

UC 12748 14S

APPROVED APR 23 2014  
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# UNIVERSITY of HOUSTON | ENGINEERING

## Department of Biomedical Engineering

BME Department  
<http://www.egr.uh.edu/bioe/grad>

3605 Cullen Blvd, Room 2027  
Houston, TX 77204-5060  
Phone: 832-842-8813

Date: February 19, 2014

To: Undergraduate Committee

From: Cullen College of Engineering, Department of Biomedical Engineering  
Contact Person: Dr. Ting Chen  
Phone: 832/842-8887 Email: [tchen23@central.uh.edu](mailto:tchen23@central.uh.edu)

RECEIVED FEB 20 2014  
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Subject: Biomedical Engineering Degree Plan Changes

Dean's Signature \_\_\_\_\_

David P. Shattuck

Date 20 FEB 2014

I am requesting that the Biomedical Engineering undergraduate degree plan be modified. These changes will affect all students entering into the Biomedical Engineering undergraduate program starting in fall 2014.

The new degree plan will increase the number of credit hours from 129 and 130 to 131 for all three options in the degree program. The increase in credit hours is strictly an increase in BIOE course requirements; our students will now complete 54 credit hours in engineering courses, going beyond the ABET minimum requirement of 48 credit hours in engineering courses. Further, the addition of specific technical electives to the curriculum will better prepare graduates for industry. These changes allow for training in upper-division and laboratory coursework, which will also better prepare students for medical school; the Texas Medical Application Service, for example, recommends applicants take supplementary upper-division coursework to better prepare for the academic demands of medical school. Finally, the 3 Texas universities accredited by ABET already require more credits for their biomedical engineering programs; Texas A&M and UT – Austin both require 133 credit hours, and Rice University requires 134 credit hours for their biomedical engineering degree.

First, current options in the degree program will be replaced by three new options.

- a. Neural and Rehabilitation Engineering Option
- b. Biomedical Imaging Option
- c. Bionanoscience Option

Second, replace ECE 1331 with BIOE 1331 Computing for Biomedical Engineering.

Third, BIOE 3140 Quantitative Physiology Laboratory will be added to be concurrently enrolled with BIOE 3340 Quantitative Physiology a student's junior year.

Fourth, BIOE 3440 will be replaced with BIOE 3341 Biothermodynamics in a student's junior year.

Fifth, BIOE 2150 and BIOE 3350 will be replaced by BIOE 4115 and BIOE 4315 Introduction to Bioinstrumentation and lab for students to take in a student's senior year.

Sixth, all Non-BIOE and BIOE senior level courses will be replaced by BIOE Technical Electives, except BIOE 4115, BIOE 4315, BIOE 4335 and BIOE 4336.

Seventh, BIOE 4335 Capstone Design I and BIOE 4336 Capstone Design II will replace BIOE 4334 Capstone Design.

Eighth, calculation of major GPA has been modified in the proposed degree plan.

Best Regards,



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John S Dunn Endowed Chair Professor  
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## Biomedical Engineering, B.S.B.E.

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←Return to: [Cullen College of Engineering](#)

Biomedical engineering majors must earn a grade of C- or better in all engineering, mathematics, and science courses, including transfer courses.

After attempting at least six hours within the major, if the cumulative major GPA is below 2.25, the student is placed on probation.

Once on probation, in the next semester(s), the semester major GPA is evaluated. If the semester major GPA is greater than or equal to 2.25, but the cumulative major GPA is below 2.25 the student continues on probation. If the semester major GPA is below 2.25 the student is suspended.

The major grade point average is calculated using all BIOE courses as well as all Engineering Computing XXXX 1331 courses, [CHEE 2331](#) , [ECE 2100](#) , and [ECE 2300](#) , and [MECE 3400](#) . In addition, for those students that choose the Neuroengineering option, the major grade point average will also include [ECE 3155](#) , [ECE 3337](#) , [ECE 3355](#) , [ECE 3366](#) , and [ECE 3456](#) .

Students may petition for readmission to the Cullen College of Engineering through the Associate Dean for Undergraduate Programs. Readmission is not guaranteed. If readmitted, the student will be on engineering major probation during the semester of readmission. Students must transfer out of engineering after two engineering major suspensions.

