This interdisciplinary program provides students with a broad science and mathematics background similar to that of Tulane's traditional physics major, combined with a strong grounding in engineering design and the application of physics principles to practical engineering problems. The curriculum is characterized by a strong emphasis on modern physics and its application to 21st century technology, including new materials, quantum electronics, nanofabrication, and devices. Focus areas in our department include: materials engineering, computational engineering, and nanodevices. Our students will be well equipped to pursue research and development careers in new and emerging technologies that cut across traditional engineering and science disciplines, to pursue graduate studies in science or engineering, or to enter professional fields including law, management, and medicine. Graduates will have substantial experience with laboratory methods, data analysis, and computation. A centerpiece of the curriculum is the design sequence, consisting of a two-semester Introduction to Design sequence, a summer industry internship, and a two-semester capstone Team Design Project. As an intrinsic part of the curriculum, students develop strong oral and written communication skills, multidisciplinary teamwork skills, experience in public service, and knowledge about the high ethical standards of the engineering profession. The program builds on cross-cutting areas of research strength in the School of Science and Engineering, including: novel 21st century materials; materials for energy; biomolecular materials; macromolecules; “quantum mechanics to devices”; surfaces, interfaces, and nanostructures; and computation.

Tulane’s Engineering Physics program is accredited by the Engineering Accreditation Commission of ABET.

Mission Statement for Engineering Physics
The mission of our program is to provide the highest quality education for students in the principles and applications of Engineering Physics. The excellence of the program is ensured by our department’s high regard for teaching, research activities and industrial ties. The program educates students to take leadership roles in industry, academia and government.

Educational Objectives for Engineering Physics Program
Our engineering physics program aims to educate students to become professionals with in-depth knowledge and skills in mathematics, science and engineering to understand physical systems; to research, design and solve problems; and to provide the foundation for graduate study and lifelong learning. Our objective is to prepare graduates who will successfully pursue:

1. Advanced studies leading to research and/or professional careers in Engineering
2. Advanced studies leading to research and/or professional careers in Physical Science
3. Careers in Engineering Physics or related technical and professional fields.

Student Outcomes for Engineering Physics
Graduates of the Engineering Physics program at Tulane University will attain:

1. an ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics
2. an ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors
3. an ability to communicate effectively with a range of audiences
4. an ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts
5. an ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives
6. an ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions
7. an ability to acquire and apply new knowledge as needed, using appropriate learning strategies

Engineering Physics is a field that provides broad training in physics and mathematics and basic training in engineering and design. The practitioner of engineering physics is involved in the development of new devices and products using sophisticated physical concepts. The engineering physics curriculum educates students to work in areas where technology is changing rapidly and where the boundaries of several traditional engineering disciplines overlap, such as nanomaterials/devices, lasers, plasmas, robotics, materials, medical imaging, superconductors, and semiconductors. The curriculum develops sufficient depth in both engineering and science to produce graduates who are able to relate basic knowledge to practical problems in engineering. The engineering physicist is a person with the training of both an applied physicist and an engineer, the inclination to attack novel as well as routine problems in engineering, and the flexibility to exploit basic knowledge in any branch of science and technology using analytical and experimental skills.

Our engineering physics curriculum places emphasis on:

- basic principles of engineering
- problem solving
- mathematics
• physics
• engineering design
• computer science and engineering
• chemistry
• science and scientific principles
• research
• communications
• multi-disciplinary teamwork
• continuous learning
• leadership
• ethics
• preparation for advanced degrees in engineering and science

The required curriculum for engineering physics is relatively full. Class schedules should be carefully planned. Typical of engineering in the US, some engineering physics majors may take a course overload in some semesters.

