通信工程专业（留学生）培养方案

Telecommunications Engineering（International Program）

（门类：工学； 专业类：电子信息类；专业代码： 080703）

(Category: Engineering; Specialty category: Electronic Information; Specialty Code: 080703)

一、专业简介 Brief Introduction to this Major

通信工程专业自 2000 年开始招生，2006 年开始招收英文授课的国际留学生，2016 年入选山东省高水平应用型立项建设专业群，2019 年获批山东省一流本科建设专业，2021 年获批国家一流本科建设专业。专业以科研和学科建设推动本科生人才培养水平提高，所属学科有导航制导与控制二级学科博士点，信息与通信工程一级学科硕士点。专业拥有教育部-中兴通讯产教融合创新基地、未来技术技能与人文交流人才国际训练基地、信息与通信山东省普通高等学校实验教学示范中心等平台，可满足通信工程专业学生的创新实践需求。专业人才培养过程强调“德行并重”，注重中国特色的品德教育与国际化的工程能力培养。

The telecommunication engineering undergraduate program (major) has been recruiting new students since 2000, and overseas student since 2006. This major was awarded to be the high-level application major group of Shandong province in 2016, also approved to construct the provincial first-class and national first-class undergraduate major in 2019 and 2021 respectively. We advance the undergraduate ability training program by the research work and discipline construction. The discipline which telecommunication major belongs to in our university have a doctoral program in second level disciplines—Navigation Guidance and Control, and a first level discipline masteral program – Information and communication engineering. We constructed a National Education Department – ZTE Industry-education integration innovation base, an International Future Technical Skills and Cultural Exchange Talents training base, and a provincial college experimental teaching demonstration center for information and telecommunication. We emphasize both virtue and action in the process of cultivating, as well as the moral education with Chinese Characteristics and internationalized engineering ability training.

二、培养目标 Major Training Objectives

坚持以立德树人为根本任务，培养具备良好学习能力、团队意识、创新精神和国际视野，能够在通信专业领域胜任系统开发/应用、工程实施、工程管理等工作的德智体美全面发展的高素质应用创新型人才。

通过学习和工作锻炼，毕业 5 年左右能够达到下列培养目标：

1.具有高度的社会责任感和健全的人格，能够在通信领域工程实践或产品研发中，敬业奉献，恪守职业道德及法律法规；

2.能够在多元化团队和跨文化背景下工作，独立或领导团队实施复杂工程项目的协调与管理；

3.能够考虑社会环境影响及可持续性发展，综合多方面因素进行方案的合理判断、评估及优选，解决与专业职位相关的问题；

4.能够分析和解决通信领域的复杂工程实施中的关键技术问题，具备科学思维方法、技术创新能力、综合判断和决策能力；

5.具备终身学习的能力和国际化视野，能持续关注通信相关领域的技术前沿和动态，并能对本行业技术发展趋势做出合理的判断。

The program is committed to the essential mission of fostering morality and education. The program is on cultivate high-quality application-oriented innovative talents with a holistic development in morality, intelligence, physical fitness, and aesthetics. These individuals possess strong learning abilities, team awareness, innovative spirit, and an international perspective. Students are proficient in system development/application, engineering implementation, engineering management, and other aspects of communication work.

Through study and work training, the following training objectives can be achieved about 5 years after graduation:

1.Have a high sense of social responsibility and sound personality, be able to devote themselves to engineering practice or product development in the field of communications, and abide by professional ethics and laws and regulations;

2.Ability to work in a diverse team and cross-cultural context, independently or leading a team to coordinate and manage complex engineering projects;

3.Be able to consider social environmental impact and sustainable development, make

reasonable judgments, evaluations and optimization of plans based on various factors, and solve problems related to professional positions;

4.Be able to analyze and solve key technical problems in the implementation of complex engineering projects in the field of communications, and possess scientific thinking methods, technological innovation capabilities, comprehensive judgment and decision-making capabilities;

5.Have the ability of lifelong learning and international vision, be able to continuously pay attention to the technological frontiers and trends in the communication-related fields, and be able to make reasonable judgments on the technological development trends in the industry.