### Suggested Program Plan

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- [Sample Program - Biomedical Engineering \(BIOE\)](#)

←Return to: [Cullen College of Engineering](#)

## Sample Program - Biomedical Engineering (BIOE)

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### First Year

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#### Fall Semester

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- **BIOE 1100 - Introduction to Biomedical Engineering Credit Hours: 1.0**
- **BIOL 1161 - Introduction to Biological Science Laboratory Credit Hours: 1.0**
- **BIOL 1361 - Introduction to Biological Science Credit Hours: 3.0**
- **CHEM 1111 - Fundamentals of Chemistry Laboratory Credit Hours: 1.0**
- **CHEM 1331 - Fundamentals of Chemistry Credit Hours: 3.0**
- **ENGL 1303 - First Year Writing I Credit Hours: 3.0**
- **MATH 1431 - Calculus I Credit Hours: 4.0**

**Total 16**

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#### Spring Semester

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- **BIOL 1162 - Introduction to Biological Science Laboratory Credit Hours: 1.0**
- **BIOL 1362 - Introduction to Biological Science Credit Hours: 3.0**
- **CHEM 1112 - Fundamentals of Chemistry Laboratory Credit Hours: 1.0**
- **CHEM 1332 - Fundamentals of Chemistry Credit Hours: 3.0**
- **ECE 1331 - Computers and Problems Solving Credit Hours: 3.0**
- **MATH 1432 - Calculus II Credit Hours: 4.0**
- **PHYS 1321 - University Physics I Credit Hours: 3.0**

**Total 18**

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### Second Year

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#### Fall Semester

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Current Catalog Entry

- BIOE 2150 - Biosensors I **Credit Hours: 1.0**
- CHEM 3221 - Fundamentals of Organic Chemistry Laboratory **Credit Hours: 2.0**
- CHEM 3331 - Fundamentals of Organic Chemistry **Credit Hours: 3.0**
- ENGL 1304 - First Year Writing II **Credit Hours: 3.0**
- MATH 2433 - Calculus III **Credit Hours: 4.0**
- PHYS 1322 - University Physics II **Credit Hours: 3.0**

**Total 16**

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**Spring Semester**

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- MECE 3400 - Introduction to Mechanics **Credit Hours: 4.0**
- CHEE 2331 - Chemical Processes **Credit Hours: 3.0**
- ECE 2100 - Circuit Analysis Laboratory **Credit Hours: 1.0**
- ECE 2300 - Circuit Analysis **Credit Hours: 3.0**
- HIST 1373 - The United States to 1877 **Cr. 3.**
- MATH 3321 - Engineering Mathematics **Credit Hours: 3.0**

**Total 17**

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**Students must choose one of the three options below for years three and four:**

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- Biomechanics Option
- Biomolecular Option
- Neuroengineering Option

**Biomechanics Option**

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**Third Year**

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## Fall Semester

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- **BIOE 3340 - Quantitative Physiology Credit Hours: 3.0**
- **ENGI 2304 - Technical Communications Credit Hours: 3.0**
- **INDE 2333 - Engineering Statistics I Credit Hours: 3.0**
- **HIST 1378 - The United States Since 1877 Credit Hours: 3.0**
- **Visual and Performing Arts Core Course Cr. 3.**

**Total 15**

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## Spring Semester

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- **BIOE 3350 - Biosensors II Credit Hours: 3.0**
- **BIOE 3440 - Biothermodynamics and Biofluids Credit Hours: 4.0**
- **BIOE 4324 - Advanced Continuum Biomechanics Credit Hours: 3.0**
- **BCHS 3304 - General Biochemistry I Credit Hours: 3.0**
- **POLS 1336 - U.S. and Texas Constitutions and Politics Credit Hours: 3.0**

**Total 16**

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## Fourth Year

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### Fall Semester

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- **BIOE 5312 - Computational Fluid Dynamics Credit Hours: 3.0**
- **BIOE 5323 - Fundamentals of Tissue Engineering Credit Hours: 3.0**
- **BIOE 5455 - Bioanalytics Credit Hours: 4.0**
- **BIOE Technical Elective Cr. 3.**<sup>13</sup>
- **POLS 1337 - U.S. Government: Congress, President, and Courts Credit Hours: 3.0**

**Total 16**

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Current Catalog Entry

## Spring Semester

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- **BIOE 4334 - Capstone Design Credit Hours: 3.0**
- **BIOE 4325 - Application of Engineering Principles Applied to Biological Systems Credit Hours: 3.0**
- **BIOE Technical Elective Cr. 3.** <sup>13</sup>
- **Social Science Core Course Cr. 3.**
- **Humanities Core Course Cr. 3.**

