

# Antenna Engineering

*Specialized Certificate*

## About the Antenna Engineering Program

Due to the increasing demand for wireless communication and the need for more efficient and effective ways to transmit and receive signals, antenna engineering is reaching an all-time high. As more devices and technologies rely on wireless communication, such as smartphones, tablets, internet of things (IoT) devices, and 5G networks, the need for better antennas to support these systems continues to grow. Additionally, advancements in antenna technology are also needed for other applications such as satellite communication, radar systems, and GPS navigation.

This certificate will provide you with the specialized knowledge and skills in the design, analysis, and optimization of antennas. It introduces the methods of testing and measuring the antennas, and applications of antennas in various systems. The certificate starts with the basic knowledge of antenna design and then extends to modern technologies in the design and fabrication of antennas.

## Learning Outcomes

In this program students will:

- Acquire an understanding of antenna concepts and their advanced industry applications such as 5G communications, MIMO antennas, biomedical sensors, biomedical microwave imaging, reconfigurable antennas, and implanted wireless power transfer
- Apply concepts to the design and simulation of practical antennas varying characteristic elements to optimize their system performance
- Gain hands-on experience with tools used in the industry to verify antenna performance
- Learn practical techniques for planar antenna and array design, simulation and beamforming
- Learn practical consideration such as material selection, fabrication and measurements
- Learn to set up a full analysis of antennas and microwave circuits in simulation software such as ANSYS HFSS, CST Microwave Studio, MATLAB, and FEKO
- Learn practical techniques for estimating emissions and susceptibility
- Learn about attenuation and frequency response of typical coupling and propagation paths
- Learn how the electromagnetic fields interact with the human body and human body electromagnetic radiation exposure regulations
- Learn about electromagnetic compatibility testing and standards
- Learn how to optimize antenna characteristics to overcome the human body effect

## Program Audience

This certificate is intended for individuals who would like to pursue career in the antenna industry, retrain them for new antenna technologies, or just refresh their antenna knowledge.

Strong skills obtained after completing the certificate can support career development as a:

- Antenna Design Engineer
- Radio Frequency/Microwave Engineer
- Radio Frequency Antenna Engineer

## Program Overview

Antenna engineering is the branch of electrical engineering that deals with the design, analysis, and implementation of antennas. An antenna is a transducer that converts electric or magnetic signals to electromagnetic waves, usually used at the radio frequency (RF) bands. Antennas are therefore critical parts of all wireless systems. They are used in a variety of applications such as wireless communication, radar, satellite navigation, biomedical imaging, diagnosis, sensing, and treatment. Antenna engineering is an important field of engineering because provides skills and knowledge for engineers to develop high-performance, efficient, and cost-effective antennas, and therefore, improve or develop new technologies for wireless communications, and biomedical imaging and treatment.

## Program Details

### Prerequisites

Students should have a general knowledge of electrical engineering, circuits, signals, and systems. We recommend a bachelor's degree in electrical engineering or similar fields, or a combination of a post-secondary degree and related job experience.

## Course Matrix

Course Title	Course ID	Units	Course Offered			
			Fall	Winter	Spring	Summer
<b>Required Courses must be taken in order</b>						
Antennas Theory and Design	EE-41337	3.0	Online		Online	
Advanced Antennas Design, Modeling and Simulation	EE-40183	3.0		Online		Online
Introduction Electromagnetic Compatibility (EMC) and Interference (EMI)	EE-40194	3.0	Online		Online	
<b>Elective Courses – choose one course</b>						
Antennas for Biomedicine and Personal Communication	EE-40195	3.0		Online		Online
RF Circuit Design	EE-40003	3.0			Online	
RF System Design for Wireless Communications	EE-40098	3.0		Online		Online

## Length

There are 12 total units required for this certificate. The entire certificate program can be completed in one year. The recommended pace of pursuit is one course per quarter. Students have up to five years to complete all requirements for the certificate.

## Cost

The total cost of the program is \$3,245.00, which includes the \$95.00 certificate fee. Please note that all fees are subject to change and do not include textbooks.

## Frequently Asked Questions

### About the Certificate

How do I apply to the certificate Program?

STEP 1: If you have a My Extension account, skip to Step 2. If you do not have a My Extension account, go to [myextension.ucsd.edu](http://myextension.ucsd.edu), click "Create an account" on the right side of the page, and follow the instructions to create an account. Once you have a My Extension account, continue to Step 2.

