

# **Department of Electrical and Electronic Engineering**

## **Communication Engineering**

### **I. Introduction**

Communication engineering, especially wireless communications engineering, has become extremely important throughout the world and in particular for Shenzhen, which is recognized as a world-class center of communication industry. With the increasing demand on mobile data access, the development of next generation broadband communication systems has been initiated, which would boost up career opportunity in related academic and industrial fields. The offered 4-year undergraduate program on communication engineering is tailored for the most cutting-edge areas in communication engineering. In addition to lecturers and labs, students are also encouraged to work with supervisors on real research problems as early as the second year of the program. The key areas under study include: classic and modern communication theory, microwave engineering, wireless communications, optical communications, computer networks, embedded systems, microwave imaging, etc.

### **II. Objectives**

The Communication Engineering major aims to cultivate students with solid fundamental theory of communication engineering, modern communication technologies and related R&D capabilities, abilities to use English and computer, and being engaged in science research, engineering design, equipment manufacturing, network operations and technology management in the field of information and communication, as well as in various fields of national economy related to Information Communication Technology (ICT). Upon graduation, the students are expected to work in wireless communication, antenna and microwave engineering, information engineering, integrated circuit and communication system design,

research and development, and continue post-graduate education in communication engineering, microwave engineering, information engineering, or pursue 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

**Prerequisites:** Calculus B-I (GE101), Calculus B-II (GE102), Physics I (PHY101), Physics II (PHY102), Linear Algebra I (MA103), Probability and Statistics (MA204), Fundamentals of Electric Circuits (EE104).

**Degree conferred:** Bachelor Degree of Engineering

**The minimum credits requirement for graduation:** 151.5 credits

### **IV. Discipline**

Major Disciplines include Communication Engineering, Electronic Engineering, and Information Engineering .etc.

### **V. Main Courses**

Core courses include Signals and Systems, Series of courses concerning Circuit Theory and its Application, Engineering Electromagnetics, Digital Signal Processing, Communication Principles, Wireless Communications, Antennas and Radio Propagation, Fiber Communication, Data Communication and Networking, Series of courses concerning Communication System Design, Microwave Engineering .etc.

### **VI. Practice – Based Courses**

Core practical training includes Industrial practice, Advanced Electronic Science Experiment (It is a subject elective course. Outstanding students after their junior year, can join research working with their professor), and all sorts of domestic and international academic and

innovative 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: 28 credits;

Major Core Courses: 14 credits;

Major Elective Courses: 21 credits;

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

The minimum credits requirement for graduation: 151.5 credits.

## VIII. Course Arrangement

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

Major Required Courses	Course Code	Course Name	Credit	Lab Credits	Hours /week	Terms	Advised term to take the course	Instruction language	Prerequisite	Dept
Foundational Courses	MA212	Probability and Statistics	3		3	Spr.	2/Spr.	C/E	MA101b MA102b MA103b	MA
	EE104	Fundamentals of Electric Circuits	2		2	Spr.	1/Spr.	C/E	MA101b MA102b MA103b	EE
	EE201	Analog circuit	4	1	5	Fall	2/Fall	C	MA103b PHY101a PHY102a EE104	
	EE203	Solid-state electronics	3		3	Fall	2/Fall	C/E	MA101b MA102b PHY101a PHY102a	
	EE205	Signals and Systems	3	1	4	Fall	2/Fall	C/E	NA	
	EE202	Digital Circuit	4	1	5	Spr.	2/Spr.	C	PHY102a EE203 EE201	
	EE206	Communication Principles	3	1	4	Spr.	2/Spr.	C/E	EE205	
	EE208	Engineering electromagnetics	3	1	4	Spr.	2/Spr.	C/E	MA101b MA102b MA103b EE104	