**Total 15**

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**Degree Total: 129**

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## Biomolecular Option

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### Third Year

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#### Fall Semester

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- **BIOE 3340 - Quantitative Physiology Credit Hours: 3.0**
- **ENGI 2304 - Technical Communications Credit Hours: 3.0**
- **INDE 2333 - Engineering Statistics I Credit Hours: 3.0**
- **HIST 1378 - The United States Since 1877 Credit Hours: 3.0**
- **Visual and Performing Arts Core Course Cr. 3.**

**Total 15**

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#### Spring Semester

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Current Catalog Entry

- BIOE 3350 - Biosensors II **Credit Hours: 3.0**
- BIOE 3440 - Biothermodynamics and Biofluids **Credit Hours: 4.0**
- BIOE Technical Elective **Cr. 3.**<sup>13</sup>
- BCHS 3304 - General Biochemistry I **Credit Hours: 3.0**
- POLS 1336 - U.S. and Texas Constitutions and Politics **Credit Hours: 3.0**

**Total 16**

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## **Fourth Year**

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### **Fall Semester**

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- BIOE 5323 - Fundamentals of Tissue Engineering **Credit Hours: 3.0**
- BIOE 4366 - Biomolecular Engineering Fundamentals **Credit Hours: 3.0**
- BIOE 4393 - Cellular and Biological Transport Phenomena **Credit Hours: 3.0**
- BIOE 5455 - Bioanalytics **Credit Hours: 4.0**
- POLS 1337 - U.S. Government: Congress, President, and Courts **Credit Hours: 3.0**

**Total 16**

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### **Spring Semester**

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- BIOE 4334 - Capstone Design **Credit Hours: 3.0**
- BIOE 5389 - Transport Phenomena in Physiological Systems **Credit Hours: 3.0**
- BIOE Technical Elective **Cr. 3.**<sup>13</sup>
- Social Science Core Course **Cr. 3.**
- Humanities Core Course **Cr. 3.**

**Total 15**

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**Degree Total: 129**

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## Neuroengineering Option

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### Third Year

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#### Fall Semester

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- BIOE 3340 - Quantitative Physiology **Credit Hours: 3.0**
- BCHS 3304 - General Biochemistry I **Credit Hours: 3.0**
- ECE 3337 - Signals and Systems Analysis **Credit Hours: 3.0**
- ENGI 2304 - Technical Communications **Credit Hours: 3.0**
- INDE 2333 - Engineering Statistics I **Credit Hours: 3.0**

**Total 15**

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#### Spring Semester

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- BIOE 3350 - Biosensors II **Credit Hours: 3.0**
- BIOE 3440 - Biothermodynamics and Biofluids **Credit Hours: 4.0**
- BIOL 4315 - Neuroscience **Credit Hours: 3.0**
- ECE 3355 - Electronics **Credit Hours: 3.0**
- ECE 3155 - Electronics Laboratory **Credit Hours: 1.0**
- POLS 1336 - U.S. and Texas Constitutions and Politics **Credit Hours: 3.0**

**Total 17**

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### Fourth Year

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#### Fall Semester

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Current Catalog Entry

- **BIOE 3366 - Introduction to Digital Signal Processing Credit Hours: 3.0**
- **BIOE 4458 - Instrumentation Electronics Credit Hours: 4.0**
- **BIOE Technical Elective Cr. 3.**<sup>13</sup>
- **HIST 1378 - The United States Since 1877 Credit Hours: 3.0**
- **Visual and Performing Arts Core Course Cr. 3.**

**Total 16**

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**Spring Semester**

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- **BIOE 4334 - Capstone Design Credit Hours: 3.0**
- **BIOE Technical Elective Cr. 3.**<sup>13</sup>
- **POLS 1337 - U.S. Government: Congress, President, and Courts Credit Hours: 3.0**
- **Social Science Core Course Cr. 3.**
- **Humanities Core Course Cr. 3.**

**Total 15**

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**Degree Total: 130**

## Biomedical Engineering, B.S.B.E.

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Biomedical Engineering majors are required to follow all requirements and regulations outlined in the Engineering General Degree Information section of the Undergraduate Catalog.

Biomedical engineering majors must earn a grade of C- or better in all engineering, mathematics, and science courses, including transfer courses.

The major grade point average is calculated using all BIOE courses as well as all Engineering Computing XXXX 1331 courses, **CHEE 2331** , **ECE 2100** , and **ECE 2300** , and **MECE 3400**.