Engineering Physics Certificates
The Engineering Physics program offers optional certificates for students who are interested in specific aspects of the broader program. Completing a certificate offers several advantages: structured/guided use of electives for focusing in a particular area, providing some depth within a broad-based ENGP curriculum; additional branding that may help students attract interest in industry after graduation; and preparation for common graduate engineering programs. Certificates are optional, but if a student does complete one, this is reported on the transcript. Students may choose one of four certificates:

• Computational Engineering (https://catalog.tulane.edu/science-engineering/physics-engineering/computational-engineering-certificate/)
• Electrical Engineering (https://catalog.tulane.edu/science-engineering/physics-engineering/electrical-engineering-certificate/)
• Materials Engineering (https://catalog.tulane.edu/science-engineering/physics-engineering/materials-engineering-certificate/)
• Mechanical Engineering (https://catalog.tulane.edu/science-engineering/physics-engineering/mechanical-engineering-certificate/)

with each having a pre-approved set of coursework that meets the requirements of that certificate. For more information and an up-to-date list of pre-approved electives, follow the links above and go to the “Requirements” section.

PEP Website
https://sse.tulane.edu/pep/academics/undergraduate/engineering-physics/

Requirements

General Course Requirements for Engineering Physics
The major curriculum consists of the following requirements (98 credits total plus Tulane Core Curriculum requirements):

Tulane University’s Core Requirements for Graduation
Engineering Physics majors are exempt from the Newcomb-Tulane foreign language requirement. All other Newcomb-Tulane College core requirements must be fulfilled.

<table>
<thead>
<tr>
<th>Course ID</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mathematics</td>
<td></td>
<td>13</td>
</tr>
<tr>
<td>Select four classes to be completed during the first two years of study including the following:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>MATH 2210</td>
<td>Calculus III</td>
<td>4</td>
</tr>
<tr>
<td>MATH 2240</td>
<td>Intro To Applied Math</td>
<td>4</td>
</tr>
<tr>
<td>or MATH 4240</td>
<td>Ordinary Differential Equ</td>
<td>4</td>
</tr>
<tr>
<td>Basic Science First Year of Study</td>
<td></td>
<td>4</td>
</tr>
<tr>
<td>PHYS 1310</td>
<td>General Physics I</td>
<td>4</td>
</tr>
<tr>
<td>PHYS 1320</td>
<td>General Physics II</td>
<td>4</td>
</tr>
<tr>
<td>CHEM 1070</td>
<td>General Chemistry I</td>
<td>4</td>
</tr>
<tr>
<td>&amp; CHEM 1075</td>
<td>and General Chemistry Lab I</td>
<td></td>
</tr>
<tr>
<td>CHEM 1080</td>
<td>General Chemistry II</td>
<td>4</td>
</tr>
<tr>
<td>&amp; CHEM 1085</td>
<td>and General Chemistry Lab II</td>
<td></td>
</tr>
</tbody>
</table>
## Basic Science Second Year of Study
- **PHYS 2350**: Modern Physics I 3
- **PHYS 2360**: Modern Physics II 3

### Introduction to Design
- **ENGP 2020**: Computing Concepts & App. 4
- **ENGP 2310**: Product & Experimental Design 3

### General Engineering Courses
- **ENGP 1410**: Statics 3
- **ENGP 2010**: Electric Circuits 3
- **ENGP 2011**: Electric Circuits Lab 1
- **CENG 2120**: Thermodynamics I 3
- **ENGP 2430**: Mechanics of Materials 3

### Materials Science and Engineering
- **ENGP 3120**: Materials Science & Engr 3

### Advanced Laboratory
- **ENGP 3530**: Advanced Laboratory I 3

### Nanoscience and Technology
- **ENGP 3600**: Nanoscience & Technology 3

### Computation
- Select one of the following: 3
- **ENGP 3170**: Computnl Physics & Engr 3
- **CENG 3230**: Numr Meth For Chem Eng 3
- **MATH 3310**: Scientific Computing I 3

- plus one additional 3-credit engineering elective for students choosing MATH 3310 3

### Seminar
- **PHYS 3800**: Physics Colloquium 1

### Contemporary Topics
- Select one of the following: 3
- **PHYS 3150** or **PHYS 6150**: Intro To Neutron Science 3
- **PHYS 3210** or **PHYS 6210**: Molec Biophysics & Polymer Phy 3
- **PHYS 3230** or **PHYS 6230**: Quantum Information Sci & Eng 3
- **PHYS 3310** or **PHYS 6310**: Quantum Optics 3
- **PHYS 3450** or **PHYS 6450**: Elem Particle Physics 3
- **PHYS 3700** or **PHYS 6700**: Electnc Prop of Materls 3
- **PHYS 4470**: Intro Quantum Mechanics 3

