

# **Department of Electrical and Electronic Engineering**

## **Opto-electronic Information Science and Engineering**

### **I. Introduction**

Optoelectronic Information Science and Engineering is a comprehensive technology, which is composed of optics, optoelectronics, microelectronics and other technologies. It is a new cross-subject with strong practical application, and is widely used in the national economy and defense. The professional training includes the theoretical knowledge of optoelectronics, flat panel display, lighting, solar energy, optical design and optical communication technology. At the same time, English and computer application training are important. Graduated students will be engaged in the field of optoelectronic information, optical communication, photoelectric detection, optoelectronic devices, new display and lighting technology, new energy, and new technology research and development. They are also suitable for the research and development of optoelectronic devices and related high-tech disciplines, scientific research institutions, universities and institutions engaged in scientific research, development, teaching and management.

### **II. Objectives**

Optoelectronic Information Science and Engineering major aims to nourish students with solid photonics knowledge as well as practical skills and hands-on research experience. Students will be exposed to the state-of-the-art technologies of display, lighting, photovoltaic, laser, terahertz imaging technology, liquid crystal photonics, and fiber communications. Our graduates can either work in photonics related areas like display, lighting and semiconductor, laser spectral, terahertz imaging technology, liquid crystal photonics, or continue post-graduate education in photonics or related fields. They are capable of pursuing research, development, education, and management positions at a broad spectrum of enterprises, research institutes, and

universities.

### **III. Period of Study and Degree Requirement**

**Time length:** 4 years

**Degree conferred:** Bachelor of Engineering

**The minimum credit requirement for graduation:** 152.5 credits

### **IV. Discipline**

Optoelectronics and Laser Technology

### **V. Main Courses**

Major courses include Solid-State Electronics, Semiconductor Devices, Fundamental of Optoelectronic Technology, Fundamental of Optics, Principles of Lasers, Optical Design, Semiconductor Optics, Display and Lighting Technologies .etc.

### **VI. Practice - Based Courses**

Major practical training includes Optoelectronics Devices Fabrication Laboratory, Optoelectronic related Innovative Experiment, Industrial Practice, Advanced Electronic Science Experiment (Outstanding students after their junior year, can join research working with their professor), and all sorts of domestic and international academic competitions.

### **VII. Course Structure and Credit Requirements**

General Education (GE) Required Courses: 66.5 credits; (General Physics A)

General Education (GE) Elective Courses: 10 credits;

Major Foundational Courses: 31 credits;

Major Core Courses: 14 credits;

Major Elective Courses: 19 credits;

Undergraduate Thesis/Projects, Research Projects and Internship: 12 credits;

The minimum credit requirement for graduation: 152.5 credits.

## VIII. Course Arrangement

**Table 1: Major Required Course (Foundational and Core Courses)**

| Major<br>Required<br>Courses | Course Code | Course Name                              | Credit | Lab Credits | Hours<br>/week | Terms         | Advised term<br>to take the<br>course | Instruction<br>language | Prerequisite                           | Dept |
|------------------------------|-------------|--|--------|-------------|----------------|---------------|---------------------------------------|-------------------------|--|------|
| Foundational Courses         | ME102       | CAD Engineering Design                   | 3      | 1           | 4              | Fall/<br>Spr. | 1/S                                   | C                       | NA                                     | ME   |
|                              | EE104       | Fundamentals of Electric<br>Circuits     | 2      |             | 2              | Spr.          | 1/S                                   | C/E                     | MA101b<br>MA102b<br>MA103b             | EE   |
|                              | EE201       | Analog Circuit                           | 4      | 1           | 5              | Fall          | 2/F                                   | C                       | MA103b<br>PHY101a<br>PHY102a<br>EE104  |      |
|                              | EE203       | Solid-State Electronics                  | 3      |             | 3              | Fall          | 2/F                                   | C/E                     | MA101b<br>MA102b<br>PHY101a<br>PHY102a |      |
|                              | EE205       | Signals and Systems                      | 3      | 1           | 4              | Fall          | 2/F                                   | C/E                     | NA                                     |      |
|                              | EE202       | Digital Circuit                          | 4      | 1           | 5              | Spr           | 2/S                                   | C                       | PHY101a<br>PHY102a<br>EE203<br>EE201   |      |
|                              | EE204       | Introduction to<br>Semiconductor Devices | 3      | 1           | 4              | Spr.          | 2/S                                   | C/E                     | EE303                                  |      |
|                              | EE208       | Engineering<br>Electromagnetics          | 3      | 1           | 4              | Spr.          | 2/S                                   | C/E                     | MA101b<br>MA102b<br>MA103b<br>EE104    |      |
|                              | EE210       | Fundamentals of Optics                   | 3      |             | 3              | Spr.          | 2/S                                   | C/E                     | NA                                     |      |

