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2020 级测绘工程专业本科培养方案

一、专业基本信息

英文名称	Surveying and Mapping Engineering			
专业代码	业代码 081201 学科门类		工学	
学 制	4 年	授予学位	工学学士	

二、培养目标和专业特色

1.培养目标

培养德、智、体、美、劳全面发展,掌握测绘工程基础理论、基本知识和基本技能,接受科学 思维和工程实践训练,具有人文素养、职业道德和社会责任感,胜任国家基础测绘、城乡建设、自 然资源监测、地理信息服务及应急管理等领域测绘项目的设计、生产、研发及管理工作,具有较强 的组织管理能力、创新意识、继续学习能力、国际视野和城市测绘特色的应用型工程技术人才。

毕业后经过5年左右的工作和学习,能够达到如下目标:

- (1) 能在国家基础测绘、城乡建设、地理信息服务及应急管理等领域胜任工程勘测、设计、 施工及管理等方面的测绘技术工作;
- (2) 具有良好专业素养、丰富的工程管理经验和极强工作责任心,成为测绘地理信息企事业单位中的技术负责人或技术骨干;
 - (3) 具有继续学习适应发展的能力,能够独立或协同承担测绘地理信息科研工作;
- (4) 具有良好的团队意识、国际化视野和沟通能力,能在设计、生产、研发和多学科团队中担任组织管理骨干或技术负责人角色,具备团队协作精神及领导力;
- (5) 具有良好的思想道德修养和科学文化素养,具有社会责任感、事业心及良好的职业道德,能够承担和履行社会责任,服务于国家与社会。

2.专业特色

本专业依托首都建设和学校土木建筑类学科优势,培养服务首都、面向全国、依托建筑行业、服务城乡建设的专业测绘人才。人才培养适应测绘高新科技发展,融教学、科研和生产为一体,强调理论与实践密切结合,培养测绘新技术、新方法、新工艺的应用能力,突出城市测绘特色,满足城乡建设、古建筑保护、复杂结构精密测量等测绘人才需求。

三、主干学科

测绘科学与技术

四、主干课程

1. 主干基础课程

测绘地理信息概论、工程制图与识图、C语言程序设计、数据结构、地球科学概论、数字地形测量学、地图学、CAD基础与应用、误差理论与测量平差基础、大地测量学基础、地理信息系统原理(双语)、遥感原理与应用、摄影测量学。

2. 主干专业课程

GNSS 原理及其应用、工程测量学、变形监测与灾害预报、不动产测量与管理、激光雷达测量技术与应用。

五、主要实践教学环节

1. 主要实验

数字地形测量学实验、卫星导航定位技术实验、摄影测量实验、地理信息系统原理实验、大地测量学基础实验、工程测量学实验、变形监测实验、不动产测量与管理实验、激光雷达测量技术实验。

2. 主要实践环节

数字地形测量实习、卫星导航定位实习、遥感原理实习、摄影测量实习、地理信息系统实习、 地图学实习、控制测量实习、自然地理地貌及遥感图像解译实习、工程测量综合实习、空间信息综 合实习、不动产测量与管理实习、激光雷达测量实习。

六、毕业学分要求

参照北京建筑大学本科学生学业修读管理规定及学士学位授予细则,修满本专业最低计划学分应达到 170 学分,其中理论课程 131 学分,实践教学环节 39 学分(含创新实践及科研训练必修 2 学分)。

七、各类课程结构比例

5. 17w(E-11)000				
课程类别	课程属性	学分	学时	学分比例
通识教育课	必修	41.5	688	24.41%
世 次 教育体	选修	2	32	1.18%
大类基础课	必修	43	<mark>756</mark>	25.29%
人关至训体	选修	1	16	0.59%
专业核心课	必修	16	256	9.41%
专业方向课	必修	6	96	3.53%
	选修	21.5	344	12.65%
独立实践环节	必修	37	840	21.76%
	选修	2	40	1.18%
总计		170	3068	100%

八、教学进程表

学期	教学周	考试	实践	学期	教学周	考试	实践
1	4-19 周	20 周	1-3 周	2	1-16 周	17周	18-20 周
3	1-15 周	16 周	17-20 周	4	1-16 周	17 周	18-20 周

5	1-16 周	17-18 周	19-20 周	6	1-14 周	15 周	16-20 周
7	6-16 周	17 周	1-5 周 18-20 周	8	1-16 毕	业设计/实习	17 周答辩

九、毕业生应具备的知识能力及实现矩阵

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 毕业生应具备的知识能力 	相关知识领域	实现途径 (课程支撑)			
	1.1 能将数学、自然科学、工程科学的语言工具用于测绘工程问题的表述	计算思维导论、C语言程序设计、数据结构、CAD基础与应用、工程制图与识图、高等数学 A(1-2)、概率与数理统计 B、普通物理 A(1-2)、线性代数、土木工程概论、地图学、遥感原理与应用、地球科学概论、计算机图形学、遥感数字图像处理等。			
1.工程知识: 能够将数学、 自然科学、工程基础和专业 知识用于解决复杂测绘工	1.2 能针对具体的测 绘对象建立数学模型 并求解	高等数学 A(1-2)、线性代数、物理实验(1-2)、数字地形测量学、地理信息系统原理(双语)、摄影测量学、变形监测与灾害预报、大地测量学基础、误差理论与测量平差基础等。			
程问题。	1.3 能够将数学、自然 科学、工程基础和专业 知识以及数学模型方 法用于推演、分析复杂 测绘工程问题	计算思维导论、CAD基础与应用、 工程制图与识图、线性代数、GNSS 原理及其应用、激光雷达测量技术 与应用、计算机图形学、工程测量 学、遥感数字图像处理等。			
	1.4 能够将数学、自然 科学、工程基础和专业 知识以及数学模型方 法用于复杂测绘工程 问题解决方案的比较 与综合	C语言程序设计、数据结构、概率与数理统计 B、数字地形测量实习、地图学实习、摄影测量实习、空间信息综合实习、毕业设计等。			
2.问题分析: 能够应用数	2.1 能运用数学、自然	计算思维导论、C语言程序设计、			
学、自然科学和工程科学的	科学和工程科学原理,	数据结构、高等数学 A(1-2)、概率			
基本原理,识别、表达、并	识别和判断复杂测绘	与数理统计 B、物理实验(1-2)、			
通过文献研究分析复杂测	工程问题的关键环节	线性代数、土木工程概论、C#程序			
绘工程问题,以获得有效结		设计、地图学、地理信息系统原理			

毕业生应具备的知识能力	相关知识领域	实现途径 (课程支撑)
论。		(双语)、地球科学概论、变形监测 与灾害预报、摄影测量实习、遥感 数字图像处理等。
	2.2 能基于数学、自然 科学和工程科学原理 和数学模型方法正确 表达复杂测绘工程问 题 2.3 能认识到解决测绘 问题有多种方案可选	CAD基础与应用、数字地形测量学、误差理论与测量平差基础、测量程序设计大赛实训、激光雷达测量技术与应用、GIS基础应用技能、工程测量学等。 C语言程序设计、数据结构、科技文献检索、摄影测量学、大地测量
	择,会通过文献研究寻求可替代的解决方案 2.4 能运用数学、自然科学和工程科学的基	学基础、地理信息系统原理实习、不动产测量与管理实习等。 普通物理 A(1-2)、科技文献检索、 GNSS 原理及其应用、控制测量实
	本原理,借助文献研 究,分析过程的影响因 素,获得有效结论	习、工程测量综合实习、毕业设计、 科研训练等。
3.设计/开发解决方案:能够设计针对复杂测绘工程	3.1 掌握测绘工程设计、实施、管理等全流程相关技术,以及测绘地理信息产品的全周期生产方法,了解影响设计目标和技术方案的各种因素	计算思维导论、GIS 基础应用技能、不动产测量与管理、智慧城市导论、摄影测量实习、工程测量综合实习、空间信息综合实习、遥感数字图像处理等。
问题的解决方案,设计满足特定需求的测绘系统或测绘生产流程,并能够在设计环节中体现创新意识,考虑社会、健康、安全、法律、文化以及环境等因素。	3.2 能够针对特定需求,完成测绘系统、生产流程的设计	测量程序设计与数据处理、CAD 基础与应用、地理信息系统原理(双语)、摄影测量实习、GNSS 原理及其应用、激光雷达测量技术与应用、工程测量学、空间信息综合实习等。
人内以从州 免苛凶杀。	3.3 能够进行测绘系统 或测绘生产流程的设 计,在设计中体现创新 意识	数字地形测量学、工业测量与数据 处理、地理国情监测、创新实践(测 绘技能大赛、测绘科技论文大赛)、 数字地形测量实习、工程测量综合 实习、创新创业类、毕业设计等。

毕业生应具备的知识能力	相关知识领域	实现途径(课程支撑)
	3.4 在测绘系统或测	测绘地理信息概论、变形监测与灾
	 绘生产流程的设计中	 害预报、创新实践(测绘技能大赛、
	 能够考虑安全、健康、	 测绘科技论文大赛)、数字地形测量
	法律、文化及环境等制	 实习、工程测量综合实习、创新创
	 约因素	业类、毕业设计等。
	4.1 能够基于科学原	地图学、地理信息系统原理(双语)、
	 理,通过文献研究,采	 大地测量学基础、工程测量学、智
	 用科学方法,调研和分	慧城市导论、地理国情监测、遥感
	 析复杂测绘工程问题	 原理实习、地图学实习、卫星导航
	 的解决方案	定位实习等。
	4.2 能够根据测绘对	计算思维导论、工程制图与识图、
	 象特征,选择研究路	 遥感原理与应用、摄影测量学、
4.研究: 能够基于科学原理	。 线,设计测绘技术方案	GNSS 原理及其应用、工程测量综
并采用科学方法对复杂测		合实习等。
会工程问题进行研究,包括	4.3 能够根据测绘技	测量程序设计与数据处理、工业测
设计实验、分析与解释数	术方案构建实验系统,	量与数据处理、激光雷达测量技术
据、并通过信息综合得到合	安全地开展测绘实验,	与应用、卫星导航定位实习、测绘
理有效的结论。 	正确地采集测绘实验	技能大赛实训、控制测量实习、激
	 数据	光雷达测量技术实习等。
	4.4 能对实验结果进	科技文献检索、地图学、科技论文
	行分析和解释,并通过	写作(双语)、不动产测量与管理实
	信息综合获得合理有	习、激光雷达测量技术实习、空间
	效结论	信息综合实习、测量程序设计大赛
		实训、毕业设计等。
	5.1 了解测绘常用的现	计算思维导论、C 语言程序设计、
	代测绘仪器、信息技术	CAD 基础与应用、C#程序设计、数
5.使用现代工具:能够针对	工具和测绘软件的使	字地形测量学、工程测量学、激光
复杂测绘工程问题,开发、	用原理和方法,并理解	雷达测量技术与应用、计算机图形
选择与使用恰当的测绘技	其局限性	学、大数据与地理信息系统、GIS
术、信息资源、现代测绘仪 四个公司 by N = B = 5 K = 1		基础应用技能、不动产测量与管理、
器和信息技术工具,包括对		智慧城市导论等。
复杂测绘工程问题的预测	5.2 能够选择与使用恰	工程制图与识图、工程测量学、测
与模拟,并能够理解其局限	当的现代测绘仪器、信	量程序设计与数据处理、测量程序
性。	息资源和测绘软件,对	设计大赛实训、数字地形测量实习、
	复杂测绘工程问题进	遥感原理实习、卫星导航定位实习、