	EE307	Antennas and Radio Propagation	3	1	4	Fall	3/Fall	C/E	EE104 EE201 EE208	
	<b>Total</b>		<b>28</b>	<b>6</b>	<b>34</b>					
Core Courses	EE301	Frontier Seminars in Modern Electronic Science and Technology I	1		1	Fall	3/Fall	C/E	NA	
	EE313	Wireless Communications	3	1	4	Fall	3/Fall	C/E	EE206	
	CS305	Computer Networks	3	1	4	Fall	3/Fall	C/E	EE206	2
	EE302	Frontier Seminars in Modern Electronic Science and Technology II	1		1	Spr.	3/Spr.	C/E	NA	
	EE314	Communications System Design I	2	2	4	Spr.	3/Spr.	C/E	EE313	
	EE316	Microwave Engineering	3	1	4	Spr.	3/Spr.	E	EE104 EE201 EE208	
	EE401	Frontier Seminars in Modern Electronic Science and Technology III	1		1	Fall	4/Fall	C/E	NA	
	<b>Total</b>		<b>14</b>	<b>5</b>	<b>19</b>					
EE470		Internship	2	2	16	Smr.	3/Smr.	NA	NA	EE
EE480		Research Projects	2	2				NA	NA	
EE490		Undergraduate Thesis/Projects	8	8	8	Fall & Spr.	4/Fall & Spr.	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	Credits	Lab Credits	Hours /week	Terms	Advised term to take the course	Instruction language	Prerequisite	Dept.
EE204	Introduction to Semiconductor Devices	3	1	4	Spr.	2/Spr.	C/E	EE203	
CS202	Computer Organization Principle	3	1	4	Spr.	2/Spr.	C/E	CS207	CS
CS203	Data Structures and Algorithm Analysis	3	1	4	Fall	2/Fall	C	NA	CS
EE317	Advanced Electronic Science Experiment I*	1	1	2	Fall	3/Fall	NA	NA	
EE318	Advanced Electronic Science Experiment II	1	1	2	Spr.	3/Spr.	NA	NA	
CS301	Embedded System and Microcomputer Principle	3	1	4	Fall	3/Fall	C/E	NA	CS
BIO214	Biomedical Instrumentation and Experiment	3	1	4	Spr.	2/Spr.	C	NA	BIO
EE304	Integrated Circuit Design	3	2	5	Spr.	3/Spr.	C/E	MA101b MA102b EE202 EE204	
EE308	Fiber Communication Principles and Techniques	3	1	4	Spr.	3/Spr.	C/E	EE303	
MA208	Basic Stochastic Processes	3		3	Spr.	2/Spr.	E	MA101b MA102b MA103b MA212	MA
EE405	Advanced Electronic Science Experiment III	1	1	2	Fall	4/Fall	NA	NA	
EE411	Information Theory and Coding	2		2	Fall	4/Fall	C/E	MA101b MA102b MA103b MA212	
EE323	Digital Signal Processing	3	1	4	Fall	3/Fall	E	EE205	
EE417	Communications System Design II	2	2	4	Fall	4/Fall	E	EE316 EE307 EE206	

EE419	Biosensor	3	1	4	Fall	4/Fall	E	NA	
EE402	Frontier Seminars in Modern Electronic Science and Technology IV	1		1	Spr.	4/Spr.	C/E	NA	
EE106	Introduction to Optoelectronic	2		2	Spr.	1/Spr.	C	NA	
EE210	Fundamentals of Optics	3		3	Spr.	2/Spr.	C/E	NA	
EE303	Fundamental of Optoelectronic Technology	3	1	4	Fall	3/Fall	C/E	NA	
EE305	Introduction to VLSI Technology	3	1	4	Fall	3/Fall	C/E	EE202	
EE306	Introduction to MEMS	3	1	4	Spr.	3/Spr.	E	PHY101a PHY102a	
EE309	Introduction to Semiconductor Optics	3		3	Fall	3/Fall	C/E	EE203	
EE310	Principles and Technologies of Lasers	3		3	Spr.	3/Spr.	C/E	NA	
EE311	Optical Design	3	1	4	Fall	3/Fall	C/E	PHY307	
EE320	Integrated Circuit Fabrication Laboratory	3	1.5	4.5	Spr./Fall	3/Spr./Fall	C	EE203	
EE321	Spectral Technology and Application	3		3	Fall	3/Spr.	C/E	NA	
EE322	Optoelectronics Devices Fabrication Laboratory	2	1	3	Spr.	3/Spr.	C/E	EE203 EE204 EE303 EE309 EE310	
EE324	Laser Microfabrication	3		3	Spr.	3/Spr.	C/E	NA	
EE325	Nonlinear Optimization Techniques for Electrical Engineering	3	1	4	Fall	3/Fall	C/E	MA101b MA102b MA103b	
EE326	Digital Image Processing	3	1	4	Spr.	3/Spr.	E	EE323	
EE328	Speech Signal Processing	3	1	4	Spr.	3/Spr.	E	EE323	
EE330	DSP Design and Simulation	1.5	1.5	3	Spr.	3/Spr.	C/E	EE323	
EE332	Digital System Design	3	1	4	Spr.	3/Spr.	E	EE323	
EE403	Introduction to Display and Lighting Technologies	2		2	Fall	4/Fall	C/E	EE311 EE203 EE204	
EE407	Energy Harvesting Technologies	3		3	Fall	4/Fall	C/E	NA	
EE409	Ultrafast Photonics	3	1	4	Fall	4/Fall	C/E	NA	
EE423	Pattern Recognition	2		2	Fall	4/Fall	C/E	EE323	