|              |              |   |           |          |           |              |       |     |                         |    |
|--------------|--------------|---|-----------|----------|-----------|--------------|-------|-----|-------------------------|----|
|              | EE303        | Fundamental of Optoelectronic Technology                          | 3         | 1        | 4         | Fall         | 3/F   | C/E | NA                      |    |
|              | <b>Total</b> |   | <b>31</b> | <b>7</b> | <b>38</b> |              |       |     |                         |    |
| Core Courses | EE301        | Frontier Seminars in Modern Electronic Science and Technology I   | 1         |          | 1         | Fall         | 3/F   | C/E | NA                      | EE |
|              | EE309        | Introduction to Semiconductor Optics                              | 3         |          | 3         | Fall         | 3/F   | C/E | EE203                   |    |
|              | EE311        | Optical Design  | 3         | 1        | 4         | Fall         | 3/F   | C/E | PHY307                  |    |
|              | EE302        | Frontier Seminars in Modern Electronic Science and Technology II  | 1         |          | 1         | Spr.         | 3/S   | C/E | NA                      |    |
|              | EE310        | Principles and Technologies of Lasers                             | 3         |          | 3         | Spr.         | 3/S   | C/E | NA                      |    |
|              | EE401        | Frontier Seminars in Modern Electronic Science and Technology III | 1         |          | 1         | Fall         | 4/F   | C/E | NA                      |    |
|              | EE403        | Introduction to Display and Lighting Technologies                 | 2         |          | 2         | Fall         | 4/F   | C/E | EE311<br>EE203<br>EE204 |    |
|              | <b>Total</b> |   | <b>14</b> | <b>1</b> | <b>15</b> |              |       |     |                         |    |
| EE470        |              | Internship  | 2         | 2        | 16        | Sur.         | 3/Sum | NA  | NA                      | EE |
| EE480        |              | Research Projects   | 2         | 2        |           |              |       | NA  | NA                      |    |
| EE490        |              | Undergraduate Thesis/Projects                                     | 8         | 8        | 8         | Fall<br>Spr. | 4/F&S | NA  | NA                      |    |

|   |           |           |           |  |  |  |  |  |
|---|-----------|-----------|-----------|--|--|--|--|--|
| <b>Total</b>  | <b>12</b> | <b>12</b> | <b>24</b> |  |  |  |  |  |
| <p>*Note: Internship will last approximately 4 to 6 weeks, 14 to 16 hours per week.</p> <p>**Note: Students can choose whatever term they like to select Research Projects course, so it is not listed on advised term to take the course. Minimum learning hours of this course are 48 to 64 hours in total.</p> |           |           |           |  |  |  |  |  |