毕业生应具备的知识能力	相关知识领域	实现途径(课程支撑)
	THEOREM	人。 人。 人。 人。 人。 人。 人。 人。 人。 人。
	行技术设计、数据处理	地理信息系统原理实习、控制测量
	与精度分析	实习、工程测量综合实习、不动产
		测量与管理实习、激光雷达测量技
		术实习、空间信息综合实习、测绘
		技能大赛实训、毕业设计等。
	5.3 能够针对具体的	概率与数理统计 B、普通物理
	测绘对象,开发或选用	(1-2)、线性代数、科技文献检索、
	满足特定需求的现代	误差理论与测量平差基础、摄影测
	测绘仪器、信息技术工	量实习、毕业设计、创新实践(测
	具,对复杂测绘工程问	绘技能大赛、测绘科技论文大赛)
	题进行预测与模拟,并	等。
	能够分析其局限性	
	6.1 了解测绘领域的	思想道德修养与法律基础、土木工
	技术标准体系、知识产	程概论、数字地形测量学、遥感原
	权、测绘管理政策和法	理与应用、大地测量学基础、GNSS
	律法规,理解不同社会	原理及其应用、工程测量学、测绘
	文化对工程活动的影	管理与法律法规、工业测量与数据
6.工程与社会:能够基于工	响	处理、数字地形测量实习、地理信
程相关背景知识进行合理		息系统原理实习、工程测量综合实
分析,评价测绘工程实践和		习、测绘技能大赛实训、工程实践
复杂测绘工程问题解决方		类、毕业设计等。
案对社会、健康、安全、法	6.2 能分析和评价测绘	中国近现代史纲要、马克思主义基
律以及文化的影响,并理解	工程实践对社会、健	本原理概论、毛泽东思想和中国特
应承担的责任。 	康、安全、法律、文化	色社会主义体系理论概论、不动产
	的影响,以及这些制约	管理与测量、测绘管理与法律法规、
	因素对工程项目实施	变形监测与灾害预报、哲学视野与
	的影响,并理解应承担	人文素养、创新创业与社会发展、
	的责任	生态文明与智慧科技等。
	7.1 知晓和理解环境保	物理实验(1-2)、测绘地理信息概
7.环境和可持续发展:能够	护和可持续发展的理	论、地球科学概论、遥感数字图像
理解和评价针对复杂测绘	念和内涵	处理、地理国情监测、自然资源管
工程问题的测绘工程实践		理、形势与政策(1-4)等。
对环境、社会可持续发展的	7.2 能够从环境保护和	市场营销、地球科学概论、不动产
影响。	可持续发展的角度思	测量与管理、智慧城市导论、地理
	考测绘工程实践的可	国情监测、变形监测与灾害预报、

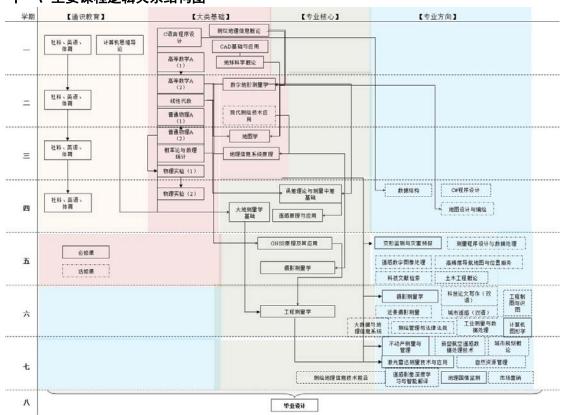
		Name A Company Company
毕业生应具备的知识能力	相关知识领域	实现途径(课程支撑)
	持续性,评价测绘工程 实践中可能对人类和 环境造成的损害和隐 患	控制测量实习、不动产测量与管理实习、复合培养类、毕业设计等。
	8.1 具有正确价值观, 理解个人与社会的关 系,了解中国国情	思想道德修养与法律基础、中国近现代史纲要、马克思主义基本原理概论、毛泽东思想和中国特色社会主义体系理论概论、体育(1-4)等。
8.职业规范: 具有人文社会 科学素养、社会责任感,能 够在测绘工程实践中理解 并遵守测绘行业职业道德 和规范,履行责任。	8.2 理解诚实公正、诚信守则的测绘行业职业道德和规范,并能在测绘工程实践中自觉遵守	思想道德修养与法律基础、中国近现代史纲要、毛泽东思想和中国特色社会主义体系理论概论、大学生职业生涯与发展规划、测绘地理信息概论、测绘管理与法律法规、形势与政策(1-4)、数字地形测量实习、不动产测量与管理实习、工程测量综合实习、空间信息综合实习、测绘技能大赛实训等。
	8.3 理解测绘工作人员 对公众的安全、健康、 福祉、环境保护的社会 责任,能够在测绘工程 实践中自觉履行责任	马克思主义基本原理概论、大学生 职业生涯与发展规划、形势与政策 (5-8)、测绘地理信息概论、地球 科学概论、变形监测与灾害预报、 测绘管理与法律法规、毕业设计等。
9.个人和团队: 能够在建筑、土木等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。	9.1 能与建筑、土木等 学科的成员有效沟通, 合作共事 9.2 能够在团队中独立 或合作开展工作 9.3 能够组织、协调和	大学生职业生涯与发展规划、体育(1-4)、土木工程概论、城市规划概论、工程测量学、工程测量综合实习、毕业设计等。创新实践(测绘技能大赛、测绘科技论文大赛)、数字地形测量实习、遥感原理实习、控制测量实习、激光雷达测量技术实习、测绘技能大赛实训、GIS 软件开发大赛实训等。中国近现代史纲要、控制测量实习、
	指挥团队开展工作	空间信息综合实习、激光雷达测量 技术实习、测绘技能大赛实训、毕 业设计等。

毕业生应具备的知识能力	相关知识领域	实现途径 (课程支撑)
10.沟通:能够就复杂测绘 工程问题与测绘同行及社 会公众进行有效沟通和交	10.1 能就测绘专业问题,在测绘技术设计书、测绘技术总结等书面表述以及陈述发言中,准确表达观点,回应质疑,理解与测绘同行及社会公众交流的差异性	地图学实习、控制测量实习、卫星 导航定位实习、工程测量综合实习、 毕业设计等。
流,包括撰写测绘技术设计 书和测绘技术总结等、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。	10.2 了解测绘专业领域的国际发展趋势、研究热点,理解和尊重不同文化的差异性和多样性	大学英语(1-2)、英语国家文化、 地理信息系统原理(双语)、空间 信息综合实习、现代测绘技术应用、 GIS 基础应用技能、遥感应用前景 等。
行沟通和交流。	10.3 具备跨文化交流 的语言和书面表达能 力,能就测绘专业问 题,在跨文化背景下进 行基本沟通和交流	大学英语(1-2)、科技论文写作(双语)、口语、英语报刊选读、专门用途英语、工程实践类、复合培养类、第二课堂跨文化学分要求(参与国际会议、展览及志愿者等)等。
11.项目管理: 理解并掌握	11.1 掌握工程项目中 涉及的管理与经济决 策方法 11.2 了解测绘工程及 测绘产品生产的全流	测绘管理与法律法规、市场营销、不动产测量与管理、数字地形测量实习、控制测量实习、毕业设计等。市场营销、测绘管理与法律法规、空间信息综合实习、毕业设计等。
工程管理原理与经济决策 方法,并能在测绘、建筑、 土木、环境等学科环境中应 用。	程成本构成,理解其中 涉及的工程管理与经 济决策问题 11.3 能在土木、建筑	土木工程概论、工程测量综合实习、
/H [∨]	等学科环境下,在设计 开发测绘方案的过程 中,运用工程管理与经 济决策方法	不动产测量与管理实习、城市规划 概论、毕业设计等。
12.终身学习: 具有自主学 习和终身学习的意识,有不 断学习和适应发展的能力。	12.1 能在社会发展的 大背景下,认识到自主 学习和终身学习的必 要性	思想道德修养与法律基础、大学生职业生涯与发展规划、专门用途英语、英美文学名篇赏析、测绘地理信息概论、误差理论与测量平差基

毕业生应具备的知识能力	相关知识领域	实现途径 (课程支撑)
		础、测绘管理与法律法规、测绘地 理信息技术前沿等。
	12.2 具有自主学习和	马克思主义基本原理概论、毛泽东
	适应发展的能力,包括	思想和中国特色社会主义体系理论
	对测绘技术问题的理	概论、地球科学概论、科技论文写
	解能力,归纳总结的能	作(双语)、智慧城市导论、人工智
	力和提出问题的能力	能在地理信息系统中的应用、毕业
	等。	设计、创新实践(测绘技能大赛、
		测绘科技论文大赛)等。

十、指导性教学计划(见附表)

十一、主要课程逻辑关系结构图



2020 Undergraduate Program for Specialty in Surveying and Mapping Engineering

I Specialty Name and Code

English Name	Surveying and Mapping Engineering		
Code	081201	Disciplines	Engineering
Length of Schooling	Four years	Degree	Bachelor of Engineering

II Educational Objectives and Features

1.Objectives

This program is to cultivate all-round development of morality, intelligence, physique, beauty and labor, master the basic theory, basic knowledge and basic skills of Surveying and mapping engineering, accept the training of scientific thinking and engineering practice, have humanistic quality, professional ethics and social responsibility, and be competent for the design, production and research of Surveying and mapping projects in national basic surveying and mapping, urban and rural construction, natural resource monitoring, geographic information service and emergency management Development and management, with strong organization and management ability, innovation consciousness, continuous learning ability, international vision and urban surveying and mapping characteristics of Applied Engineering and technical personnel. After five years of work and study after graduation, students can achieve the following goals:

- (1) Capable of Surveying and mapping technology in national basic surveying and mapping, urban and rural construction, geographic information service and emergency management, etc;
- (2) With good professional quality, rich engineering management experience and strong sense of responsibility, he has become the technical director or technical backbone of Surveying and mapping geographic information enterprises and institutions;
- (3) Have the ability to continue learning to adapt to the development, and be able to independently or cooperatively undertake the scientific research of Surveying and mapping geographic information;
- (4) Have good team consciousness, international vision and communication ability, be able to play the role of organizational management backbone or technical director in design, production, R & D and multidisciplinary teams, with team spirit and leadership;
- (5) With good ideological and moral cultivation and scientific and cultural literacy, with a sense of social responsibility, dedication and good professional ethics, can undertake and perform social responsibility, serve the country and society.

2. Features

Relying on the advantages of capital construction and civil architecture discipline, this major cultivates professional surveying and mapping talents serving the capital, facing the whole country, relying on the construction industry and serving urban and rural construction. Personnel training adapts to the

development of high-tech surveying and mapping, integrates teaching, scientific research and production, emphasizes the close combination of theory and practice, cultivates the application ability of new technology, new method and new process of Surveying and mapping, highlights the characteristics of Urban Surveying and mapping, and meets the needs of Surveying and mapping talents such as urban and rural construction, protection of ancient buildings and precise measurement of complex structures.