### First Year

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#### Fall Semester

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- [BIOE 1100 - Introduction to Biomedical Engineering](#) **Credit Hours: 1.0**
- [BIOL 1161 - Introduction to Biological Science Laboratory](#) **Credit Hours: 1.0**
- [BIOL 1361 - Introduction to Biological Science](#) **Credit Hours: 3.0**
- [CHEM 1111 - Fundamentals of Chemistry Laboratory](#) **Credit Hours: 1.0**
- [CHEM 1331 - Fundamentals of Chemistry](#) **Credit Hours: 3.0**
- [MATH 1431 - Calculus I](#) **Credit Hours: 4.0**
- [ENGL 1303 - First Year Writing I](#) **Credit Hours: 3.0**

**Total 16**

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#### Spring Semester

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- [BIOL 1162 - Introduction to Biological Science Laboratory](#) **Credit Hours: 1.0**
- [BIOL 1362 - Introduction to Biological Science](#) **Credit Hours: 3.0**
- [CHEM 1112 - Fundamentals of Chemistry Laboratory](#) **Credit Hours: 1.0**

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- [CHEM 1332 - Fundamentals of Chemistry](#) Credit Hours: 3.0
- [BIOE 1331 – Computing for Biomedical Engineering](#) Credit Hours: 3.0
- [MATH 1432 - Calculus II](#) Credit Hours: 4.0
- [PHYS 1321 - University Physics I](#) Credit Hours: 3.0

**Total 18**

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## **Second Year**

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### **Fall Semester**

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- [CHEM 3221 - Fundamentals of Organic Chemistry Laboratory](#) Credit Hours: 2.0
- [CHEM 3331 - Fundamentals of Organic Chemistry](#) Credit Hours: 3.0
- [MATH 2433 - Calculus III](#) Credit Hours: 4.0
- [PHYS 1322 - University Physics II](#) Credit Hours: 3.0
- [ENGL 1304 - First Year Writing II](#) Credit Hours: 3.0
- Social Science Core Course Credit Hours: 3.0

**Total 18**

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### **Spring Semester**

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- [MECE 3400 - Introduction to Mechanics](#) Credit Hours: 4.0
- [CHEE 2331 - Chemical Processes](#) Credit Hours: 3.0
- [ECE 2100 - Circuit Analysis Laboratory](#) Credit Hours: 1.0
- [ECE 2300 - Circuit Analysis](#) Credit Hours: 3.0
- [MATH 3321 - Engineering Mathematics](#) Credit Hours: 3.0

**Total 14**

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**Students must choose one of the thrust areas:**

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Proposed Catalog Entry 2014 - 2015

- [Biomedical Imaging Option](#)
- [Bionanoscience Option](#)
- [Neural and Rehabilitation Engineering Option](#)

## Biomedical Imaging Option

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### Third Year

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#### Fall Semester

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- [BIOE 3340 - Quantitative Physiology](#) Credit Hours: 3.0
- [BIOE 3140 - Quantitative Physiology Laboratory](#) Credit Hours: 1.0
- [INDE 2333 - Engineering Statistics I](#) Credit Hours: 3.0
- ENGI 2304 - Technical Communications Credit Hours: 3.0
- [BCHS 3304 - General Biochemistry I](#) Credit Hours: 3.0
- HIST 1377 - The United States to 1877 Credit Hours: 3.0

Total 16

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#### Spring Semester

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- [BIOE 3341 - Biothermodynamics](#) Credit Hours: 3.0
- BIOE Technical Elective Credit Hours: 3.0
- BIOE Technical Elective Credit Hours: 3.0
- [HIST 1378 - The United States Since 1877](#) Credit Hours: 3.0
- [POLS 1336 - U.S. and Texas Constitutions and Politics](#) Credit Hours: 3.0

Total 15

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### Fourth Year

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#### Fall Semester

- BIOE 4315 – Introduction to Bioinstrumentation **Credit Hours: 3.0**
- BIOE 4115 – Introduction to Bioinstrumentation Laboratory **Credit Hours: 1.0**
- BIOE 4335 – Capstone Design I **Credit Hours: 3.0**
- BIOE Technical Elective **Cr. 3.** <sup>13</sup>
- BIOE Technical Elective **Cr. 3.** <sup>13</sup>
- [POLS 1337 - U.S. Government: Congress, President, and Courts](#) **Credit Hours: 3.0**

**Total 16**

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### **Spring Semester**

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- BIOE 4336 – Capstone Design II **Credit Hours: 3.0**
- BIOE Technical Elective **Cr. 3.** <sup>13</sup>
- BIOE Technical Elective **Cr. 3.** <sup>13</sup>
- BIOE Technical Elective **Cr. 3.** <sup>13</sup>
- Visual and Performing Arts Core Course **Credit Hours: 3.0**
- Humanities Core Course **Credit Hours: 3.0**