**Table 2: Major Elective Courses**

| Course Code | Course Name                                     | Credit | Lab Credits | Hours /week | Terms        | Advised term to take the course | Instruction language | Prerequisite                              | Dept |
|-------------|---|--------|-------------|-------------|--------------|---------------------------------|----------------------|---|------|
| EE106       | Introduction to Optoelectronic                  | 2      |             | 2           | Spr.         | 1/S                             | C                    | NA  |      |
| EE317       | Advanced Electronic Science Experiment I*       | 1      | 1           | 2           | Fall         | 3/F                             | NA                   | NA  |      |
| EE305       | Introduction to VLSI Technology                 | 3      | 1           | 4           | Fall         | 3/F                             | C/E                  | EE202                                     |      |
| EE318       | Advanced Electronic Science Experiment II       | 1      | 1           | 2           | Spr.         | 3/S                             | NA                   | NA  |      |
| CS301       | Embedded system and microcomputer principle     | 3      | 1           | 4           | Fall         | 3/F                             | C/E                  | NA  | CS   |
| EE308       | Fiber Communication Principles and Techniques   | 3      | 1           | 4           | Spr.         | 3/S                             | C/E                  | MA101b<br>MA102B<br>EE202<br>EE204        |      |
| EE320       | Integrated Circuit Fabrication Laboratory       | 3      | 1.5         | 4.5         | Spr.<br>Fall | 3/S&F                           | C                    | EE203                                     |      |
| BIO214      | Biomedical Instrumentation and Experiment       | 3      | 1           | 4           | Spr.         | 2/S                             | C                    | NA  | BIO  |
| EE321       | Spectral Technology and Application             | 3      |             | 3           | Fall         | 3/F                             | C/E                  | NA  |      |
| EE322       | Optoelectronics Devices Fabrication Laboratory  | 2      | 1           | 3           | Spr.         | 3/S                             | C/E                  | EE203<br>EE204<br>EE303<br>EE308<br>EE310 |      |
| EE324       | Laser Microfabrication                          | 3      |             | 3           | Spr.         | 3/S                             | C/E                  | NA  |      |
| EE407       | Energy Harvesting Technologies                  | 3      |             | 3           | Fall         | 4/F                             | C/E                  | NA  |      |
| MSE320      | Introduction to photovoltaic thermal technology | 3      |             | 3           | Spr.         | 3/S                             | C/E                  | PHY101<br>PHY102<br>EE201<br>PHY312       | MSE  |
| EE405       | Advanced Electronic                             | 1      | 1           | 2           | Fall         | 4/F                             | NA                   | NA  |      |

|        |   |     |     |   |      |     |     |                                    |    |
|--------|---|-----|-----|---|------|-----|-----|------------------------------------|----|
|        | Science Experiment<br>III                               |     |     |   |      |     |     |                                    |    |
| EE409  | Ultrafast Photonics                                     | 3   | 1   | 4 | Fall | 4/F | C/E | NA                                 |    |
| EE402  | Frontier Seminars in<br>Modern Electronic<br>Science IV | 1   |     | 1 | Spr. | 4/S | C/E | NA                                 |    |
| EE419  | Biosensor   | 3   | 1   | 4 | Fall | 4/F | E   | NA                                 |    |
| EE304  | Integrated Circuit<br>Design                            | 3   | 2   | 5 | Spr. | 3/S | C/E | MA101b<br>MA102b<br>EE202<br>EE204 |    |
| EE206  | Communication<br>Principles                             | 3   | 1   | 4 | Spr. | 2/S | C/E | EE205                              |    |
| EE306  | Introduction to MEMS                                    | 3   | 1   | 4 | Spr. | 3/S | E   | PHY101<br>a<br>PHY102<br>a         |    |
| EE307  | Antennas and Radio<br>Propagation                       | 3   | 1   | 4 | Fall | 3/F | C/E | EE104<br>EE201<br>EE208            |    |
| EE313  | Wireless<br>Communications                              | 3   | 1   | 4 | Fall | 3/F | C/E | EE206                              |    |
| EE314  | Communications<br>System Design I                       | 2   | 2   | 4 | Spr. | 3/S | C/E | EE313                              |    |
| EE316  | Microwave<br>Engineering                                | 3   | 1   | 4 | Spr. | 3/S | E   | EE104<br>EE201<br>EE208            |    |
| EE323  | Digital Signal<br>Processing                            | 3   | 1   | 4 | Fall | 3/F | E   | EE205                              |    |
| EE326  | Digital Image<br>Processing                             | 3   | 1   | 4 | Spr. | 3/S | E   | EE323                              |    |
| EE328  | Speech Signal<br>Processing                             | 3   | 1   | 4 | Spr. | 3/S | E   | EE323                              |    |
| EE330  | DSP Design and<br>Simulation                            | 1.5 | 1.5 | 3 | Spr. | 3/S | C/E | EE323                              |    |
| EE332  | Digital System Design                                   | 3   | 1   | 4 | Spr. | 3/S | E   | EE323                              |    |
| MA201b | Ordinary Differential<br>Equations B                    | 4   |     | 4 | Fall | 2/F | C/E | MA101<br>MA102<br>MA103            | MA |