III Major Disciplines

Science and Technology of Surveying and Mapping

IV Major Courses

1. Basic Courses

Introduction to Geomatics, Engineering Drawing and Read Drawing, C Language Programming Design, Data Structure, Introduction to Earth Science, Digital Topographic Surveying, Cartography, CAD Basic and Application, Fundamentals of Error Theory and Surveying Adjustment, Foundation of Geodesy, The Principle of Geographic Information System (Bilingual), Application and Principles of Remote Sensing, Photogrammetry.

2. Specialty Courses

Application and Principles of GNSS, Engineering Surveying, Deformation Monitoring and Disasters Predicting, Real Estate Surveying and Management, Application and Technology of Laser Radar Surveying.

V Major Practical Training

1. Major experiment

Experiment of Digital Topographic Surveying, Experiment of Satellite Navigation and Positioning Technology, Experiment of Photogrammetry, Experiment of GIS Principles, Experiment of Geodesy, Experiment of Engineering Surveying, Experiment of Deformation Monitoring, Experiment of Real Estate Surveying and Management, Experiment of Application and Technology of Laser Radar Surveying.

2. Major Practical Training

Digital Topographic Surveying Practice, Satellite Navigation and Positioning Practice, Principles of Remote Sensing Practice, Photogrammetry Practice, GIS Practice, Cartography Practice, Control Surveying Practice, Interpretation of Physical Geography, Geomorphology and Remote Sensing Image Practice, Comprehensive Training for Engineering Surveying, Comprehensive Training for Spatial Information, Real Estate Surveying and Management Practice, Laser Radar Surveying Practice.

VI Graduation Requirements

In accordance with "Management Regulations for the Undergraduate Students of Beijing University of Civil Engineering and Architecture" and "Bachelor's Degree Awarding Regulations", the minimum

credits required by specialty for graduate is 170, including131credits of theoretical courses and 39 credits of practice teaching (2 credits of compulsory innovation practice and scientific research training included).

VII Proportion of Course

Course Category	Course Type	Credits	Class Hour	Proportion
	Compulsory	41.5	<mark>688</mark>	24.41%
General Education	Optional	2	32	1.18%
	Compulsory	43	<mark>756</mark>	25.29%
Big Academic Subjects	Optional	1	16	0.59%
Professional Core	Compulsory	16	256	9.41%
B 6 1 1B1 1	Compulsory	6	96	3.53%
Professional Direction	Optional	21.5	344	12.65%
	Compulsory	37	840	21.76%
Practice	Optional	2	40	1.18%
Total		170	<mark>3068</mark>	100%

VIII Table of Teaching Program

Semester	Teaching	Exam	Practice	Semester	Teaching	Exam	Practice
1	4-19	20	1-3	2	1-16	17	18-20
3	1-15	16	17-20	4	1-16	17	18-20
5	1-16	17-18	19-20	6	1-14	15	16-20
		1-5	0	1-16 gra	duation pr	oject 17	
/	6-16	17	18-20	8		defense	

IX Graduate Abilities and Matrices

1A Graduate Abinites and Watrices			
Graduate Abilities	Related Knowledge	Course Supports	
1. Engineering	1.1 Be able to use	Introduction to Computational Thinking、C	
	the language tools of	Language Programming Design Data	
knowledge: Be able to	mathematics, natural	Structure CAD Basic and Application	
use mathematics,	science and	Engineering Drawing and Interpreting	
natural science,	engineering science	Advanced Mathematics A(1-2), Theory of	
engineering foundation	to express surveying	Probability and Statistics (B). College physics	
and professional	and mapping	A(1-2), Linear Algebra, Introduction to Civil	
knowledge to solve			
complex surveying and	engineering	Engineering Cartography Application and	
mapping engineering	problems	Principles of Remote Sensing Introduction to	
		Earth Science Computer Graphics Remote	
problems.		Sensing Digital Image Processing.	

Graduate Abilities	Related Knowledge	Course Supports
	1.2 Be able to	Advanced Mathematics A(1-2), Linear
	establish	Algebra Physics Experiment(1-2) Digital
	mathematical model	Topographic Surveying Principle of
	and solve for	Geographic Information System
	specific surveying	Photogrammetry Deformation Monitoring and
	and mapping objects	Disasters Predicting, Foundation of Geodesy,
		Fundamentals of Error Theory and Surveying
		Adjustment.
	1.3 Be able to use	Introduction to Computational Thinking、CAD
	mathematics, natural	Basic and Application, Engineering Drawing
	science, engineering	and Interpreting Linear Algebra Application
	foundation and	and Principles of GNSS Application and
	professional	Technology of Laser Radar Surveying
	knowledge as well	Computer Graphics Engineering Surveying
	as mathematical	emote Sensing Digital Image Processing.
	model method to	
	deduce and analyze	
	complex surveying	
	and mapping	
	engineering	
	problems	
	1.4 Can use	C Programming Language Design Data
	mathematics, natural	Structure Theory of Probability and Statistics
	science, engineering	(B), Digital Topographic Surveying Practice,
	foundation and	Cartography Practice Photogrammetry
	professional	Practical Comprehensive Practice for Spatial
	knowledge as well	Information Graduation design.
	as mathematical	
	model method to	
	compare and	
	synthesize the	
	solutions of complex	
	surveying and	
	mapping	
	engineering	
	problems	

Graduate Abilities	Related Knowledge	Course Supports
	2.1 Be able to	Introduction to Computational Thinking、C
	identify and judge	Programming Language Design Data
	the key links of	Structure Advanced Mathematics A(1-2)
	complex surveying	Theory of Probability and Statistics (B)
	and mapping	Physics Experiment(1-2), Linear Algebra,
	engineering	Introduction to Civil Engineering、C#
	problems by using	Programming Cartography Principle of
	the principles of	Geographic Information System、Introduction
	mathematics, natural	to Earth Science Deformation Monitoring and
	science and	Disasters Predicting, Photogrammetry
	engineering science	Practice Remote Sensing Digital Image
2. Problem analysis: Be		Processing
able to apply the basic	2.2 Be able to	CAD Basic and Application Digital
principles of	correctly express	Topographic Surveying, Fundamentals of Error
mathematics, natural	complex surveying	Theory and Surveying Adjustment, Surveying
science and engineering	and mapping	Program Design Practice Contest、Application
science to identify,	engineering	and Technology of Laser Radar Surveying GIS
express and analyze	problems based on	base Application Skill, Engineering Surveying.
complex surveying and	the principles of	
mapping engineering	mathematics, natural	
problems through	science and	
literature research, so as	Engineering Science	
to obtain effective	and mathematical	
conclusions.	model	
	2.3 Can realize that	C Programming Language Design、Data
	there are many	Structure, Photogrammetry, Foundation of
	solutions to solve	Geodesy, Engineering Surveying, GIS
	the problem of	Practice Practical Training for Real Estate
	Surveying and	Surveying and Management.
	mapping, and will	
	seek alternative	
	solutions through	
	literature research	
	2.4 Can use the	College physics A(1-2), Document Retrieval of
	basic principles of	Science and Technology Application and
	mathematics, natural	Principles of GNSS . Practical Training for

Graduate Abilities	Related Knowledge	Course Supports
3. Design/Develop solutions: Be able to design solutions for complex surveying and mapping engineering problems, design surveying and mapping production process to meet specific needs, reflect innovation consciousness in the design process, and	science and Engineering Science, with the aid of literature research, analyze the influencing factors of the process, and obtain effective conclusions 3.1 Master the technology related to the whole process of Surveying and mapping engineering design, implementation and management, as well as the full cycle production method of Surveying and mapping geographic information products, and understand various factors affecting the design objectives and technical	Control Surveying、Practical Training for Engineering Surveying、Graduation design、Scientific research training. Introduction to Computational Thinking、CAD Basic and Application、GIS base Application Skill、Real Estate Surveying and Management、Introduction to Smart City、Engineering Surveying、Practical Training for Photogrammetry、Practical Training for Engineering Surveying、Comprehensive Practice for Spatial Information、Remote Sensing Digital Image Processing
consider factors such as society, health, safety, law, culture and environment.	solutions 3.2 Be able to complete the design of Surveying and mapping system and production process according to specific requirements	Surveying Program Design and Data Processing、CAD Basic and Application、 Principle of Geographic Information System、 Photogrammetry Practice、Application and Principles of GNSS、Application and Technology of Laser Radar Surveying、 Engineering Surveying、Comprehensive Practice for Spatial Information、Surveying

Graduate Abilities	Related Knowledge	Course Supports
		Program Design Practice Contest.
	3.3 Be able to design the surveying and	Digital Topographic Surveying Engineering Surveying Geographic Conditions
	mapping system or production process,	Monitoring Invocation Practice(School of Surveying and Mapping Skills Contest, School
	and embody the innovation	of Surveying and Mapping Paper Contest). Digital Topographic Surveying Practice.
	consciousness in the design	Practical Training for Engineering Surveying, Innovation and Entrepreneurship, Graduation
	3.4 In the design of	design. Introduction to Geomatics, Invocation
	Surveying and mapping system or	Practice(School of Surveying and Mapping Skills Contest、School of Surveying and
	mapping production process, the	Mapping Paper Contest), Digital Topographic Surveying Practice, Practical Training for
	constraints of safety, health, law, culture	Engineering Surveying Innovation and Entrepreneurship Graduation design.
	and environment can be considered	
4. Research: Based on	4.1 Based on scientific principles,	Cartography Principle of Geographic Information System Foundation of Geodesy
scientific principles and	through literature	Engineering Surveying Introduction to Smart
scientific methods, it can study complex	research, using scientific methods,	City、Geographic Conditions Monitoring、 Practical Training for Remote Sensing
surveying and mapping engineering problems,	research and analyze the solutions of	Princples Cartography Practice Practical Training for Satellite Navigation and
including designing experiments, analyzing	and mapping	Positioning.
and interpreting data, and obtaining	engineering problems	
reasonable and effective conclusions through	4.2 According to the characteristics of	Introduction to Computational Thinking, Engineering Drawing and Interpreting,
information synthesis.	Surveying and mapping objects, the	Application and Principles of Remote Sensing, Photogrammetry, Application and Principles of
	research route can	GNSS . Practical Training for Engineering

Graduate Abilities	Related Knowledge	Course Supports
	be selected and the	Surveying.
	technical scheme of	
	Surveying and	
	mapping can be	
	designed	
	4.3 It can construct	Surveying Program Design and Data
	the experimental	Processing Industry Surveying and Data
	system according to	Processing Application and Technology of
	the technical scheme	Laser Radar Surveying Practical Training for
	of Surveying and	Satellite Navigation and Positioning, Practical
	mapping, carry out	Training for Control Surveying Practical
	the surveying and	Training for Laser Radar Surveying.
	mapping experiment	Technology.
	safely, and collect	
	the surveying and	
	mapping	
	experimental data	
	correctly	
	4.4 The	Document Retrieval of Science and
	experimental results	Technology Cartography Scientific Paper
	can be analyzed and	Writing, Engineering Surveying, Practical
	explained, and	Training for Real Estate Surveying and
	reasonable and	Management, Practical Training for Laser
	effective	Radar Surveying Technology Comprehensive
	conclusions can be	Practice for Spatial Information Graduation
	obtained through	design.
	information	
	synthesis	
5. Using modern tools:	5.1 Understand the	Introduction to Computational Thinking、C
Be able to develop,	principles and	Programming Language Design、CAD Basic
select and use	methods of modern	and Application、C# Programming、Digital
appropriate surveying	surveying and	Topographic Surveying Application and
and mapping	mapping	Technology of Laser Radar Surveying
technology, information	instruments,	Computer Graphics Big Data an GIS GIS base
resources, modern	information	Application Skill、Real Estate Surveying and
surveying and mapping	technology tools and	Management \ Introduction to Smart City.