三、毕业要求 Graduation Requirements

在满足工程教育认证通用标准的基础上，依据学校的人才培养定位和专业培养目标，制定以下 12 条毕业要求：

1.工程知识：能够将数学、自然科学、计算、工程基础和专业知识用于解决通信领域复杂工程问题。

2.问题分析：能够应用数学、自然科学和工程科学的第一性原理，对通信领域复杂工程问题进行识别、建模和分析，通过文献研究分析并考虑可持续发展的要求，对通信领域的复杂工程问题进行表达、模拟，提出解决方案，以获得有效结论。

3.设计/开发解决方案：能够开发和设计针对通信领域复杂工程问题的解决方案，设计满足特定需求的通信单元、通信系统或通信网络，并能够在设计环节中体现创新性，并能从健康与安全、全生命周期成本与净零碳要求、法律与伦理、社会与文化等角度考虑可行性。

4.研究：能够基于科学原理并采用科学方法对通信领域复杂工程问题进行研究，包括设计实验、分析与解释数据、并通过信息综合得到合理有效的结论。

5.使用现代工具：能够针对通信领域复杂工程问题，开发、选择与使用恰当的技术、资源、现代工程工具和信息技术工具，包括对通信系统工程问题的预测与模拟，并能够理解其局限性。

6.工程与可持续发展：在解决通信工程复杂工程问题时，能够基于工程相关背景知识进行合理分析，客观评价工程实践对健康、安全、环境、法律以及经济和社会可持续

发展的影响，并理解应承担的责任。

7.伦理和职业规范：具备人文社会科学素养、法治素养，能够在通信专业工程实践中理解并遵守工程职业道德和规范和相关法律，履行责任。

8.个人和团队：能够在多样化、多学科背景下的团队中承担个体、团队成员以及负责人的角色，在工作中践行体育精神、劳动精神。

9.沟通：能够就通信领域复杂工程问题与业界同行及社会公众进行有效沟通和交流，包括撰写报告和设计文稿、陈述发言、清晰表达或回应指令。并具备一定的国际视野，能够在跨文化背景下进行沟通和交流并能理解、尊重语言和文化差异。

10.项目管理：理解并掌握通信工程项目相关的管理原理与经济决策方法，并能在多学科环境中应用。

11.终身学习：具有自主学习和终身学习的意识和能力，能够理解广泛的技术变革对工程和社会的影响，适应新技术变革，具有批判性思维能力。

12.中文能力达到《国际中文教育中文水平等级标准》（GF0025-2021）四级或同等水平。

Based on the school's talent cultivation positioning and the objectives of professional training, the following 12 graduation requirements are formulated in accordance with the general standards of engineering education certification:

1.Engineering knowledge: Ability to apply mathematics, natural sciences, computing, engineering fundamentals and professional knowledge to solve complex engineering problems in the communications field.

2.Problem Analysis: Be able to apply the first principles of mathematics, natural sciences and engineering sciences to identify, model and analyze complex engineering problems in the field of communications. Through literature research and analysis and considering the requirements of sustainable development, express, simulate and propose solutions to complex engineering problems in the field of communications to obtain effective conclusions.

3.Design/Develop Solutions: Ability to develop and design solutions to complex engineering problems in the field of communications, design communications units, communications systems or communications networks that meet specific needs, and be

innovative in the design process and consider feasibility from the perspectives of health and safety, life cycle costs and net zero carbon requirements, legal and ethical, social and cultural aspects.

4.Research: Ability to conduct research on complex engineering problems in the communications field based on scientific principles and using scientific methods, including designing experiments, analyzing and interpreting data, and obtaining reasonable and effective conclusions through information synthesis.

5.Use of modern tools: Ability to develop, select and use appropriate techniques, resources, modern engineering tools and information technology tools for complex engineering problems in the communications field, including prediction and simulation of communications system engineering problems, and understanding their limitations.

6.Engineering and Sustainable Development: When solving complex engineering problems in communications engineering, students should be able to make reasonable analyses based on engineering-related background knowledge, objectively evaluate the impact of engineering practices on health, safety, the environment, law, and economic and social sustainable development, and understand the responsibilities that should be assumed.

7.Ethics and professional norms: Possess literacy in the humanities and social sciences, and legal literacy, and be able to understand and abide by engineering professional ethics and norms and relevant laws in the practice of communications professional engineering, and fulfill responsibilities.

8.Individuals and Teams: Be able to assume the roles of individuals, team members, and leaders in a diverse, multidisciplinary team, and practice the spirit of sportsmanship and labor in work.