STEP 2: Click on the "Apply Now" button on the certificate page. Complete the required fields on the application. Then click Save Your Work button. Once you have saved the application, the "Submit" button will appear. Click the "Submit" button to submit your application for review and consideration. Once submitted, your application cannot be changed. You can track the progress of your application at [My Extension](#).

Is there an application fee for the certificate program?

Current application or certificate fees, if any, are listed under the "Apply Now" button on the [certificate page](#) on our website.

Is this program in-class or online?

The courses in this program are offered in online format only. For online classes, all assignments and test/quizzes are completed online and submitted through Canvas, our online learning management system.

Can the prerequisite be waived if I have taken a programming course elsewhere or have equivalent working knowledge?

There is no hard prerequisite for this program. However, it is highly recommended for students to have a general knowledge of electrical engineering, circuits, signals, and systems. Please email [unexenr@ucsd.edu](mailto:unexenr@ucsd.edu) if you would like to see the syllabus of the prerequisite course.

Is financial aid available?

- UC San Diego Division of Extended Studies offers continuing education loans through UC Approved Lenders. Each institution offers low competitive interest rates and flexible payment options. You are also encouraged to contact your personal financial institution about possible lending solutions. Direct links to UC Approved Lenders can be found on our website's [Financial Resources](#) page. The Employment Development Department (EDD) provides a comprehensive range of employment and training services in partnership with state and local agencies/organizations. More information is available on their website at [edd.ca.gov](http://edd.ca.gov).
- Career Centers Located throughout San Diego County offer their communities comprehensive employment and training services benefiting both business and job seekers. More information is available on their website at [workforce.org](http://workforce.org).
- Please click [here](#) for information about Veteran's Benefits.
- Free Application for Federal Student Aid (FAFSA) funds are limited to degree programs only and cannot be used for courses or certificate fees at UC San Diego Division of Extended Studies.

## Is this certificate program open to non-California residents?

Yes, the program is open to non-California residents, including non-US residents. The tuition is the same for all students. If you have questions about how enrolling in courses may or may not affect your visa status, please contact our International Department at [ipinfo@ucsd.edu](mailto:ipinfo@ucsd.edu) or (858) 534-6784.

## If I work full-time, will I still be able to complete this program?

Yes. Our programs are designed to be working-student friendly and most of our students are working professionals. The courses are typically three units, which amounts to approximately 27-30 hours of class time.

## Will I get any hands-on experience in the program?

Most courses combine theory with hands-on exercises.

## Is the program accredited?

UC San Diego is accredited by the Western Association of Schools and Colleges (WASC). UC San Diego Division of Extended Studies – like all other UC San Diego schools, colleges, and departments – is accredited by WASC through the University. All courses and certificate programs offered by UC San Diego Division of Extended Studies have been developed and are administered in accordance with Division of Extended Studies policy and the regulations of the Academic Senate of the University of California.

## Will this program prepare me for a certification exam?

This program is not aligned with any one certification exam. Our programs are designed to provide students with knowledge that will make them valuable in the workforce.

## Do you provide job or internship placement?

No, we do not currently offer job placement assistance, internships, or career services assistance.

## About the Courses

### When does course enrollment open for each quarter?

Our classes post to our website and become open for enrollment approximately two months prior to the new quarter starting. If you would like to receive an email reminder, you can sign up for our newsletter(s) in [My Extension](#), under the "Preferences" tab.

### When should I enroll in a course?

We recommend enrolling as soon as possible, as occasionally classes will reach capacity.

### Once I have enrolled in a course, when will I get online access to it?

If you have enrolled at least three days before the course begins, you will have access starting on the first day of class. You should receive an email from Student Services with instructions for how to login to the course. If you have enrolled on or after the start date of the course, you will have access to the course within one business day.

### How are the online courses formatted?

Online courses are asynchronous with prerecorded lectures, corresponding PowerPoints, and subsequent materials as provided by the instructor. They have a start and end date, but all the lessons are uploaded to our Learning Management System, so that you can learn at your own pace. However, please be aware that you may have weekly assignments, quizzes and/or tests that are due on specific dates. To access your online course, first login to your [My Extension](#) account, next select "My Courses" from the menu. From your list of courses, select the course you would like to access, and click the link that appears in the "Location" section. You will then be redirected to the Learning Management System (LMS) where your course is located.

We are currently using Canvas as our (LMS) for all our online courses. While students do not get access to their respective courses until the first day of the course, we encourage students who are new to Canvas to click on the following link to Canvas and: [Take the free tour of Canvas](#).