Graduate Abilities	Related Knowledge	Course Supports
instruments and	mapping software	
information technology	commonly used in	
tools, including	surveying and	
prediction and	mapping, and	
Simulation of complex	understand their	
surveying and mapping	limitations	
engineering problems,	5.2 Be able to select	Engineering Drawing and Interpreting, Digital
and understand their	and use appropriate	Topographic Surveying, Practical Training for
limitations.	modern surveying	Remote Sensing Principles Practical Training
	and mapping	for Satellite Navigation and Positioning、GIS
	instruments,	Practice Practical Training for Control
	information	Surveying, Comparative Practical Training for
	resources and	Engineering Surveying Practical Training for
	surveying and	Real Estate Surveying and Management
	mapping software to	Practical Training for Laser Radar Surveying
	carry out technical	Technology Comprehensive Practice for
	design, data	Spatial Information Graduation design
	processing and	Surveying and Mapping Skills Practice
	accuracy analysis	Contest.
	for complex	
	surveying and	
	mapping	
	engineering	
	problems	
	5.3 It can develop or	Theory of Probability and Statistics (B),
	select modern	College physics A(1-2), Linear Algebra,
	surveying and	Document Retrieval of Science and
	mapping instruments	Technology, Fundamentals of Error Theory and
	and information	Surveying Adjustment, Surveying Program
	technology tools to	Design and Data Processing, Practical Training
	meet specific needs	for Photogrammetry Graduation design
	for specific	Invocation Practice(School of Surveying and
	surveying and	Mapping Skills Contest、School of Surveying
	mapping objects,	and Mapping Paper Contest).
	predict and simulate	
	complex surveying	

Graduate Abilities	Related Knowledge	Course Supports
	and mapping	
	engineering	
	problems, and	
	analyze their	
	limitations	
	6.1 Understand the	Thought Morals Accomplishment and Basic
	technical standard	Law, Introduction to Civil Engineering, Digital
	system, intellectual	Topographic Surveying Application and
	property rights,	Principles of Remote Sensing, Foundation of
	surveying and	Geodesy、Application and Princples of GNSS、
	mapping	Surveying Management and Laws Digital
	management	Topographic Surveying Practice, GIS Practice,
6. Engineering and	policies, laws and	Comparative Practical Training for Engineering
Society: Be able to	regulations in the	Surveying, Engineering practice class,
make reasonable	field of Surveying	Graduation design.
analysis based on	and mapping, and	
engineering related	understand the	
background knowledge,	influence of	
evaluate the impact of	different social	
Surveying and mapping	cultures on	
engineering practice	engineering	
and complex surveying	activities	
and mapping	6.2 Be able to	The Outline of the Modern Chinese History
engineering problem	analyze and evaluate	The Generality of Basic Principle of Marxism.
solutions on society,	the impact of	Introduction to Mao Zedong Thoughts and
health, safety, law and	Surveying and	Theoretical System of the Chinese
culture, and understand	mapping	characteristic socialism. Engineering
the responsibilities that	engineering practice	Surveying Real Estate Surveying and
should be undertaken.	on society, health,	Management Surveying Management and
	safety, law and	Laws Deformation Monitoring and Disasters
	culture, as well as	Predicting, Classical appreciation and cultural
	the impact of these	inheritance. Scientific and technological
	constraints on the	revolution and social development. Ecological
	implementation of	civilization and future cities.
	engineering projects,	
	and understand the	

Graduate Abilities	Related Knowledge	Course Supports
	responsibilities that	
	should be borne	
	7.1 Know and understand the concept and connotation of environmental	Physics Experiment(1-2), Introduction to Geomatics, Introduction to Earth Science, Remote Sensing Digital Image Processing, Geographic Conditions Monitoring, Natrual Resources Management, Situation and
	protection and sustainable development	Policy(1-4).
7.Environment and sustainable development: Be able to understand and evaluate the impact of complex surveying and mapping engineering practice on the environment and social sustainable development.	7.2 From the perspective of environmental protection and sustainable development, we can think about the sustainability of Surveying and mapping engineering practice, and evaluate the damage and hidden danger that may be caused to human and environment in the practice of Surveying and mapping engineering	Marketing Management、Introduction to Earth Science、Real Estate Surveying and Management、Introduction to Smart City、Geographic Conditions Monitoring、Deformation Monitoring and Disasters Predicting、Practical Training for Control Surveying、Practical Training for Real Estate Surveying and Management、Compound culture class、Graduation design.
8. Occupational norms:	8.1 Have correct	Thought Morals Accomplishment and Basic
With humanities and	values, understand	Law, The Outline of the Modern Chinese
social science literacy,	the relationship	History. The Generality of Basic Principle of
social responsibility,	between individuals	Marxism、Introduction to Mao Zedong
can understand and	and society, and	Thoughts and Theoretical System of the
abide by the	understand China's	Chinese characteristic socialism、Physical

	Related Knowledge	Course Supports						
professional ethics and	national conditions	Education(1-4).						
norms of Surveying and								
mapping industry in the	8.2 Understand the	Thought Morals Accomplishment and Basic						
practice of Surveying	professional ethics	Law, The Outline of the Modern Chinese						
and mapping, and fulfill	and norms of the	History Introduction to Mao Zedong Thoughts						
the responsibility.	surveying and	and Theoretical System of the Chinese						
	mapping industry of	characteristic socialism、College Student						
	honesty, justice and	Occupation Career and Development Planning						
	integrity, and	Introduction to Geomatics Surveying						
	consciously abide by	Management and Laws, Situation and						
	them in the practice	Policy(1-4), Digital Topographic Surveying						
	of Surveying and	Practice Practical Training for Real Estate						
	mapping projects	Surveying and Management、Comprehensive						
		Practice for Spatial Information.						
	8.3 Understand the	The Generality of Basic Principle of Marxism.						
	social responsibility	College Student Occupation Career and						
	of Surveying and	Development Planning, Situation and						
	mapping workers for	Policy(5-8), Introduction to Geomatics,						
	public safety, health,	Introduction to Earth Science, Surveying						
	well-being and	Management and Laws, Graduation design.						
	environmental							
	protection, and be							
	able to consciously							
	perform their							
	responsibilities in							
	surveying and							
	mapping							
	engineering practice							
9. Individuals and	9.1 Be able to	College Student Occupation Career and						
teams: Be able to play	communicate	Development Planning Physical						
the role of individual,	effectively with	Education(1-4). Introduction to Civil						
team member and	members of	Engineering Mechanics						
leader in the team under	architecture, civil	Conspectus of Urban Planning Surveying						
the background of	engineering and	Program Design and Data Processing and						
architecture, civil	other disciplines	Graduation design.						
engineering and other	9.2 Ability to work	Invocation Practice(School of Surveying and						

Graduate Abilities	Related Knowledge	Course Supports
disciplines.	independently or	Mapping Skills Contest、School of Surveying
	cooperatively in a	and Mapping Paper Contest)、Digital
	team	Topographic Surveying Practice Practical
		Training for Remote Sensing Principles
		Practical Training for Satellite Navigation and
		Positioning Practical Training for Control
		Surveying, Practical Training for Engineering
		Surveying, Practical Training for Laser Radar
		Surveying Technology、GIS Software
		Development Practice.
	9.3 Ability to	The Outline of the Modern Chinese History
	organize, coordinate	Cartography Practice、GIS Practice、
	and direct the work	Comprehensive Practice for Spatial
	of the team	Information, Practical Training for Laser Radar
		Surveying Technology Surveying and
		Mapping Skills Contest Practice Graduation
		design.
10. Communication: Be	10.1 Be able to	Cartography Practice Practical Training for
able to effectively	accurately express	Control Surveying Comparative Practical
communicate and	opinions, respond to	Training for Engineering Surveying
communicate with	queries, and	Graduation design.
surveying and mapping	understand the	
peers and the public on	differences of	
complex surveying and	communication with	
mapping engineering	surveying and	
problems, including	mapping peers and	
writing surveying and	the public in written	
mapping technology	statements and	
design book and	statements on	
surveying and mapping	surveying and	
technology summary,	mapping technology	
making statements,	design book and	
clearly expressing or	survey technology	
responding to	summary	
instructions, and having	10.2 Understand the	College English(1-2)、English Country
a certain international	international	Culture Principle of Geographic Information

Graduate Abilities	Related Knowledge	Course Supports
vision, and being able	development trends	System Comprehensive Practice for Spatial
to communicate and	and research	Information Application of Modern Surveying
exchange in	hotspots in the field	and Mapping Technology、GIS base
cross-cultural	of Surveying and	Application Skill Remote Sensing Application
background.	mapping, and	Prospect.
	understand and	
	respect the	
	differences and	
	diversity of different	
	cultures	
	10.3 Have the ability	College English(1-2), Scientific Paper writing,
	of cross-cultural	Oral English Selected readings of English
	communication	Newspapers English for Specific Purposes
	language and written	Engineering Practice Compound Training
	expression, and be	Cross-cultural credit requirements for the
	able to carry out	second classroom (participation in international
	basic	conferences, exhibitions and volunteers, etc.).
	communication and	
	exchange on	
	surveying and	
	mapping	
	professional issues	
	under the	
	cross-cultural	
	background	
11. Project	11.1 Master the	Introduction to Civil Engineering Marketing
management:	management and	Management、Real Estate Surveying and
Understand and master	economic	Management Digital Topographic Surveying
the principles of	decision-making	Practice Practical Training for Control
engineering	methods involved in	Surveying, Comparative Practical Training for
management and	the project	Engineering Surveying Graduation design.
economic	11.2 Understand the	Marketing Management、Surveying
decision-making	whole process cost	Management and Laws, Practical Training for
methods, and can be	composition of	Spatial Information Graduation design.
applied in surveying	Surveying and	
and mapping,	mapping	

Graduate Abilities	Related Knowledge	Course Supports
architecture, civil	engineering and	
engineering,	production of	
environment and other	Surveying and	
disciplines.	mapping products,	
	and understand the	
	engineering	
	management and	
	economic	
	decision-making	
	problems involved	
	11.3 Under the	Comparative Practical Training for Engineering
	environment of civil	Surveying, Practical Training for Real Estate
	engineering,	Surveying and Management, Conspectus of
	architecture and	Urban Planning Graduation design.
	other disciplines, in	
	the process of	
	designing and	
	developing	
	surveying and	
	mapping scheme,	
	the method of	
	engineering	
	management and	
	economic	
	decision-making can	
	be used	
	12.1 Under the	Thought Morals Accomplishment and Basic
12. Lifelong learning:	background of social	Law、College Student Occupation Career and
Have the consciousness	development, we	Development Planning English for Specific
of self-learning and	can realize the	Purposes Appreciation of Famous British and
lifelong learning, and	necessity of	American Literature, Introduction to
have the ability of	self-learning and	Geomatics. Fundamentals of Error Theory and
continuous learning and	lifelong learning	Surveying Adjustment, Surveying Management
adapting to		and Laws, Advanced Technology of Surveying.
development.	12.2 Have the ability	The Generality of Basic Principle of Marxism,
	of self-learning and	Introduction to Mao Zedong Thoughts and

Graduate Abilities	Related Knowledge	Course Supports
	adapting to	Theoretical System of the Chinese
	development,	characteristic socialism. Introduction to Earth
	including the ability	Science, Scientific Paper Writing, Introduction
	to understand the	to Smart City、Application of Artificial
	surveying and	Intelligence in GIS Graduation design
	mapping technical	Invocation Practice(School of Surveying and
	problems, the ability	Mapping Skills Contest、School of Surveying
	to summarize and	and Mapping Paper Contest).
	the ability to ask	
	questions.	