### Classical Topics
- Select one of the following: 3
- **PHYS 3630**: Electromagnetic Theory 3
- **PHYS 3740**: Classical Mechanics 3
- **PHYS 4230**: Thermal Physics 3
- **PHYS 4650**: Optics 3

### Engineering Electives
- Select four of the following: 12
- **CENG 2110**: Matl & Energy Balances 3
- **CENG 2320**: Transport Phenomena I 3
CENG 2500  Intro To Biotechnology  3
CENG 3110  Thermodynamics II  3
CENG 3390  Transport Phenomena II  3
ENGP 2420  Engineering Dynamics  3
ENGP 3290  Computational Materials Scienc  3
ENGP 3350  Kinetics of Material Systems  3
ENGP 3360  Structure of Materials  3
ENGP 3370  Processing of Biomaterials  3
ENGP 3380  Materials for Energy  3
ENGP 3560  Photonic Materials & Devices  3
ENGP 3620  MicroFab and Nanotech  3
ENGP 3660  Special Topics  1-3
ENGP 3720  Mechanic Behavior of Materials  3
ENGP 3760  Thermodynamics of Materials  3
BMEN 2730  Biomedical Electronics  4
BMEN 3300  Biomechanics  3
BMEN 3400  Biomaterials & Tissue Engr  3
BMEN 3440  Biofluid Mechanics  3
BMEN 3650  Biomechanics and Biotransport  3
BMEN 3730  Biomedical Signals and Systems  3
BMEN 3820  Math Analysis Bio Systms  3
BMEN 3932  Elements of BMEN Design  3
CMPS 3350  Intro to Computer Graphics  3

or other courses as approved by the Faculty Advisor

Engineering or Related Field Elective
Select one additional course in engineering or a related field ²  3

Professional Development
ENGP 3430  & ENGP 3440  Prof Develop Engineers I and Prof Develop Engineers II ³  3

Summer Internship
Normally done in the summer following the third year of study  0

Team Design Project and Professional Practice  ⁴
ENGP 4310  Team Dsgn Proj &Prf Pr I  3
ENGP 4320  Team Dsgn Proj &Prf P II  3

Total Credits Required for Major  98

¹ Typically taken in the second year of study
² One additional course in engineering (e.g. an approved engineering elective) or a related field (e.g. mathematics, computer science, biology, music technology, etc.) as approved by the Faculty Advisor. This additional elective cannot be counted against any existing requirement. Note: This requirement does not apply to any students matriculating before Fall 2016.
³ Normally taken in the junior year
⁴ Taken in the fourth year of study

Note:

Many intermediate and advanced courses in the program have prerequisites listed under the Basic Science and Mathematics categories; several of the allowed electives may have additional prerequisites. Many of the required and elective courses may not be offered every year. Students must work closely with the departmental undergraduate advisor to develop an individualized schedule of courses that fits their needs and interests, while satisfying all of the above requirements along with the university’s core requirements for graduation.

ROTC Courses
ROTC courses, if elected, are taken in addition to the normal courses. Please see the Engineering Physics advisor for details.
# Sample Schedule of Classes for Engineering Physics