### For online courses, will I ever need to attend in person?

The online courses in this program are offered entirely online. All course requirements, including lectures, tests, quizzes, and assignments will be completed online. You will not be required to attend in person.

### What if I am having trouble with my Learning Management System or My Extension?

Please contact Student Services at (858) 534-3400 or [unex-reg@ucsd.edu](mailto:unex-reg@ucsd.edu) if you experience any issues logging in to any of our systems.

### When does enrollment for a course close?

Enrollment in a course may be closed for one or more of the following reasons:

- The course is at capacity. If the course is at capacity you will only be able to join the waitlist. If space becomes available in the course, students on the waitlist are contacted in the order they joined the waitlist.
- The course has progressed to a point where students will no longer be able to make-up missed work and be successful in the course.
- The course is cancelled due to low enrollments.

For all three of these reasons we recommend students enroll early in their courses of interest.

### When is the refund deadline for courses?

The refund deadline for courses in this program is typically one week after the start of the course. This allows you to enroll in a course and participate in the course for approximately one week to determine if the course is a good fit. Then, if needed, you may either transfer your enrollment to a different course or submit a drop request. The exact refund deadline for each section is listed in the section notes.

### What are the grading options for courses?

You can take courses for one of three options: Letter Grade, Pass/No Pass, or Not for Credit. If you are taking a course towards a certificate, you *must* complete your courses for credit (i.e., Pass/No Pass or Letter Grade) and receive a C-/Pass or higher grade. Grades below a C-, No Pass, and Not for Credit will *not* count towards certificate requirements.

### How will I receive my final grade?

Once the course is completed, the instructor has 10 working days to submit your grades. After the grades have been posted, you can view and print them via [My Extension](#), your online education management portal. Please contact Student Services at 858-534-3400 or [unex-reg@ucsd.edu](mailto:unex-reg@ucsd.edu) if you experience any issues with logging in.

### What kind of credit do I earn?

The courses in this program are post-baccalaureate, professional-level, credit bearing courses. Credit earned in these courses may lead to the award of a formal certificate by UC San Diego Division of Extended Studies or may be applied toward an academic degree or professional credential, *subject to the approval of the receiving institution*.

If you wish to transfer credit, it is your responsibility to confer with the receiving institution before enrolling, as each individual academic institution decides whether to accept Division of Extended Studies credits.

### Are courses transferrable?

UC San Diego Division of Extended Studies is not a degree granting institution; however, many UC San Diego Division of Extended Studies courses can be transferred to other colleges or universities. The transferability of credit is determined solely by the receiving institution. You should discuss how your individual courses will transfer with the Office of the Registrar at the receiving institution *prior to enrolling*.

## Can I take a course without registering for the certificate?

Yes, you may take any course in this program without registering for the certificate, provided you have fulfilled any and all prerequisites for the course.

## How long is each course?

Three-unit courses run for approximately 8-10 weeks. For exact course dates of upcoming sections, visit the webpage of the course you are interested in taking on [our website](#).

## When is each course offered?

Please visit the course page on [our website](#) to see when courses are typically offered. You can also see a full program schedule by clicking on the "View Schedule" button under the "Courses" section on [the certificate page](#).

## How can I get more information on the specific courses?

Please email [unexenr@ucsd.edu](mailto:unexenr@ucsd.edu) to request specific course syllabi.

## How many hours can I expect to spend studying outside of class time?

Each student has their own learning style so this can vary greatly. As a rule of thumb, expect to spend an average of two hours studying for every hour you spend in-class.

## What are the instructors' credentials?

The program courses are taught by seasoned professionals and overseen by an advisory board of leaders in the field. You can view the advisor list under the "Advisors" section on the [certificate page](#). You can find information about a course instructor, including a biography and credentials, on the course page.

## What are the required textbooks for a course?

Instructors will post the current textbooks requirements and recommendations on the course page on our website. Please note the textbooks requirements are subject to change every quarter and different instructor may require different books, even if they are teaching the same course in the same quarter, so be sure to check the textbook requirements *for the section in which you are enrolling*.

## Will I be able to order the required textbooks before the class begins?

Yes, you can order the book(s) any time after enrolling in the course. You may order books through the campus bookstore or online retailers, such as Amazon.com.

## For More Information

For program specific questions, please visit [the certificate page](#) on our website or contact a program representative at [unexenr@ucsd.edu](mailto:unexenr@ucsd.edu) or (858) 534-9152. For administrative questions, please contact our Student Services Department at [unex-reg@ucsd.edu](mailto:unex-reg@ucsd.edu) or (858) 534-3400.