X Table of Teaching Arrangement (appendix table)

表 1 测绘工程专业指导性教学计划

课程光别	课程属性	课程名称	学分	总学时	讲课学时	实验学时	上机学时	课外学时	延续教学	开课 学期	教学单位
		思想道德修养与法律基础 Thought Morals	3	48	48					1	马克思主义学院
		Accomplishment and Basic Law 中国近现代史纲要	3	48	32			16		2	马克思主义学院
		The Outline of the Modern Chinese History 马克思主义基本原理概论★	J	40	32			10			一 一 一 一 一 一
		与兄恋主义基本原理概比★ The Generality of Basic Principle of Marxism	3	48	48					3	马克思主义学院
		毛泽东思想和中国特色社会主义体系理论概 论★ Introduction to Mao Zedong Thoughts and Theoretical System of the Chinese characteristic socialism	5	80	64			16		4	马克思主义学院
		形势与政策(1-4)	2	32	32					1-4	马克思主义学院
	小	Situation and Policy (1-4) 大学生职业生涯与发展规划									
	-	College Student Occupation Career and Development Planning	1	16	16					1/2	学工部
		大学生心理健康 The Mental health of College Students	1	16	16					1/2	学工部
通		大学英语(1-2) ★ College English(1-2)	6	128	96				32	1-2	人文学院
识		大学英语拓展系列课程(1-4) College English training(1-4)	2	32	32					3	人文学院
教		大学英语拓展系列课程(5-8) College English training(5-8)	2	32	32					4	人文学院
育课		体育(1-4) Physical Education(1-4)	4	120	120					1-4	体育部
		计算思维导论 Introduction to Computational Thinking	1. 5	56	24			32		1/2	电信学院
		小 计	33. 5	656	560			80	32		
		建筑艺术与城市设计	2	32						1-8	各院部
	核	哲学逻辑与人文素养	2	32						1-8	各院部
		创新创业与社会发展	2	32						1-8	各院部
	心	生态文明与智慧科技	2	32						1-8	各院部
		至少修读 4 类合	计 8 🗄	学分,	每类	至少何	· 多读 2	学分			
		工程实践类		-			期任法				 各院部
	任	复合培养类	1-8 学期任选						各院部		
	选		类任道	先至小							
		通识教育课合 其中通识教育必修 33.5 学分,通识教育核	计至り	少修 诗	÷ 43. 5	5 学分) 学分	· (今)	休育運	11 受分)

程类别	课程属性	课程名称	学 分	总学时	讲课学时	实验学时	上机学时	课外学时	延续教学	开课 学期	教学单位
		高等数学 A (1) ★ Advanced Mathematics A(1)	5	92	80				12	1	理学院
		高等数学 A (2) ★ Advanced Mathematics A(2)	5	84	80				4	2	理学院
		线性代数 Linear Algebra	2	40	32				8	2	理学院
		概率与数理统计 B Theory of Probability and Statistics (B)	3	48	44				4	3	理学院
		普通物理 A (1) ★ College physics A(1)	3	<mark>56</mark>	52			4		2	理学院
		普通物理 A(2)★ College physics A(2)	3	<mark>56</mark>	52			4		3	理学院
	必	物理实验(1-2) Physics Experiment(1-2)	2	60		60				3-4	理学院
	36.	C语言程序设计 ★ CProgramming Language	2	32	24	8				1	地理信息科学系
大	修	地球科学概论 Introduction to Earth Science	2	32	32					1	地理信息科学系
类基		测绘地理信息概论 Introduction to Geomatics	1	16	16					1	测绘学院
垄		CAD 基础与应用 CAD Basic and Application	2	32	16	16				1	测绘工程系
础		数字地形测量学★ Digital Topographic Surveying	4	64	52	12				2	测绘工程系
课		地图学 Cartography	3	48	40	8				3	地理信息科学系
		地理信息系统原理(双语)★ The Principle of Geographic Information System	3	48	40	8				3	地理信息科学系
		遥感原理与应用★ Principles of Remote Sensing and Application	3	48	48					3	遥感工程系
		小 计	43	756	608	112		8	28		
-		现代测绘技术应用 Application of Modern Surveying and Mapping Technology	1	16	16					2	测绘工程系
	选	GIS 基础应用技能 GIS base Application Skill	1	16	8	8				2	地理信息科学系
	修	遥感应用前景Remote Sensing Applicantion Prospect	1	16	16					3	遥感工程系
		小 计	3	48	40	8					
		大类学科基础课合计 44	学分	,必	修 43	学分,	任选	1学	分		
		误差理论与测量平差基础 ★Fundamentals of Error Theory and Surveying Adjustment	3	48	48					4	测绘工程系
专		大地测量学基础★ Foundation of Geodesy	3	48	40	8				4	测绘工程系
业	必	GNSS 原理及其应用★ The Application and Principles of GNSS	3	48	44	4				5	测绘工程系
核	修	摄影测量学★ Photogrammetry	3	48	40	8				5	遥感工程系
心		工程测量学★ Engineering Surveying	4	64	56	8				6	测绘工程系
课		小计	16	256		28				0	1/3/
		专业核心	课合	计必值	多 <mark>16</mark> 4	 学分					

课程类别	课程属性	课程名称	学分	总学时	讲课学时	实验学时	上机学时	课外学时	延续教学	开课 学期	教学单位
		变形监测与灾害预报 Deformation Monitoring and Disasters Predicting	2	32	24	8				5	测绘工程系
	必	不动产测量与管理 Real Estate Surveying and Management	2	32	28	4				7	测绘工程系
	修	激光雷达测量技术与应用 The Application and Technology of Laser Radar Surveying	2	32	24	8				7	测绘工程系
		小 计	6	96	76	20					
		C#程序设计 C# Programming	2	32	16	16				4	地理信息科学系
		地图设计与编绘 Map Design and Compilation	2	32	16	16				4	地理信息科学系
		数据结构(限选)Data structure	2	32	32					4	遥感工程系
		遥感数字图像处理 Remote Sensing Digital Image Processing	2	32	24	8				5	遥感工程系
		科技文献检索 Document Retrieval of Science and Technology	1	16	16			8		5	图书馆
		高精度导航地图与位置服务(限选) High-Precision Navigation Map and Location Service	2	32	32					5	测绘工程系
专		土木工程概论 限选)Introduction to Civil Engineering	3	48	48					5	土木学院
业		测量程序设计与数据处理(限选)Surveying Data Processing and Programming	2	32	32					5	测绘工程系
方		工程制图与识图 (限选) Engineering Drawing and Interpreting	2	32	32					6	理学院
向	选	测绘管理与法律法规(限选) Surveying Management and Laws	1	16	16					6	测绘工程系
课	Ų	计算机图形学(限选) Computer Graphics	2	32	24	8				6	地理信息科学系
	修	工业测量与数据处理(限选) Industry Surveying and Data Processing	1. 5	24	24					6	测绘工程系
		城市遥感(双语)(限选) Urban Remote Sensing	1. 5	24	16	8				6	遥感工程系
		近景摄影测量 Close-range Photogrammetry	2	32	26	6				6	遥感工程系
		大数据与地理信息系统 Big Data and GIS	1.5	24	16	8				6	地理信息科学系
		智慧城市导论 (限选) Introduction to Smart City	1	16	16					6	地理信息科学系
		科技论文写作(双语) Scientific Paper writing	1	16	16					6	测绘工程系
		自然资源管理 Natural Resources Management	1	16	16					7	地理信息科学系
		地理国情监测(限选) Geographic Conditions Monitoring	1. 5	24	16	8				7	地理信息科学系
		新型航空遥感数据处理技术 Modern aerial remote sensing data processing technology	2	32	32					7	遥感工程系
		遥感影像深度学习与智能解译 Deep learning and intelligent interpretation of remote sensing image	2	32	32					7	遥感工程系

测绘地理信息技术前沿 Advanced Technology of Surveying, Mapping and GIS	1	16	16					7	测绘学院
城市规划概论 Conspectus of Urban Planning	1.5	24	20	4				7	建筑学院
市场营销 Marketing Management	1.5	24	24					7	经管学院
小 计	40	640	<mark>558</mark>	<mark>82</mark>		8			
专业方向课合计 27.5 学分,必修 6 学分,任选至少修读 21.5 学分									

表 2 测绘工程专业指导性教学计划(实践环节)

课程		学	折合	实验	上	 开课	开设	
属性	课程名称	分	学时	实践	机	学期	周次	教学单位
	军事理论	2	36					
	Military Theory		30			1	1-3	武装部
	军训	2	112			1		4H XX JAI
	Military Training		112					
	形势与政策(5-8)Situation and Policy(5-8)	-	32			5-8	分散	马院、各学院
	数字地形测量实习	3	60	60		2	18-20	测绘工程系
	Digital Topographic Surveying Practice			00			10 20	N124 11271
	地图学实习 Cartography Practice	2	40	40		3	17-18	地理信息科学系
	地理信息系统原理实习							
	GIS Practice	2	40		40	3	19-20	地理信息科学系
	控制测量实习							
	Practical Training for Control Surveying	2	40	40		4	19-20	测绘工程系
	遥感原理实习 Practical Training for	,	00	00		,	10	マポーロズ
	Principles of Remote Sensing	1	20	20		4	18	遥感工程系
课	摄影测量实习 Practical Training for	1	20	20		5	20	遥感工程系
内	Photogrammetry	1	20	20		0	20	迪 芯工注水
	卫星导航定位实习 Practical Training for	1	20	20		5	19	测绘工程系
	Satellite Navigation and Positioning 自然地理地貌及遥感图像解译实习							V.V. E
	自然地理地貌及進懋對涿舺洋头刁 Natural Geography and Remote Sensing image	1	20	20		6	16	遥感工程系
	interpretation Practice	1	20	20		0	10	世 恋 上 住 於
	工程测量综合实习 Comparative Practical							
	Training for Engineering Surveying	4	80	80		6	17-20	测绘工程系
	空间信息综合实习 Spatial Information	_	100	100		-	1.5	그리 사스 과수 만수
	Practice	5	100	100		7	1-5	测绘学院
	不动产测量与管理实习 Practical Training for	1	20	10	10	7	18	测绘工程系
	Real Estate Surveying and Management	_	20	10	10	•	10	网络工作系
	激光雷达测量技术实习 Practical Training for Laser Radar Surveying Technology	2	40	20	20	7	19-20	测绘工程系
	毕业设计与毕业答辩							
	Graduation design and defense	8	160	160		8	1-16	测绘工程系
	小计	37	840	590	70			
-	测绘技能大赛实训 Surveying	31	040	590	10			
	网络汉尼人泰夫州 Surveying and Mapping Skills Practice	2	40	40		4	1-10	测绘工程系
	Contest		40	40		4	1-10	例
	学院测绘技能大赛 School of							
	Surveying and Mapping Skills	1	20	20		4		测绘学院
	Contest							
课	创新实践及科研测量程序设计大赛实训							
外	训练 Surveying Programming Design	1	20	20		5		测绘工程系
	Practice Contest							
	北斗创新创业大赛 Beidou Innovation and	1	20	20		5		测绘工程系
	Entrepreneurship Contest	1	20	20		5		
	全国论文大赛 Mostrule		0.0	0.0)Eid (V))(127-
	Cup-National Paper Contest	1	20	20				测绘学院

