	Control Systems	3
List Mathematics Requirements		
MATH 151	Calculus I	5
MATH 152	Calculus II	5
MATH 251	Multivariate and Vector Calculus	4
MATH 252	Introduction to Differential Equations	4
List Science Requirements		
CHEM 124	Principles of Chemistry I with Laboratory	4
List Computer Science Requirements		
CS 105	Introduction to Computer Programming	2
or CS 104	Introduction to Computer Programming for Engineers	
or CS 115	Object-Oriented Programming I	
List Humanities and Social Sciences Requirements		
See Illinois Tech Core Curriculum, sections B and C		21
List Interprofessional Project (IPRO) Requirements		
See Illinois Tech Core Curriculum, section E		6
List Technical Elective Course		

Options

Technical electives: select six credit hours, approved by the advisor, from Engineering or 400-level Physics courses	6
Engineering electives: select 9 credits from the approved list of Engineering electives <small>BME 309, BME 422, BME 433, BME 438, CAE 286, CAE 287, CAE 312, CAE 419, CAE 470, ECE 403, ECE 408, ECE 437, ECE 447, MMAE 302, MMAE 320, MMAE 323, MMAE 485</small>	9

List Free Elective
Credit Hours (if applicable)

Semester-by-semester plan of study for the degree program

			Year 1
Semester 1	Credit Hours	Semester 2	Credit Hours
PHYS 100	2	PHYS 221	4
PHYS 123	4	MS 201	3
CHEM 124	4	MATH 152	5
MATH 151	5	Humanities 200-level course	3
	15		15
			Year 2
Semester 1	Credit Hours	Semester 2	Credit Hours
PHYS 223	4	PHYS 304	3
CS 105	2	MATH 252	4
MATH 251	4	MMAE 232	3
MMAE 202	3	Social Sciences elective	3
Humanities or Social Sciences elective	3	Humanities elective (300+)	3
	16		16
			Year 3
Semester 1	Credit Hours	Semester 2	Credit Hours
PHYS 300	4	PHYS 240	3
PHYS 301	3	ECE 308	3
PHYS 308	3	Engineering elective	3
MMAE 313	3	IPRO 497 or 397	3
Engineering elective	3	Social Sciences elective (300+)	3
	16		15
			Year 4
Semester 1	Credit Hours	Semester 2	Credit Hours
PHYS 405	3	PHYS 485	1
PHYS 413	3	Engineering elective	3

<u>PHYS 427</u>	3	Technical elective	3
<u>PHYS 485</u>	1	<u>I</u> PRO 497	3
<u>ECE 438</u>	3	Social Sciences elective (300+)	3
Technical elective	3	Humanities elective (300+)	3
	16		16

Total Credit Hours: 125

Reviewer
Comments