

## **ELECTRICAL ENGINEERING MINOR (23 – 24 CREDITS)**

### **A. Mission**

The minor in Electrical Engineering is designed to allow students with quantitative and scientific aptitudes and interests to **acquire a basic level of competence in in areas such as electronics, instrumentation, control, signal processing, or digital devices**. It can bring significant career benefits to majors in science, business or math. Students who are already enrolled in an ECE major may not enroll in this program.

### **B. Learning Outcomes & Assessment**

1. Upon completion of this program students should be able to:
  1. Identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics
  2. Function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives
  3. Develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions
  
2. Assessment of this program will follow our bi-yearly assessment, evaluation and continuous improvement cycle that is done for the ECE major. It will be first assessed in Fall 2023.

### **C. Curriculum Outline**

## **ELECTRICAL ENGINEERING MINOR (23-24 CREDITS)**

### **A. Core Classes (12 credits)**

Select one course from the following:

- ECE 211 – Electric Circuits Credit: 4
- PHY 362 - Electrical Circuits and Machines Credit: 4

Select one course from the following:

- ECE 314 – Microelectronic Circuits Credit: 4
- PHY 321 - Electronics Credit: 3  
with  
PHY 321 LAB - Electronics Laboratory Credit: 1

Select one course from the following:

- CSC 222 - Computer Organization and Programming Credit: 4
- ECE 233 – Signals and Systems Credit: 4
- ECE 271- Digital Systems Credit: 4

### **B. Cognate Classes (8 credits)**

- MAT210 – Calculus I Credit: 4
- MAT220 – Calculus II Credit: 4

**C. Electives – Choose 3 - 4 credits from the following:**

- CSC 222 - Computer Organization and Programming Credit: 4
- ECE 233 – Signals and Systems Credit: 4
- ECE 270 - C/C++ Programming Language Credit: 4
- ECE 271- Digital Systems Credit: 4
- ECE 321 - Power Circuits and Systems Credit: 4
- ECE 335 - Digital Signal Processing Credit: 4
- ECE 344 – Electromagnetics Credit: 3
- ECE 375 - Microprocessor Applications Credit: 4
- ECE 388 - Humanoid Robotics Credit: 3
- ECE 416 - Advanced Electronics Credit: 4
- ECE 421 - Power Electronics Credit: 4
- ECE 433 – Introduction to Digital Imaging Credit: 3
- ECE 454 - Communications Systems Credit: 4
- ECE 455 - Wireless Communications Credit: 4
- ECE 464 – Mechatronics Credit: 4
- ECE 465 – Introduction to Robotics Credit: 4
- ECE 470 – Machine Learning Credit: 4
- ECE 472 - Advanced Digital Systems Credit: 4
- ECE 475 - Computer Architecture Credit: 4
- ECE 499 - Independent Study Credit: 3
- PHY 439 - Advanced Electromagnetic Theory Credit: 3

Note: Some courses may have pre-requisites.

Note: Only one of ECE 271 or CSC 222 can be attributed to the minor.

**D. Enrollment**

- What is the projected enrollment when the program begins?  
4 students in the first year of the minor
- What is the projected enrollment after five years?  
12 students
- How were these projections determined:  
We receive between 4 requests from students of Business, Math and Physics every year for an Electrical Engineering minor. We approximate that it will take 3 years to complete the minor resulting in 12 students enrolled in the minor at any one time after the minor is mature. This reflects 4 students taking courses at each level at any given time.

## **E. Faculty**

**Director of Electrical Engineering Minor –**

### **Adrian Ieta A. Core Requirements**

- MAT210 – Calculus I and MAT220 – Calculus II - **Math Faculty (please see attached support letter)**
- ECE211 – Electric Circuits - **Mustafa Ayad, Mario Bkassiny, Ildar Sabarinov, Hui Zhang, Adrian Ieta, Marianne Hromalik, Sungeun Kim (every semester rotated as part of normal workload)**
- PHY 362 - Electrical Circuits and Machines – **Physics Faculty (please see attached support letter)**
- ECE271/CSC222 – Digital Systems/ Computer Organization and Programming - **Mustafa Ayad, Mario Bkassiny, Ildar Sabarinov, Marianne Hromalik, Sungeun Kim (every semester rotated as part of normal workload)**
- ECE 233 – Signals and Systems **Mario Bkassiny, Ildar Sabarinov, Sungeun Kim (every semester rotated as part of normal workload)**
- ECE 314 – Microelectronics – **Ildar Sabarinov, Hui Zhang, Adrian Ieta, Marianne Hromalik, Sungeun Kim (every semester rotated as part of normal workload)**

### **B. Elective Requirements**

- ECE 321 - Power Circuits and Systems **Hui Zhang (every semester rotated as part of normal workload)**
- ECE 344 – Electromagnetics **Ildar Sabarinov, Sungeun Kim (every semester rotated as part of normal workload)**
- ECE 365 - Control Systems **Mustafa Ayad, Ildar Sabarinov, Hui Zhang (every semester rotated as part of normal workload)**
- ECE 375 - Microprocessor Applications **Mustafa Ayad, new faculty hire for 2022 (every semester rotated as part of normal workload)**
- ECE 454 - Communications Systems **Mario Bkassiny (every semester rotated as part of normal workload)**
- ECE 475 - Computer Architecture **Marianne Hromalik (every semester rotated as part of normal workload)**
- PHY 439 - Advanced Electromagnetic Theory – **Physics Faculty (please see attached support letter)**

All other courses on the Electives list for the EE minor run as ECE electives. We typically (when fully staffed) run 2 -3 electives each semester meaning that each elective runs once every 3 or 4 semesters. They are rotated among the faculty according to their field of expertise.

### **F. Advisement**

All minor students will be assigned an academic advisor in the ECE department. These students will be shared across all our faculty as is the norm in our ECE major.

**G. Resources**

Expenditures		Start-up	When the program begins	After five years
Personnel	<i>Reallocation</i>	\$0	\$0	\$0
	<i>New funds</i>	\$0	\$0	\$0
Library	<i>Reallocation</i>	\$0	\$0	\$0
	<i>New funds</i>	\$0	\$0	\$0
Equipment	<i>Reallocation</i>	\$0	\$0	\$0
	<i>New funds</i>	\$0	\$0	\$0
Laboratories	<i>Reallocation</i>	\$0	\$0	\$0
	<i>New funds</i>	\$0	\$0	\$0
Supplies & Expenses (OTPS)	<i>Reallocation</i>	\$200 <sup>1</sup>	\$200 <sup>1</sup>	\$200 <sup>1</sup>
	<i>New funds</i>	\$0	\$0	\$0
Capital Expenditures	<i>Reallocation</i>	\$0	\$0	\$0
	<i>New funds</i>	\$0	\$0	\$0
Other	<i>Reallocation</i>	\$0	\$0	\$0
	<i>New funds</i>	\$0	\$0	\$0
Grand Total		\$200	\$200	\$200

<sup>1</sup>Extra OTPS expenses are for extra components, tools and consumables in labs for the duration of the program.