课程属性	课程名称	学分	折合学时	实验实践	上机	开课 学期	开设 周次	教学单位		
	GIS 软件开发大赛实训 GIS Software Development Practice	1	20	20				地理信息科学系		
	科研训练 Scientific research training	1	20	20				测绘工程系		
	小 计	8	160	160						
	实践环节合计 39 学分,课内必修 37 学分,课外(创新实践及科研训练)必修 2 学分									

2020 级测绘工程(智能导航实验班)专业本科培养方案

一、专业基本信息

英文名称	Surveying and Mapping Engineering (Intelligent Navigation)									
专业代码	081201	学科门类	工学							
学 制	4年	授予学位	工学学士							

二、培养目标和专业特色

1.培养目标

培养德、智、体、美、劳全面发展,掌握测绘工程与导航定位基础理论、基本知识和基本技能,接受科学思维和工程实践训练,具有人文素养、职业道德和社会责任感,胜任国家基础测绘、城乡建设、应急管理、智能交通、位置服务等领域项目的设计、生产、研发及管理工作,具有较强的组织管理能力、创新意识、继续学习能力、国际视野和智能导航特色的应用型工程技术人才。

毕业后经过5年左右的工作和学习,能够达到如下目标:

- (1) 具备基础测绘、高精度导航地图生产、导航产品制造、大数据分析与位置服务、智能导航硬件研发等专业技术能力,能在国家基础测绘、城乡建设、应急管理、智能交通、位置服务等领域胜任工程勘测、设计、施工及管理等方面的测绘技术工作;
- (2) 具有良好专业素养、丰富的工程管理经验和极强工作责任心,成为测绘地理信息及导航相关企事业单位中的技术负责人或技术骨干;
 - (3) 具有继续学习适应发展的能力,能够独立或协同承担测绘地理信息科研工作;
- (4) 具有良好的团队意识、国际化视野和沟通能力,能在设计、生产、研发和多学科团队中担任组织管理骨干或技术负责人角色,具备团队协作精神及领导力;
- (5) 具有良好的思想道德修养和科学文化素养,具有社会责任感、事业心及良好的职业道德,能够承担和履行社会责任,服务于国家与社会。

2.专业特色

本专业依托首都建设和学校土木建筑类学科优势,培养服务首都、面向全国,具备解决智慧城市测绘相关问题,能进行导航定位产品研发及集成解决方案设计的测绘人才。人才培养适应测绘高新科技发展,融教学、科研和生产为一体,强调理论与实践密切结合,培养测绘新技术、新方法、新工艺的应用能力,突出城市测绘特色,服务于城市测绘与管理、智能交通、应急管理、互联网、航空航天等领域。

三、主干学科

测绘科学与技术

四、主干课程

1. 主干基础课程

测绘地理信息概论、工程制图与识图、C语言程序设计、地球科学概论、导航装备基础、数字地形测量学、地图学、CAD基础与应用、误差理论与测量平差基础、大地测量学基础、地理信息系统原理(双语)、遥感原理与应用、摄影测量学。

2. 主干专业课程

GNSS 原理及其应用、工程测量学、嵌入式系统与程序设计、高精度导航地图与位置服务、GNSS 程序设计、室内定位与智能导航。

五、主要实践教学环节

1. 主要实验

数字地形测量学实验、GNSS 原理及其应用实验、摄影测量学实验、地理信息系统原理实验、 大地测量学基础实验、工程测量学实验、导航装备基础实验。

2. 主要实践环节

数字地形测量实习、卫星导航定位实习、遥感原理实习、摄影测量实习、地理信息系统实习、 地图学实习、控制测量实习、导航装备基础实习、工程测量综合实习、导航定位综合实习、高精度 地图采集实习、导航定位嵌入式研发实习。

六、毕业学分要求

参照北京建筑大学本科学生学业修读管理规定及学士学位授予细则,修满本专业最低计划学分应达到 174 学分,其中理论课程 131 学分,实践教学环节 43 学分(含创新实践及科研训练必修 6 学分)。

七、各类课程结构比例

2. 17w/1711/2007					
课程类别	课程属性	学分	学时	学分比例	
)즉)타시· 주)퍼	必修	41.5	672	23.85%	
通识教育课	选修	2	32	1.15%	
大类基础课	必修	44.5	772	25.57%	
专业核心课	必修	14	224	8.05%	
	必修	11	176	6.32%	
专业方向课	选修	18	288	10.34%	
独立实践环节	必修	37	1224	21.26%	
	选修	6	120	3.45%	
总计		174	3508	100%	

八、教学进程表

学期	教学周	考试	实践	学期	教学周	考试	实践
1	4-19 周	20 周	1-3 周	2	1-15 周	16周	17-20 周
3	1-14 周	15-16 周	17-20 周	4	1-15 周	16周	17-20 周

学期	教学周	考试	实践	学期	教学周	考试	实践
5	1-16 周	17-18 周	19-20 周	6	1-14 周	15 周	16-20 周
7	6-18 周	19 周	1-5 周 20 周	8	1-16 埠	坐设计/实习	17 周答辩

九、毕业生应具备的知识能力及实现矩阵

毕业生应具备的知识能力	相关知识领域	实现途径 (课程支撑)
十亚工厂 共 田 时 州	1.1 能将数学、自然科学、	计算思维导论、C 语言程序设计、
	工程科学的语言工具用	GNSS 程序设计、CAD 基础与应用、
	于测绘与导航问题的表	工程制图与识图、高等数学 A(1-2)、
	述	概率与数理统计 B、普通物理 A(1-2)、
		线性代数、土木工程概论、地图学、
		遥感原理与应用、地球科学概论、计
		算机图形学、地图设计与编绘等。
	1.2 能针对具体的测绘与	高等数学 A(1-2)、线性代数、物理实
	导航对象建立数学模型	验 (1-2)、数字地形测量学、地理信
	并求解	息系统原理 (双语)、摄影测量学、变
1.工程知识: 能够将数学、	71 44 4 101	形监测与灾害预报、大地测量学基础、
自然科学、工程基础和专业		误差理论与测量平差基础、导航装备
知识用于解决复杂测绘工		基础等。
程问题。	1.3 能够将数学、自然科	计算思维导论、CAD 基础与应用、工
	学、工程基础和专业知识	程制图与识图、线性代数、GNSS 原
	以及数学模型方法用于	理及其应用、激光雷达测量技术与应
	推演、分析复杂测绘与导	用、计算机图形学、工程测量学、地
	航问题	图设计与编绘等。
	1.4 能够将数学、自然科	C 语言程序设计、GNSS 程序设计、
	学、工程基础和专业知识	概率与数理统计 B、数字地形测量实
	以及数学模型方法用于	习、地图学实习、摄影测量实习、导
	复杂测绘与导航问题解	航装备基础实习、导航定位综合实习、
	决方案的比较与综合	毕业设计等。
0 问题八托、轮放应用数	2.1 能运用数学、自然科	计算思维导论、C 语言程序设计、
2.问题分析: 能够应用数学、自然科学和工程科学的基本原理。识别、基础、并	学和工程科学原理,识别	GNSS 程序设计、高等数学 A(1-2)、
	和判断复杂测绘与导航	概率与数理统计 B、物理实验 (1-2)、
基本原理,识别、表达、并通过文献研究分析复杂测	问题的关键环节	线性代数、土木工程概论、C#程序设
通过文献研究分析复杂测 公共程序放结		计、地图学、地理信息系统原理(双
会工程问题,以获得有效结		语)、地球科学概论、变形监测与灾害
论。		预报、摄影测量实习、地图设计与编

毕业生应具备的知识能力	相关知识领域	实现途径(课程支撑)
		绘等。
	2.2 能基于数学、自然科	CAD 基础与应用、数字地形测量学、
	学和工程科学原理和数	误差理论与测量平差基础、测量程序
	学模型方法正确表达复	设计大赛实训、激光雷达测量技术与
	杂测绘与导航问题	应用、GIS 基础应用技能、工程测量
		学、室内定位与智能导航等。
	2.3能认识到解决测绘与	C 语言程序设计、GNSS 程序设计、
	导航问题有多种方案可	科技文献检索、摄影测量学、大地测
	选择,会通过文献研究寻	量学基础、工程测量学、地理信息系
	求可替代的解决方案	统原理实习、高精度地图采集实习等。
	2.4 能运用数学、自然科	普通物理 A(1-2)、科技文献检索、
	学和工程科学的基本原	GNSS 原理及其应用、控制测量实习、
	理,借助文献研究,分析	工程测量综合实习、毕业设计、科研
	过程的影响因素,获得有	团队创新训练等。
	效结论	
	3.1 掌握测绘与导航工程	计算思维导论、CAD 基础与应用、GIS
	设计、实施、管理等全流	基础应用技能、不动产测量与管理、
	程相关技术,以及测绘与	智慧城市导论、工程测量学、摄影测
	导航产品研发的全周期	量实习、工程测量综合实习、导航定
	生产方法,了解影响设计	位综合实习、地图设计与编绘等。
	目标和技术方案的各种	
3.设计/开发解决方案:能	因素。	
够设计针对复杂测绘工程	3.2 能够针对特定需求,	GNSS 程序设计、CAD 基础与应用、
问题的解决方案,设计满足	完成测绘与导航系统、产	地理信息系统原理 (双语)、摄影测量
特定需求的测绘系统或测	品研发流程的设计	实习、GNSS 原理及其应用、激光雷
会生产流程,并能够在设计		达测量技术与应用、工程测量学、卫
环节中体现创新意识,考虑		星导航定位实习、测量程序设计大赛
社会、健康、安全、法律、		实训等。
文化以及环境等因素。	3.3能够进行测绘与导航	数字地形测量学、工程测量学、地理
义化以及小児守凶系。	系统或产品研发流程的	国情监测、创新实践(测绘技能大赛、
	设计,在设计中体现创新	测绘科技论文大赛)、数字地形测量实
	意识	习、工程测量综合实习、创新创业类、
		毕业设计等。
	3.4 在测绘与导航系统	测绘地理信息概论、创新实践(测绘
	或产品研发流程的设计	技能大赛、测绘科技论文大赛)、数字
	中能够考虑安全、健康、	地形测量实习、工程测量综合实习、