|        |  |     |     |   |      |       |     |                                     |  |
|--------|--|-----|-----|---|------|-------|-----|-------------------------------------|--|
| EE325  | Nonlinear Optimization Techniques for Electrical Engineering | 3   | 1   | 4 | Fall | 3/F   | C/E | MA101b                              |  |
| EE411  | Information Theory and Coding                                | 2   |     | 2 | Fall | 4/F   | C/E | MA101b<br>MA102b<br>MA103b<br>MA212 |  |
| EE417  | Communications System Design II                              | 2   | 2   | 4 | Fall | 4/F   | E   | EE316<br>EE307<br>EE206             |  |
| EE423  | Pattern Recognition  | 2   |     | 2 | Fall | 4/F   | C/E | EE323<br>EE326                      |  |
| EE427  | Principles of Remote Sensing                                 | 2   |     | 2 | Fall | 4/F   | C/E | EE323<br>EE326                      |  |
| EE327  | Fundamentals of Information Optics                           | 3   | 1   | 4 | Fall | 3/F   | C/E | EE205                               |  |
| EE329  | Liquid crystal optoelectronics                               | 2   | 1   | 3 | Fall | 3/F   | C   | EE210                               |  |
| EE331  | Fundamentals of the 3rd generation Semiconductors            | 2   |     | 2 | Fall | 3/F   | C/E | EE203or<br>EE204                    |  |
| EES101 | Brief Introduction of Creative Electronic Design I           | 1   | 0.5 | 6 | Sum  | 3/Sum | C   | PHY101<br>a<br>PHY102<br>a          |  |
| EES102 | DIY Project: Assembling an iphone6                           | 2   | 2   | 8 | Sum  | 3/Sum | C   | NA                                  |  |
| EES201 | Brief Introduction of Creative Electronic Design II          | 0.5 | 0.5 | 4 | Sum  | 6/Sum | C   | NA                                  |  |
| EES202 | Design Based on LabVIEW Programming                          | 1   | 1   | 8 | Sum  | 6/Sum | C   | NA                                  |  |
| EES203 | Innovation and Entrepreneurship                              | 0.5 | 0.5 | 4 | Sum  | 6/Sum | C   | NA                                  |  |
| EES204 | Fiber Sense Design   | 1   | 1   | 8 | Sum  | 6/Sum | C   | NA                                  |  |
| EES205 | Advanced Technology Forecasting                              | 1.5 |     | 6 | Sum  | 6/Sum | E   | NA                                  |  |
| EES301 | Statistical Machine Learning                                 | 2   |     | 8 | Sum  | 9/Sum | E   | MA103b                              |  |

|  |   |            |             |              |     |       |   |    |  |
|--|---|------------|-------------|--------------|-----|-------|---|----|--|
| EES302   | 2D Materials:<br>Properties and Devices | 2          |             | 8            | Sum | 9/Sum | E | NA |  |
| <b>Total</b>   |   | <b>108</b> | <b>36.5</b> | <b>187.5</b> |     |       |   |    |  |
| <p>*Note: To meet the graduate criteria, one must select at least 19 credits course from above.</p> <p>**Note: Advanced Electronic Science Experiment can be selected by outstanding senior students. This course will allow those students accomplish researching work with their professors.</p> |   |            |             |              |     |       |   |    |  |