								EE326	
EE427	Principles of Remote Sensing	2		2	Fall	4/Fall	C/E	EE323 EE326	
MA201b	Ordinary Differential Equations B	4		4	Fall	2/Fall	C/E	MA101b MA102b MA103b	MA
MA202	Complex Analysis	3		3	Spr.	2/Spr.	C/E	MA101b MA102b MA103b	MA
MA110	MATLAB Programming and Application	3		3	Spr.	1/Spr.	C/E	MA103b	MA
CS303	Artificial Intelligence	3	1	4	Fall	3/Fall	C/E	GE105 CS203	
CS309	Object-Oriented Analysis and Design	3	1	4	Fall	3/Fall	C/E	CS202 CS203 GE105	
CS302	Operating Systems	3	1	4	Spr.	3/Spr.	C/E	CS301 (EE319)	
CS201	Discrete Mathematics	3		3	Fall	2/Fall	C/E	MA101b MA102b MA103b MA104b	
CS403	Cryptography and Network Security	2		2	Fall	4/Fall	C/E	CS201 CS305 CS302	
MA206	Mathematical Modelling	3		3	Spr.	2/Spr.	C/E	MA101 MA102 MA103	
MA305	Numerical Analysis	3		3	Fall	3/Fall		MA101 MA102 MA103 MA104	
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	EE203orE E204	
EES101	Brief Introduction of Creative Electronic Design I	1	0.5	6	Sum	3/ Sum	C	PHY101a 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	
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: Properties and Devices	2		8	Sum	9/ Sum	E	NA	
Total		146	38.5	227.5					

\*Note: To meet the graduate criteria, one must select at least 21 credits course from above.

\*\*Note: Advanced Electronic Science Experiment can be selected by outstanding senior students. This course will allow those students accomplish researching work with their professors.

**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.
EE201	Analog Circuit	4	1	5	Fall	2/Fall	C	MA103b PHY101a PHY102a EE104	
EE205	Signals and Systems	3	1	4	Fall	2/Fall	C/E	NA	
EE202	Digital Circuit	4	1	5	Spr.	2/Spr.	C	PHY102a EE203 EE201	
EE206	Communication Principles	3	1	4	Spr.	2/Spr.	C/E	EE205	
EE208	Engineering Electromagnetics	3	1	4	Spr.	2/Spr.	C/E	MA101b MA102b MA103b EE104	
EE307	Antennas and Radio Propagation	3	1	4	Fall	3/Fall	C/E	EE104 EE201 EE208	
EE313	Wireless Communications	3	1	4	Fall	3/Fall	C/E	EE206	
CS305	Computer networks	3	1	4	Fall	3/F	C/E	EE206	CS
EE314	Communications System Design I	2	2	4	Spr.	3/Spr.	C/E	EE313	
EE316	Microwave Engineering	3	1	4	Spr.	3/Spr.	E	EE104 EE201 EE208	
EE204	Introduction to Semiconductor Devices	3	1	4	Spr.	2/Spr.	C/E	EE203	
CS202	Computer Organization Principle	3	1	4	Spr.	2/Spr.	C/E	CS207	CS
CS203	Data Structures and Algorithm Analysis	3	1	4	Fall	2/Fall	C	NA	CS
EE317	Advanced Electronic Science Experiment I*	1	1	2	Fall	3/Fall	NA	NA	