毕业生应具备的知识能力	相关知识领域	实现途径 (课程支撑)
	法律、文化及环境等制约	创新创业类、毕业设计等。
	因素	
	4.1 能够基于科学原理,	地图学、地理信息系统原理(双语)、
	通过文献研究,采用科学	大地测量学基础、工程测量学、智慧
	方法,调研和分析复杂测	城市导论、地理国情监测、遥感原理
	绘与导航问题的解决方	实习、地图学实习、卫星导航定位实
	案	习等。
	4.2 能够根据测绘与导	计算思维导论、工程制图与识图、遥
4.研究: 能够基于科学原理	航对象特征,选择研究路	感原理与应用、摄影测量学、GNSS
并采用科学方法对复杂测	线,设计测绘与导航技术	原理及其应用、导航定位综合实习等。
绘工程问题进行研究,包括	方案	
设计实验、分析与解释数	4.3 能够根据测绘与导	GNSS 程序设计、激光雷达测量技术
据、并通过信息综合得到合	航技术方案构建实验系	与应用、卫星导航定位实习、测量程
理有效的结论。	统,安全地开展测绘与导	序设计大赛实训、控制测量实习、激
	航实验,正确地采集测绘	光雷达测量技术实习等。
	与导航实验数据	
	4.4 能对实验结果进行	科技文献检索、地图学、科技论文写
	分析和解释,并通过信息	作(双语)、工程测量学、不动产测量
	综合获得合理有效结论	与管理实习、激光雷达测量技术实习、
		空间信息综合实习、毕业设计等。
	5.1 了解测绘常用的现代	计算思维导论、C 语言程序设计、CAD
	测绘与导航仪器、信息技	基础与应用、C#程序设计、GNSS 程
	术工具和测绘与导航软	序设计、数字地形测量学、激光雷达
	件的使用原理和方法,并	测量技术与应用、计算机图形学、大
5.使用现代工具:能够针对	理解其局限性	数据与地理信息系统、GIS 基础应用
复杂测绘工程问题,开发、		技能、不动产测量与管理、智慧城市
选择与使用恰当的测绘技		导论。
术、信息资源、现代测绘仪	5.2能够选择与使用恰当	工程制图与识图、工业智能定位测量、
器和信息技术工具,包括对	的现代测绘与导航仪器、	数字地形测量实习、遥感原理实习、
复杂测绘工程问题的预测	信息资源和测绘与导航	卫星导航定位实习、地理信息系统原
与模拟,并能够理解其局限	软件,对复杂测绘与导航	理实习、控制测量实习、工程测量综
性。	工程问题进行技术设计、	合实习、不动产测量与管理实习、激
	数据处理与精度分析	光雷达测量技术实习、空间信息综合
		实习、毕业设计、测绘技能大赛实训
		等。
	5.3 能够针对具体的测	概率与数理统计 B、普通物理 (1-2)、

毕业生应具备的知识能力	相关知识领域	实现途径 (课程支撑)
	绘与导航对象,开发或选	线性代数、科技文献检索、误差理论
	用满足特定需求的现代	 与测量平差基础、测量程序设计与数
	测绘与导航仪器、信息技	 据处理、摄影测量基础实习、毕业设
	术工具,对复杂测绘与导	 计、创新实践(测绘技能大赛、测绘
	 航工程问题进行预测与	 科技论文大赛)等。
	 模拟, 并能够分析其局限	
	性	
	6.1 了解测绘与导航领	思想道德修养与法律基础、土木工程
	域的技术标准体系、知识	概论、数字地形测量学、遥感原理与
	产权、测绘管理政策和法	 应用、大地测量学基础、GNSS 原理
	律法规,理解不同社会文	 及其应用、测绘管理与法律法规、数
6.工程与社会:能够基于工	化对工程活动的影响	 字地形测量实习、地理信息系统原理
程相关背景知识进行合理		 实习、工程测量综合实习、工程实践
分析,评价测绘工程实践和		类、毕业设计等。
复杂测绘工程问题解决方	6.2能分析和评价测绘与	中国近现代史纲要、马克思主义基本
案对社会、健康、安全、法	导航工程实践对社会、健	原理概论、毛泽东思想和中国特色社
律以及文化的影响,并理解	康、安全、法律、文化的	会主义体系理论概论、工程测量学、
应承担的责任。 	影响,以及这些制约因素	不动产管理与测量、测绘管理与法律
	对工程项目实施的影响,	法规、变形监测与灾害预报、哲学视
	并理解应承担的责任	野与人文素养、创新创业与社会发展、
		生态文明与智慧科技等。
	7.1 知晓和理解环境保护	物理实验 (1-2)、测绘地理信息概论、
	和可持续发展的理念和	地球科学概论、遥感数字图像处理、
	内涵	地理国情监测、自然资源管理、形势
7.环境和可持续发展:能够		与政策(1-4)等。
理解和评价针对复杂测绘	7.2能够从环境保护和可	市场营销、地球科学概论、不动产测
工程问题的测绘工程实践	持续发展的角度思考测	量与管理、智慧城市导论、地理国情
对环境、社会可持续发展的	绘与导航工程实践的可	监测、变形监测与灾害预报、控制测
影响。	持续性,评价测绘与导航	量实习、不动产测量与管理实习、复
	工程实践中可能对人类	合培养类、毕业设计等。
	和环境造成的损害和隐	
	患	
8.职业规范: 具有人文社会	8.1 具有正确价值观,理	思想道德修养与法律基础、中国近现
科学素养、社会责任感,能	解个人与社会的关系,了	代史纲要、马克思主义基本原理概论、
够在测绘工程实践中理解	解中国国情	毛泽东思想和中国特色社会主义体系
并遵守测绘行业职业道德		理论概论、体育(1-4)、军训、军事

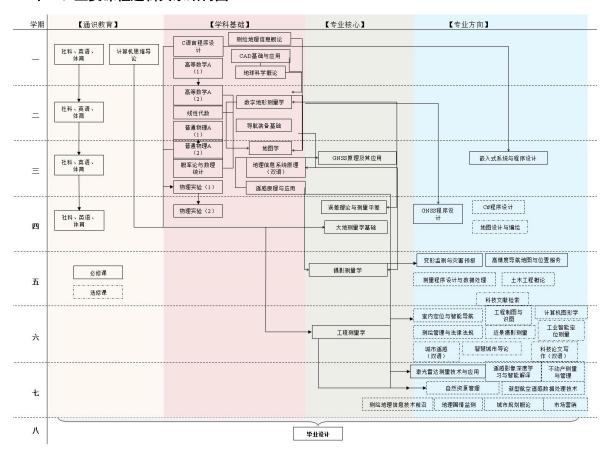
毕业生应具备的知识能力	相关知识领域	实现途径 (课程支撑)
和规范,履行责任。		理论等。
	8.2 理解诚实公正、诚信	思想道德修养与法律基础、中国近现
	守则的测绘与导航行业	代史纲要、毛泽东思想和中国特色社
	职业道德和规范,并能在	会主义体系理论概论、大学生职业生
	测绘与导航工程实践中	涯与发展规划、测绘地理信息概论、
	自觉遵守	测绘管理与法律法规、形势与政策
		(1-4)、数字地形测量实习、不动产
		测量与管理实习、导航定位综合实习
		等。
	8.3理解测绘与导航工作	马克思主义基本原理概论、大学生职
	人员对公众的安全、健	业生涯与发展规划、形势与政策
	康、福祉、环境保护的社	(5-8)、测绘地理信息概论、地球科
	会责任,能够在测绘与导	学概论、测绘管理与法律法规、毕业
	航工程实践中自觉履行	设计等。
	责任	
	9.1 能与建筑、土木等学	大学生职业生涯与发展规划、体育
	科的成员有效沟通,合作	(1-4)、土木工程概论、城市规划概
	共事	论、测量程序设计与数据处理、毕业
		设计等。
	9.2能够在团队中独立或	创新实践(测绘技能大赛、测绘科技
9.个人和团队: 能够在建	合作开展工作	论文大赛)、数字地形测量实习、遥感
筑、土木等学科背景下的团		原理实习、卫星导航定位实习、控制
队中承担个体、团队成员以		测量实习、工程测量综合实习、激光
及负责人的角色。		雷达测量技术实习、GIS 软件开发大
		赛实训等。
	9.3 能够组织、协调和指	中国近现代史纲要、地图学实习、地
	挥团队开展工作	理信息系统原理实习、导航定位综合
		实习、激光雷达测量技术实习、测绘
		技能大赛实训、毕业设计等。
10.沟通:能够就复杂测绘	10.1 能就测绘与导航专	地图学实习、控制测量实习、工程测
工程问题与测绘同行及社	业问题,在测绘与导航技	量综合实习、毕业设计等。
会公众进行有效沟通和交	术设计书、测绘与导航技	
流,包括撰写测绘技术设计	术总结等书面表述以及	
书和测绘技术总结等、陈述	陈述发言中,准确表达观	
发言、清晰表达或回应指	点,回应质疑,理解与测	
令,并具备一定的国际视	绘与导航同行及社会公	

毕业生应具备的知识能力	相关知识领域	实现途径 (课程支撑)
野,能够在跨文化背景下进	众交流的差异性	
行沟通和交流。	10.2 了解测绘与导航专	大学英语(1-2)、英语国家文化、地
	业领域的国际发展趋势、	理信息系统原理(双语)、空间信息
	研究热点,理解和尊重不	综合实习、现代测绘技术应用、GIS
	同文化的差异性和多样	基础应用技能、遥感应用前景等。
	性	
	10.3 具备跨文化交流的	大学英语(1-2)、科技论文写作(双
	语言和书面表达能力,能	语)、口语、英语报刊选读、专门用
	就测绘与导航专业问题,	途英语、工程实践类、复合培养类、
	在跨文化背景下进行基	第二课堂跨文化学分要求(参与国际
	本沟通和交流	会议、展览及志愿者等)等。
	11.1 掌握工程项目中涉	土木工程概论、市场营销、不动产测
	及的管理与经济决策方	量与管理、数字地形测量实习、控制
	法	测量实习、工程测量综合实习、毕业
		设计等。
11.项目管理:理解并掌握	11.2 了解测绘与导航工	市场营销、测绘管理与法律法规、空
工程管理原理与经济决策	程及产品研发的全流程	间信息综合实习、毕业设计等。
方法,并能在测绘、建筑、	成本构成,理解其中涉及	
土木、环境等学科环境中应	的工程管理与经济决策	
用。	问题	
	11.3 能在土木、建筑等	工程测量综合实习、不动产测量与管
	学科环境下,在设计开发	理实习、城市规划概论、毕业设计等。
	测绘与导航方案的过程	
	中,运用工程管理与经济	
	决策方法	田和松往传光上小位十十十二十八十十
	12.1 能在社会发展的大	思想道德修养与法律基础、大学生职
	背景下,认识到自主学习	业生涯与发展规划、专门用途英语、
	和终身学习的必要性	英美文学名篇赏析、测绘地理信息概
10 极自严可 日本百之》		。 一论、误差理论与测量平差基础、测绘 一等理点法律法规。测绘地理信息技术
12.终身学习: 具有自主学		管理与法律法规、测绘地理信息技术
习和终身学习的意识,有不	100日本白子巡司和任	前沿等。
断学习和适应发展的能力。	12.2 具有自主学习和适	马克思主义基本原理概论、毛泽东思
	应发展的能力,包括对测	想和中国特色社会主义体系理论概
	绘与导航技术问题的理 解能力,归纳总结的能力	论、地球科学概论、科技论文写作(双 语)、智慧城市导论、人工智能在地理
	和提出问题的能力等。	信息系统中的应用、毕业设计、创新