**Table 3: Overview of Practice-Based Courses**

| Course Code | Course Name                                   | Credits | Lab Credits | Hours /week | Terms         | Advised term to take the course | Instruction language | Prerequisite                          | Dept. |
|-------------|---|---------|-------------|-------------|---------------|---------------------------------|----------------------|---------------------------------------|-------|
| ME102       | CAD and Engineering Design                    | 3       | 1           | 4           | Fall/<br>Spr. | 1/S                             | C                    | NA                                    | ME    |
| EE201       | Analog Circuit                                | 4       | 1           | 5           | Fall          | 2/F                             | C                    | MA103b<br>PHY101a<br>PHY102a<br>EE104 |       |
| EE205       | Signals and Systems                           | 3       | 1           | 4           | Fall          | 2/F                             | C/E                  | NA                                    |       |
| EE202       | Digital Circuit                               | 4       | 1           | 5           | Spr.          | 2/S                             | C                    | PHY101a<br>PHY102a<br>EE203<br>EE201  |       |
| EE204       | Introduction to Semiconductor Devices         | 3       | 1           | 4           | Spr.          | 2/S                             | C/E                  | EE303                                 |       |
| EE208       | Engineering Electromagnetics                  | 3       | 1           | 4           | Spr.          | 2/S                             | C/E                  | MA101b<br>MA102b<br>MA103b<br>EE104   |       |
| EE303       | Fundamental of Optoelectronic Technology      | 3       | 1           | 4           | Fall          | 3/F                             | C/E                  | NA                                    |       |
| EE311       | Optical Design                                | 3       | 1           | 4           | Fall          | 3/F                             | C/E                  | PHY307                                |       |
| EE470       | Industrial Practice                           | 2       | 2           | 16          | Sur.          | 3/Sum                           | NA                   | NA                                    |       |
| EE480       | Projects of Science and Technology Innovation | 2       | 2           |             |               |                                 | NA                   | NA                                    |       |
| EE490       | Thesis(Graduation Project)                    | 8       | 8           | 8           | Fall<br>Spr.  | 4/F&S                           | NA                   | NA                                    |       |
| EE317       | Advanced Electronic Science Experiment I*     | 1       | 1           | 2           | Fall          | 3/F                             | NA                   | NA                                    |       |
| EE305       | Introduction to VLSI Technology               | 3       | 1           | 4           | Fall          | 3/F                             | C/E                  | EE202                                 |       |
| EE318       | Advanced Electronic Science Experiment II     | 1       | 1           | 2           | Spr.          | 3/S                             | NA                   | NA                                    |       |
| CS301       | Embedded system and microcomputer principle   | 3       | 1           | 4           | Fall          | 3/F                             | C/E                  | NA                                    | CS    |
| EE308       | Fiber Communication Principles and Techniques | 3       | 1           | 4           | Spr.          | 3/S                             | C/E                  | MA101b<br>MA102b                      |       |