EE318	Advanced Electronic Science Experiment II	1	1	2	Spr	3/Spr.	NA	NA	
CS301	Embedded System and Microcomputer Principle	3	1	4	Fall	3/Fall	C/E	NA	CS
BIO214	Biomedical Instrumentation and Experiment	3	1	4	Spr.	2/Spr.	C	NA	BIO
EE304	Integrated Circuit Design	3	2	5	Spr.	3/Spr.	C/E	MA101b MA102b EE202 EE204	
EE308	Fiber Communication Principles and Techniques	3	1	4	Spr.	3/Spr.	C/E	EE303	
EE405	Advanced Electronic Science Experiment III	1	1	2	Fall	4/Fall	NA	NA	
EE323	Digital Signal Processing	3	1	4	Fall	3/Fall	E	EE205	
EE417	Communications System Design II	2	2	4	Fall	4/Fall	E	EE316 EE307 EE206	
EE419	Biosensor	3	1	4	Fall	4/Fall	E	NA	
EE470	Industrial Practice	2	2	16	Smr.	3/Smr.	NA	NA	
EE480	Projects of Science and Technology Innovation	2	2				NA	NA	
EE490	Thesis(Graduation Project)	8	8	8	Fall & Spr	4/Fall & Spr.	NA	NA	
EE303	Fundamental of Optoelectronic Technology	3	1	4	Fall	3/Fall	C/E	NA	
EE305	Introduction to VLSI Technology	3	1	4	Fall	3/Fall	C/E	EE202	
EE306	Introduction to MEMS	3	1	4	Spr.	3/Spr.	E	PHY101a PHY102a	
EE311	Optical Design	3	1	4	Fall	3/Fall	C/E	PHY307	
EE320	Integrated Circuit Fabrication Laboratory	3	1.5	4.5	Spr. Fall	3/Spr./Fall	C	EE203	
EE322	Optoelectronics Devices	2	1	3	Spr.	3/Spr.	C/E	EE203	

	Fabrication Laboratory							EE204 EE303 EE309 EE310	
EE325	Nonlinear Optimization Techniques for Electrical Engineering	3	1	4	Fall	3/Fall	C/E	MA101b MA102b MA103b	
EE326	Digital Image Processing	3	1	4	Spr.	3/Spr.	E	EE323	
EE328	Speech Signal Processing	3	1	4	Spr.	3/Spr.	E	EE323	
EE330	DSP Design and Simulation	1.5	1.5	3	Spr.	3/Spr.	C/E	EE323	
EE332	Digital System Design	3	1	4	Spr.	3/Spr.	E	EE323	
EE409	Ultrafast Photonics	3	1	4	Fall	4/Fall	C/E	NA	
CS303	Artificial Intelligence	3	1	4	Fall	3/Fall	C/E	GE105 CS203	CS
CS309	Object-Oriented Analysis and Design	3	1	4	Fall	3/Fall	C/E	CS202 CS203 GE105	CS
CS302	Operating Systems	3	1	4	Spr.	3/Spr.	C/E	CS301 (EE319)	CS
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 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	
Total		128.5	61.5	209.5					

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

<b>Course Category</b>	<b>Total Hours</b>	<b>Total Credits</b>	<b>Minimum Credits Requirement</b>
General Education (GE) Required Courses	1168	66.5	66.5
General Education (GE) Elective Courses	3144	182.5	10
Major Foundational Courses	544	28	28
Major Core Courses	304	14	14
Major Elective Courses	3568	146	21
Internship, Research Projects, and Undergraduate Thesis/Projects	Estimated 380	12	12
<b>Total</b>	9108	449	151.5