9.Communication: Ability to communicate effectively with industry peers and the public on complex engineering issues in the communications field, including writing reports and design documents, making presentations, expressing clearly or responding to instructions. And have a certain international perspective, be able to communicate and interact in a cross-cultural context and understand and respect language and cultural differences.

10.Project Management: Understand and master the management principles and economic decision-making methods related to communication engineering projects, and be able to apply them in a multidisciplinary environment.

11.Lifelong learning: Have the awareness and ability of independent and lifelong learning, be able to understand the impact of broad technological changes on engineering and society, adapt to new technological changes, and have critical thinking skills.

12.The Chinese proficiency must reach Level 4 of the "Chinese Proficiency Grading Standards for International Chinese Language Education" (GF0025-2021) or equivalent.

毕业要求支撑培养目标矩阵图

Relationship of Graduation requirements supporting training objectives

毕业要求	培养目标 1	培养目标 2	培养目标 3	培养目标 4	培养目标 5
毕业要求 1			√	√	
毕业要求 2			√	√	
毕业要求 3			√	√	√
毕业要求 4			√	√	
毕业要求 5				√	√
毕业要求 6	√		√		
毕业要求 7	√				
毕业要求 8		√			
毕业要求 9		√			
毕业要求 10		√			
毕业要求 11					√
毕业要求 12					√

四、学制与学位　Degree and Program Duration

基本学制 4 年，弹性学制 3 至 6 年。

本专业授予工学学士学位。

The standard duration of the program is 4 years, with a flexible range of 3 to 6 years.

This major grants a bachelor of Engineering degree.

五、主干学科与主要课程　Major Discipline & Specialty Core Courses

主干学科：信息与通信工程

主要课程：电路、模拟电子技术、数字电子技术、计算机网络、信号与系统、数字信号处理、电磁场与电磁波、通信原理、信息论与编码。

Main discipline: Information and Telecommunications Engineering

Main courses: Circuits, Analog Electronic Technology, Digital Electronic Technology, Computer Networks, Signals & Systems, Digital Signal Processing, Electromagnetic Fields and Waves, Principles of Communications, Information Theory and Coding, Mobile Communications.

六、主要实践性教学环节 Main practice courses

包含专业实践和综合实践两类：

专业实践：认识实习、电子工艺实习、生产实习、通信系统课程设计、电信工程实训等。

综合实践：专业综合课程设计、毕业实习、毕业设计等。

It includes two categories: Professional Practice and Comprehensive Practice:

Professional Practice: Familiarity Practice, Electronic Process Practice, Production Practice, Communication System Course Design, Telecommunication Engineering Training, etc.

Comprehensive Practice: Professional Comprehensive Course Design, Graduation Practice, Graduation Design, etc.

七、毕业最低学分要求 Minimum Credit Requirement for Graduation

本专业须修满培养方案中规定课程 156 学分（其中通识教育课 48 学分，专业基础课 31 学分，专业核心课 29 学分，专业拓展课 17 学分，实践环节 31 分），方准毕业。

For a bachelor's degree in engineering, a student must achieve 48 credits in general education courses, 60 credits in specialty required courses, 17 credits in specialty elective courses, and 31 credits for the practical, amounting to a total of 156 credits.

八、课程体系的构成及学时、学分分配

Program Composition and Distribution of Course Hours and Credits

类别 \ 学期		1-1	1-2	2-1	2-2	3-1	3-2	4-1	4-2	合计	学分所占比例（%）
通识教育课	必修	12	16	11	3	3	3			48	30.8%
	选修									0	
专业基础课	必修	7		9	15					31	19.9%
专业核心课	必修					16	10	3		29	18.5%
专业拓展课	选修		2		3		4	8		17	10.9%
非独立课内实践		1	1	1.5	2.5	4	2	0.5	0	12.5	8%
实践环节			2	2		2	3	6	16	31	19.9%
实践教学学分占额定总学分比例											27.9%
额定学分合计		19	20	22	21	21	20	17	16	156	100%