**Total 18**

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**Degree Total: 131**

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## **Bionanoscience Option**

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### **Third Year**

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#### **Fall Semester**

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- [BIOE 3340 - Quantitative Physiology](#) **Credit Hours: 3.0**
- [BIOE 3140 - Quantitative Physiology Laboratory](#) **Credit Hours: 1.0**

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- [INDE 2333 - Engineering Statistics I](#) **Credit Hours: 3.0**
- ENGI 2304 - Technical Communications **Credit Hours: 3.0**
- [BCHS 3304 - General Biochemistry I](#) **Credit Hours: 3.0**
- HIST 1377 - The United States to 1877 **Credit Hours: 3.0**

Total 16

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**Spring Semester**

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- [BIOE 3341 - Biothermodynamics](#) **Credit Hours: 3.0**
- BIOE Technical Elective **Credit Hours: 3.0**
- BIOE Technical Elective **Credit Hours: 3.0**
- [HIST 1378 - The United States Since 1877](#) **Credit Hours: 3.0**
- [POLS 1336 - U.S. and Texas Constitutions and Politics](#) **Credit Hours: 3.0**

Total 15

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**Fourth Year**

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**Fall Semester**

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- BIOE 4315 – Introduction to Bioinstrumentation **Credit Hours: 3.0**
- BIOE 4115 – Introduction to Bioinstrumentation Laboratory **Credit Hours: 1.0**
- BIOE 4335 – Capstone Design I **Credit Hours: 3.0**
- BIOE Technical Elective **Cr. 3.** <sup>13</sup>
- BIOE Technical Elective **Cr. 3.** <sup>13</sup>
- [POLS 1337 - U.S. Government: Congress, President, and Courts](#) **Credit Hours: 3.0**

Total 16

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**Spring Semester**

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- BIOE 4336 – Capstone Design II **Credit Hours: 3.0**

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- BIOE Technical Elective Cr. 3. [13](#)
- BIOE Technical Elective Cr. 3. [13](#)
- BIOE Technical Elective Cr. 3. [13](#)
- Visual and Performing Arts Core Course **Credit Hours: 3.0**
- Humanities Core Course **Credit Hours: 3.0**

Total 18

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**Degree Total: 131**

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## Neural and Rehabilitation Engineering Option

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### Third Year

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#### Fall Semester

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- [BIOE 3340 - Quantitative Physiology](#) **Credit Hours: 3.0**
- [BIOE 3140 - Quantitative Physiology Laboratory](#) **Credit Hours: 1.0**
- [INDE 2333 - Engineering Statistics I](#) **Credit Hours: 3.0**
- ENGI 2304 - Technical Communications **Credit Hours: 3.0**
- [BCHS 3304 - General Biochemistry I](#) **Credit Hours: 3.0**
- HIST 1377 - The United States to 1877 **Credit Hours: 3.0**

Total 16

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#### Spring Semester

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- [BIOE 3341 - Biothermodynamics](#) **Credit Hours: 3.0**
- BIOE Technical Elective **Credit Hours: 3.0**
- BIOE Technical Elective **Credit Hours: 3.0**
- [HIST 1378 - The United States Since 1877](#) **Credit Hours: 3.0**
- [POLS 1336 - U.S. and Texas Constitutions and Politics](#) **Credit Hours: 3.0**



Proposed Catalog Entry 2014 - 2015

**Total 15**

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## **Fourth Year**

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### **Fall Semester**

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- BIOE 4315 – Introduction to Bioinstrumentation **Credit Hours: 3.0**
- BIOE 4115 – Introduction to Bioinstrumentation Laboratory **Credit Hours: 1.0**
- BIOE 4335 – Capstone Design I **Credit Hours: 3.0**
- BIOE Technical Elective **Cr. 3.** <sup>13</sup>
- BIOE Technical Elective **Cr. 3.** <sup>13</sup>
- POLS 1337 - U.S. Government: Congress, President, and Courts **Credit Hours: 3.0**

**Total 16**

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### **Spring Semester**

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- BIOE 4336 – Capstone Design II **Credit Hours: 3.0**
- BIOE Technical Elective **Cr. 3.** <sup>13</sup>
- BIOE Technical Elective **Cr. 3.** <sup>13</sup>
- BIOE Technical Elective **Cr. 3.** <sup>13</sup>
- Visual and Performing Arts Core Course **Credit Hours: 3.0**
- Humanities Core Course **Credit Hours: 3.0**

**Total 18**

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**Degree Total: 131**