|        |  |     |     |     |              |       |     |   |     |
|--------|--|-----|-----|-----|--------------|-------|-----|---|-----|
|        |  |     |     |     |              |       |     | EE202<br>EE204                            |     |
| EE320  | Integrated Circuit Fabrication Laboratory                    | 3   | 1.5 | 4.5 | Fall<br>Spr. | 3/F/S | C   | EE203                                     |     |
| BIO214 | Biomedical Instrumentation and Experiment                    | 3   | 1   | 4   | Spr.         | 2/S   | C   | NA  | BIO |
| EE322  | Optoelectronics Devices Fabrication Laboratory               | 2   | 1   | 3   | Spr.         | 3/S   | C/E | EE203<br>EE204<br>EE303<br>EE308<br>EE310 |     |
| EE405  | Advanced Electronic Science Experiment III                   | 1   | 1   | 2   | Fall         | 4/F   | NA  | NA  |     |
| EE409  | Ultrafast Photonics  | 3   | 1   | 4   | Fall         | 4/F   | C/E | NA  |     |
| EE419  | Biosensor  | 3   | 1   | 4   | Fall         | 4/F   | E   | NA  |     |
| EE304  | Integrated Circuit Design                                    | 3   | 2   | 5   | Spr.         | 3/S   | C/E | MA101b<br>MA102b<br>EE202<br>EE204        |     |
| EE206  | Communication Principles                                     | 3   | 1   | 4   | Spr.         | 2/S   | C/E | EE205                                     |     |
| EE306  | Introduction to MEMS   | 3   | 1   | 4   | Spr.         | 3/S   | E   | PHY101a<br>PHY102a                        |     |
| EE307  | Antennas and Radio Propagation                               | 3   | 1   | 4   | Fall         | 3/F   | C/E | EE104<br>EE201<br>EE208                   |     |
| EE313  | Wireless Communications                                      | 3   | 1   | 4   | Fall         | 3/F   | C/E | EE206                                     |     |
| EE314  | Communications System Design I                               | 2   | 2   | 4   | Spr.         | 3/S   | C/E | EE313                                     |     |
| EE316  | Microwave Engineering  | 3   | 1   | 4   | Spr.         | 3/S   | E   | EE104<br>EE201<br>EE208                   |     |
| EE323  | Digital Signal Processing                                    | 3   | 1   | 4   | Fall         | 3/F   | E   | EE205                                     |     |
| EE326  | Digital Image Processing                                     | 3   | 1   | 4   | Spr.         | 3/S   | E   | EE323                                     |     |
| EE328  | Speech Signal Processing                                     | 3   | 1   | 4   | Spr.         | 3/S   | E   | EE323                                     |     |
| EE330  | DSP Design and Simulation                                    | 1.5 | 1.5 | 3   | Spr.         | 3/S   | C/E | EE323                                     |     |
| EE332  | Digital System Design  | 3   | 1   | 4   | Spr.         | 3/S   | E   | EE323                                     |     |
| EE325  | Nonlinear Optimization Techniques for Electrical Engineering | 3   | 1   | 4   | Fall         | 3/F   | C/E | MA101b                                    |     |
| EE417  | Communications System Design II                              | 2   | 2   | 4   | Fall         | 4/F   | E   | EE316<br>EE307                            |     |

|              |   |              |             |              |      |        |     |                    |  |
|--------------|---|--------------|-------------|--------------|------|--------|-----|--------------------|--|
|              |   |              |             |              |      |        |     | EE206              |  |
| EE327        | Fundamentals of Information Optics                  | 3            | 1           | 4            | Fall | 3/F    | C/E | EE205              |  |
| EE329        | Liquid crystal optoelectronics                      | 2            | 1           | 3            | Fall | 3/F    | C   | EE210              |  |
| EES101       | Brief Introduction of Creative Electronic Design I  | 1            | 0.5         | 6            | Sum  | 3/Sum  | C   | PHY101a<br>PHY102a |  |
| EES102       | DIY Project: Assembling an iphone6                  | 2            | 2           | 8            | Sum  | 3/ Sum | C   | NA                 |  |
| EES201       | Brief Introduction of Creative Electronic Design II | 0.5          | 0.5         | 4            | Sum  | 6/ Sum | C   | NA                 |  |
| EES202       | Design Based on LabVIEW Programming                 | 1            | 1           | 8            | Sum  | 6/ Sum | C   | NA                 |  |
| EES203       | Innovation and Entrepreneurship                     | 0.5          | 0.5         | 4            | Sum  | 6/ Sum | C   | NA                 |  |
| EES204       | Fiber Sense Design                                  | 1            | 1           | 8            | Sum  | 6/ Sum | C   | NA                 |  |
| <b>Total</b> |   | <b>113.5</b> | <b>56.5</b> | <b>196.5</b> |      |        |     |                    |  |

**Table 4: Overview of Course Hours and Credits**

| <b>Course Category</b>   | <b>Total Course Hours</b> | <b>Total Credits</b> | <b>The Minimum Credit Requirement</b> |
|--|---------------------------|----------------------|---------------------------------------|
| General Education (GE) Required Courses                          | 1168                      | 66.5                 | 66.5                                  |
| General Education (GE) Elective Courses                          | 3144                      | 182.5                | 10                                    |
| Major Foundational Courses                                       | 608                       | 31                   | 31                                    |
| Major Core Courses   | 240                       | 14                   | 14                                    |
| Major Elective Courses   | 2896                      | 108                  | 19                                    |
| Internship, Research Projects, and Undergraduate Thesis/Projects | Estimated 380             | 12                   | 12                                    |
| <b>Total</b>   | 8436                      | 414                  | 152.5                                 |