九、指导性教学计划进程安排 Guiding Arrangements

（一）通识教育课进程表 General Education Course Table

课程类别 Classification	课程类型 Type	课程代码 Course Code	课程名称 Course Name	学分 Credit	学时			开课学期 Semester	考核方式 Test Mode	开课单位编号 Course-given Unit No.
					总学时 Total Hours	授课 Class Instruction	课内实践 Practice in course			
通识教育课 General Education Courses	通识必修课 General Required Course	212311000603 212311000703 212311000803 212311000903 212311001003 212311001103	中文 Chinese	18	288	288		1-1 1-2 2-1 2-2 3-1 3-2	考试 exam	gj
		212311001202 212311001302	中国概况 Survey of China	4	64	64		1-1 1-2	考试 exam	gj
		210866000105	高等数学(2-1) Advanced Mathematics(2-1)	5	80	80		1-1	考试 exam	sx
		210866000205	高等数学(2-2) Advanced Mathematics(2-2)	5	80	80		1-2	考试 exam	sx
		211166000104	大学物理（2-1） College Physics A	4	64	48	16	1-2	考试 exam	dx
		211166000204	大学物理（2-2） College Physics A	4	64	48	16	2-1	考试 exam	dx
		210511000302	工程概论 Introduction to Engineering	2	32	32		2-1	考试 exam	tj
		210771202402	人工智能素养 Artificial intelligence literacy	2	32	32		2-1	考试 exam	js
		211911000102	体育与健康（2-1） Physical Education and Health	2	32	32		1-1	考试 exam	ty

续表（一）

课程类别 Classification	课程类型 Type	课程代码 Course Code	课程名称 Course Name	学分 Credit	学时			开课学期 Semester	考核方式 Test Mode	开课单位编号 Course-given Unit No.
					总学时 Total Hours	授课 Class Instruction	课内实践 Practice in course			
通识教育课 General Education Courses	通识必修课 General Required Course	211911000202	体育与健康（2-2） Physical Education and Health	2	32	32		1-2	考试 exam	ty
	通识必修课合计 Total General Required			48						

（二）专业必修课进程表 Specialty Core Course Table

课程类别 Classification	课程类型 Type	课程代码 Course code	课程名称 Course name	学分 credit	学时			开课学期 Semester	考核方式 Test mode	开课单位编号 Course-given Unit No.
					总学时 Total hours	授课 Class Instruction	课内实践 Practice in course			
专业必修课 Specialty Required Courses	专业基础课 Specialty Fundamental Courses	211121150201	通信工程专业导论 Introduction to telecommunication engineering	1	16	16		1-1	考查 test	dx
		211121154104	C 语言程序设计 C language programming	3.5	56	40	16	1-1	考试 exam	dx
		210866000303	线性代数 Linearity Algebra	2.5	40	40		1-1	考试 exam	sx
		210866000102	复变函数与积分变换 Complex Function & Integral Transform	2	32	32		2-1	考试 exam	sx
		210866000403	概率论与数理统计 Probability and Statistics	3	48	48		2-1	考试 exam	sx
		211021134104	电路 Circuit Analysis	4	64	56	8	2-1	考试 exam	zd
		211021154204	模拟电子技术 Analog Electronics Technology	4	64	52	12	2-2	考试 exam	zd
		211021154304	数字电子技术 Digital Electronics Technology	4	64	52	12	2-2	考试 exam	zd
		211121154304	信号与系统 Signal and linear system	4	64	56	8	2-2	考试 exam	dx
		211021154503	单片机原理与应用 Principles and Applications of Microcontroller	3	48	36	12	2-2	考试 exam	zd
		合计		31						
	专业核心课 Specialty Core Courses	211121154403	电磁场与电磁波 Electromagnetic Fields and Waves	3	48	40	8	3-1	考试 exam	dx
		211121154504	数字信号处理 Digital signal processing	3.5	56	40	16	3-1	考试 exam	dx
		211121154604	计算机网络 Computer networks	3.5	56	40	16	3-1	考试 exam	dx
		211121154703	随机信号处理 Stochastic signal processing	2.5	40	32	8	3-1	考试 exam	dx