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credit Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Year 1</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Fall</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CHEM 1070 &amp; CHEM 1075</td>
<td>General Chemistry I and General Chemistry Lab I</td>
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<tr>
<td>PHYS 1310</td>
<td>General Physics I</td>
<td>4</td>
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<tr>
<td>PHYS 1311</td>
<td>General Physics I Lab</td>
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</tr>
<tr>
<td>MATH 1210</td>
<td>Calculus I</td>
<td>4</td>
</tr>
<tr>
<td>ENGL 1010</td>
<td>Writing</td>
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<td>TIDES Course Credits</td>
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<td></td>
<td><strong>Credit Hours</strong></td>
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<tr>
<td><strong>Spring</strong></td>
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<td></td>
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<tr>
<td>PHYS 1320</td>
<td>General Physics II</td>
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</tr>
<tr>
<td>PHYS 1321</td>
<td>General Physics II Lab</td>
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</tr>
<tr>
<td>CHEM 1080 &amp; CHEM 1085</td>
<td>General Chemistry II and General Chemistry Lab II</td>
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<tr>
<td>MATH 1220</td>
<td>Calculus II</td>
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<tr>
<td>ENGP 1410</td>
<td>Statics</td>
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<td><strong>Credit Hours</strong></td>
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<td><strong>Year 2</strong></td>
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<tr>
<td><strong>Fall</strong></td>
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<tr>
<td>PHYS 2350</td>
<td>Modern Physics I</td>
<td>3</td>
</tr>
<tr>
<td>MATH 2210</td>
<td>Calculus III</td>
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<tr>
<td>ENGP 2010</td>
<td>Electric Circuits</td>
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<tr>
<td>ENGP 2011</td>
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<tr>
<td>ENGP 2310</td>
<td>Product &amp; Experimental Design</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>Public Service Course</td>
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<td></td>
<td><strong>Credit Hours</strong></td>
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<tr>
<td><strong>Spring</strong></td>
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</tr>
<tr>
<td>PHYS 2360</td>
<td>Modern Physics II</td>
<td>3</td>
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<tr>
<td>MATH 2240</td>
<td>Intro To Applied Math</td>
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<tr>
<td>ENGP 2020</td>
<td>Computing Concepts &amp; App.</td>
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<td></td>
<td>Engineering Elective</td>
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<td>Cultural Knowledge Elective</td>
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<tr>
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<td><strong>Credit Hours</strong></td>
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<tr>
<td><strong>Year 3</strong></td>
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<tr>
<td><strong>Fall</strong></td>
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<tr>
<td>ENGP 2430</td>
<td>Mechanics of Materials</td>
<td>3</td>
</tr>
<tr>
<td>ENGP 3430</td>
<td>Prof Develop Engineers I</td>
<td>2</td>
</tr>
<tr>
<td>PHYS 3800</td>
<td>Physics Colloquium</td>
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<tr>
<td></td>
<td>Classical Elective</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>Cultural Knowledge Elective</td>
<td>3</td>
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<tr>
<td></td>
<td>Select 2 Engineering Electives</td>
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<tr>
<td></td>
<td><strong>Credit Hours</strong></td>
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<tr>
<td><strong>Spring</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CENG 2120</td>
<td>Thermodynamics I</td>
<td>3</td>
</tr>
<tr>
<td>ENGP 3120</td>
<td>Materials Science &amp; Engr</td>
<td>3</td>
</tr>
<tr>
<td>ENGP 3170</td>
<td>Computnl Physics &amp; Engr</td>
<td>3</td>
</tr>
<tr>
<td>ENGP 3530</td>
<td>Advanced Laboratory I</td>
<td>3</td>
</tr>
</tbody>
</table>
### Year 4

#### Fall
- **ENGP 4310** | Team Dsgn Proj &Prf Pr I | 3
- Public Service Course | 1
- **Engineering or Related Elective** | 5
- Cultural Knowledge Elective 4 | 3
- Cultural Knowledge Elective 5 | 3

**Credit Hours: 15**

#### Spring
- **ENGP 3600** | Nanoscience & Technology | 3
- **ENGP 4320** | Team Dsgn Proj &Prf P II | 3
- **Engineering Elective** | 6
- Contemporary Elective | 7

**Credit Hours: 13**

**Total Credit Hours: 12**

---

1. e.g., Introduction to Physics Pedagogy
2. e.g., BMEN 2730 Biomedical Electronics (4 c.h.): Electronics
3. e.g., PHYS 3630 Electromagnetic Theory (3 c.h.)
4. e.g., BMEN 3440 Biofluid Mechanics (3 c.h.), ENGP 2420 Engineering Dynamics (3 c.h.)
5. e.g., Microfabrication and Nanotechnology
6. e.g., ENGP 3360 Structure of Materials (3 c.h.)
7. e.g., PHYS 4470 Intro Quantum Mechanics (3 c.h.)