续表（二）

课程类别 Classification	课程类型 Type	课程代码 Course code	课程名称 Course name	学分 credit	学时			开课学期 Semester	考核方式 Test mode	开课单位编号 Course-given Unit No.
					总学时 Total hours	授课 Class Instruction	课内实践 Practice in course			
专业必修课 Specialty Required Courses	专业核心课 Specialty Core Courses	211121154904	射频通信电路 Radio Frequency Communications circuit	3.5	56	40	16	3-1	考试 exam	dx
		211121154803	信息论与编码 Information Theory and Coding	3	48	40	8	3-2	考试 exam	dx
		211121155004	通信原理 Principles of Communications	4	64	48	16	3-2	考试 exam	dx
		211121155203	光纤通信系统 Optical Fiber Communication Systems	3	48	40	8	3-2	考试 exam	dx
		211121155103	移动通信与 5G 技术 Mobile communication and 5G technology	3	48	40	8	4-1	考试 exam	dx
		合计 total		29						
	专业必修课合计 Total specialty required			60						

（三）专业拓展课进程表 Specialty Elective Course Table

课程类别 type	课程代码 Course code	课程名称 Course name	学分 credit	学时			开课学期 Semester	考核方式 Test mode	开课单位编号 Course-given Unit No.
				总学时 Total hours	授课 Class Instruction	课内实践 Practice in course			
专业拓展课 Specialty Elective Courses	211122151702	MATLAB 基础与应用 Fundamental & Application of Matlab	2	32	24	8	1-2	考试 exam	dx
	211122156203	Python 语言程序设计 Python language programming	3	48	32	16	2-2	考试 exam	dx
	211122156303	物联网与短距离通信技术 IOT & Short-range communication	3	48	40	8	3-1	考试 exam	dx
	211122156103	现代交换技术与通信网 Modern Switch Techniques & communication networks	3	48	40	8	3-2	考试 exam	dx
	211122157003	图像与语音信号处理 Image & Voice Signal Processing	3	48	32	16	3-2	考查 test	dx
	211122157102	软件无线电 Software Defined Radio	2	32	16	16	4-1	考查 test	dx
	211122156401	通信技术前沿 Frontier of Communication technology	1	16	16		4-1	考查 test	dx
	211122156502	微波技术与天线 Microwave & Antennas technology	2	32	24	8	4-1	考试 exam	dx
	211122156602	智能通信 Intelligent communication	2	32	32		4-1	考查 test	dx
	211122156702	通信法规与工程管理 Telecommunication specification & project management	2	32	32		4-1	考查 test	dx

续表（三）

课程类别 type	课程代码 Course code	课程名称 Course name	学分 credit	学时			开课学期 Semester	考核方式 Test mode	开课单位编号 Course-given Unit No.
				总学时 Total hours	授课 Class Instruction	课内实践 Practice in course			
专业拓展课 Specialty Elective Courses	211122156802	大数据与云计算 Big data & cloud computing	2	32	24	8	4-1	考查 test	dx
	211122157202	网络信息安全 Network Information Security	2	32	24	8	4-1	考查 test	dx
	211122153102	科技汉语 Scientific Chinese	2	32	32		4-1	考查 test	dx
		合计 Total	29						

选修学分要求与修读指导建议:（专业拓展课须在毕业前至少选修 17 学分）

Elective credits requirement：Students are required to obtain a minimum of 17 credits from the specialty elective courses.

（四）实践环节进程表（不含课内实验）

Internship and Practical Training Table（Non-independent course experiments are not included）

实践类型 Type	课程代码 Course code	课程名称 Course name	学分 Credit	学时 Hours	周数 Weeks	开课学期 Semester	教学形式		开课单位编号 Course-given Unit No.
							集中 grouped	分散 Individual	
专业实践 Specialty practice	211131157102	认识实习 Recognizing Practice	2		2	1-2	√		dx
	211131157602	电子工艺实习 Electronic Process Practice	2		2	2-1	√		dx
	211131157203	通信系统设计 Telecommunication System Design	3		3	3-2	√		dx
综合实践 Comprehensive practice	211131157702	生产实习 Production practice	2		2	3-1	√		dx
	211131157302	通信工程综合设计实践 Practice of telecommunication project Design	2		2	4-1	√		dx
	211131157402	电信工程实训 Telecommunication Skills Training	2		2	4-1	√		dx
	211131157502	创新创业实践 Innovation entrepreneurship practice	2			4-1		√	dx
	211131157802	毕业实习 Graduation Practice	2		2	4-2	√		dx
	211131157914	毕业设计（论文） Final Project Design	14		14	4-2	√		dx
实践环节合计 Total practice			31						

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