毕业生应具备的知识能力	相关知识领域	实现途径 (课程支撑)
		实践(测绘技能大赛、测绘科技论文
		写作大赛、北斗创新创业大赛、导航
		定位终端嵌入式程序设计大赛、"北斗
		杯"全国青少年科技创新大赛)等。

十、指导性教学计划(见附表)

十一、主要课程逻辑关系结构图



2020 Undergraduate Program for Specialty in Surveying and Mapping Engineering (Intelligent Navigation)

I Specialty Name and Code

English Name	Surveying and Mapping Engineering (Intelligent Navigation)		
Code	081201	Disciplines	Engineering
Length of Schooling	Four years	Degree	Bachelor of Engineering

II Educational Objectives and Features

1.Objectives

This program is to cultivate all-round development of morality, intelligence, physique, beauty and labor, master the basic theory, basic knowledge and basic skills of Surveying and mapping engineering and navigation positioning, accept the training of scientific thinking and engineering practice, have humanistic quality, professional ethics and social responsibility, and be competent for the design, production and research and development of national basic surveying and mapping, urban and rural construction, emergency management, intelligent transportation, location-based services and other fields And management, with strong organization and management ability, innovation consciousness, continuous learning ability, international vision and intelligent navigation characteristics of Applied Engineering and technical personnel. After five years of work and study after graduation, students can achieve the following goals:

- (1) It has the professional technical ability of basic surveying and mapping, high-precision navigation map production, navigation product manufacturing, big data analysis and location service, intelligent navigation hardware research and development, and is competent in surveying and mapping technology work in the fields of national basic surveying and mapping, urban and rural construction, emergency management, intelligent transportation, location service, etc;
- (2) With good professional quality, rich engineering management experience and strong sense of responsibility, become the technical director or technical backbone of enterprises and institutions related to surveying and mapping geographic information and navigation;
- (3) Have the ability to continue learning to adapt to the development, and be able to independently or cooperatively undertake the scientific research of Surveying and mapping geographic information;
- (4) Have good team consciousness, international vision and communication ability, be able to play the role of organizational management backbone or technical director in design, production, R & D and multidisciplinary teams, with team spirit and leadership;
- (5) With good ideological and moral cultivation and scientific and cultural literacy, with a sense of social responsibility, dedication and good professional ethics, can undertake and perform social responsibility, serve the country and society.

2.Features

Relying on the advantages of capital construction and civil architecture discipline, this major cultivates surveying and mapping talents who serve the capital and face the whole country, have the ability to solve the problems related to smart city surveying and mapping, and can carry out the research and development of navigation positioning products and integrated solution design. Personnel training adapts to the development of high-tech surveying and mapping, integrates teaching, scientific research and production, emphasizes the close combination of theory and practice, cultivates the application ability of new technology, new method and new process of Surveying and mapping, highlights the characteristics of Urban Surveying and mapping, and serves urban surveying and mapping and management, intelligent transportation, emergency management, Internet, aerospace and other fields.

III Major Disciplines

Science and Technology of Surveying and Mapping

IV Major Courses

1. Basic Courses

Introduction to Geomatics, Engineering Drawing and Read Drawing, C Language Programming Design, Introduction to Earth Science, Foundation of Navigation Equipment, Digital Topographic Surveying, Cartography, CAD Basic and Application, Fundamentals of Error Theory and Surveying Adjustment, Foundation of Geodesy, Principle of Geographic Information System (Bilingual), Application and Principles of Remote Sensing, Photogrammetry.

2. Specialty Courses

Application and Principles of GNSS, Engineering Surveying, Embedded System and Programming, High Precision Navigation Map and Location Service, GNSS Programming, Indoor Positioning and Intelligent Navigation.

V Major Practical Training

1. Major experiment

Experiment of Digital Topographic Surveying, Experiment of Application and Principle of GNSS, Experiment of Photogrammetry, Experiment of GIS Principle, Experiment of Foundation of Geodesy, Experiment of Engineering Surveying, Experiment of Foundation of Navigation Equipment.

2. Major Practical Training

Digital Topographic Surveying Practice, Satellite Navigation and Positioning Practice, Principle of Remote Sensing Practice, Photogrammetry Practice, GIS Practice, Cartography Practice, Control Surveying Practice, Foundation of Navigation Equipment Practice, Comprehensive Training for Engineering Surveying, Comprehensive Training for Navigation and Positioning, High-precision Map Collection Practice, Navigation and Positioning Embedded Research and Development Practice.

VI Graduation Requirements

In accordance with "Management Regulations for the Undergraduate Students of Beijing University of Civil Engineering and Architecture" and "Bachelor's Degree Awarding Regulations", the minimum credits required by specialty for graduate is 174, including 131 credits of theoretical courses and 43 credits of practice teaching (2 credits of compulsory innovation practice and scientific research training included).

VII Proportion of Course

Course Category	Course Type	Credits	Class Hour	Proportion
C 151	Compulsory	41.5	672	23.85%
General Education	Optional	2	32	1.15%
Big Academic Subjects	Compulsory	44.5	772	25.57%
Professional Core	Compulsory	14	224	8.05%
	Compulsory	11	176	6.32%
Professional Direction	Optional	18	288	10.34%
	Compulsory	37	1224	21.26%
Practice	Optional	6	120	3.45%
Total		174	3508	100%

VIII Table of Teaching Program

Semester	Teaching	Exam	Practice	Semester	Teaching	Exam	Practice
1	4-19	20	1-3	2	1-15	16	17-20
3	1-14	15-16	17-20	4	1-15	16	17-20
5	1-16	17-18	19-20	6	1-14	15	16-20
7	6-18	19	1-5 20	8	1-16 grad	uation project	17 defense

IX Graduate Abilities and Matrices

Graduate Abilities	Related Knowledge	Course Supports
1 17	1.1 Be able to use t	Introduction to Computational Thinking, C Langua
1. Engineering knowle	he language tools of	ge Programming, GNSS Programming, CAD Bas
dge: Be able to use math	mathematics, natura	ic and Application, Engineering Drawing and Inter
ematics, natural science, e	1 science and engine	preting, Advanced Mathematics A(1-2), Theory of
ngineering foundation and	ering science to expr	Probability and Statistics (B), College physics A
professional knowledge t	ess Surveying and	(1-2), Linear Algebra, Introduction to Civil Engin
o solve complex surveyin	Mapping Engineerin	eering, Cartography, Application and Principles of
g and mapping engineerin	g & Navigation pro	Remote Sensing, Introduction to Earth Science,
g problems.	blems	Computer Graphics Map Design and Compilation.

Graduate Abilities	Related Knowledge	Course Supports
	1.2 Be able to estab	Advanced Mathematics A(1-2), Linear Algebra, P
	lish mathematical m	hysics Experiment(1-2), Digital Topographic Surve
	odel and solve for s	ying, Principle of Geographic Information System,
	pecific Surveying an	Photogrammetry, Deformation Monitoring and Dis
	d Mapping Engineeri	asters Predicting, Foundation of Geodesy, Funda
	ng & Navigation obj	mentals of Error Theory and Surveying Adjustmen
	ects	t, Foundation of Navigation Equipment.
	1.3 Be able to use	Introduction to Computational Thinking, CAD Bas
	mathematics, natural	ic and Application, Engineering Drawing and Inter
	science, engineering	preting, Linear Algebra, Application and Principle
	foundation and prof	s of GNSS Application and Technology of Laser
	essional knowledge	Radar Surveying, Computer Graphics, Engineerin
	as well as mathemat	g Surveying, Map Design and Compilation.
	ical model method t	
	o deduce and analyz	
	e complex Surveying	
	and Mapping Engin	
	eering & Navigation	
	problems	
	1.4 Can use mathem	C Language Programming, GNSS Programming,
	atics, natural science,	Theory of Probability and Statistics (B), Digital T
	engineering foundati	opographic Surveying Practice, Cartography Practi
	on and professional	ce, Photogrammetry Practice, Foundation of Navi
	knowledge as well a	gation Equipment Practice, Comprehensive Practic
	s mathematical mode	e for Navigation and Positing, Graduation design.
	1 method to compare	
	and synthesize the	
	solutions of complex	
	Surveying and Map	
	ping Engineering &	
	Navigation problems	
2. Problem analysis: Be	2.1 Be able to identi	Introduction to Computational Thinking, C Langua
able to apply the basic pr	fy and judge the ke	ge Programming, GNSS Programming, Advanced
inciples of mathematics, n	y links of complex	Mathematics A(1-2). Theory of Probability and St
atural science and enginee	Surveying and Mapp	atistics (B), Physics Experiment(1-2), Linear Alge
ring science to identify, e	ing Engineering &	bra、Introduction to Civil Engineering、C# Progra

Graduate Abilities	Related Knowledge	Course Supports
xpress and analyze compl	Navigation problems	mming, Cartography, Principle of Geographic Inf
ex surveying and mappin	by using the princi	ormation System, Introduction to Earth Science, D
g engineering problems th	ples of mathematics,	eformation Monitoring and Disasters Predicting, P
rough literature research,	natural science and	hotogrammetry Practice, Map Design and Compil
so as to obtain effective	engineering science	ation.
conclusions.	2.2 Be able to corre	CAD Basic and Application, Digital Topographic
	ctly express complex	Surveying, Fundamentals of Error Theory and Sur
	Surveying and Map	veying Adjustment, Surveying Program Design Pr
	ping Engineering &	actice Contest, Application and Technology of Las
	Navigation problems	er Radar Surveying, GIS base Application Skill,
	based on the princi	Engineering Surveying, Indoor Positing and Intelli
	ples of mathematics,	gent Navigation.
	natural science and	
	engineering science	
	and mathematical	
	model	
	2.3 Can realize that	C Language Programming, GNSS Programming,
	there are many solut	Document Retrieval of Science and Technology, P
	ions to solve the pro	hotogrammetry, Foundation of Geodesy, Engineer
	blem of Surveying a	ing Surveying, GIS Practice, Practical Training fo
	nd Mapping Enginee	r High-precision Map Collection.
	ring & Navigation, a	
	nd will seek alternati	
	ve solutions through	
	literature research	
	2.4 Can use the basi	College physics A(1-2), Document Retrieval of Sc
	c principles of math	ience and Technology, Application and Principles
	ematics, natural scie	of GNSS, Practical Training for Control Surveyin
	nce and Engineering	g, Practical Training for Engineering Surveying, G
	Science, with the ai	raduation design. Scientific research training.
	d of literature resear	
	ch, analyze the influ	
	encing factors of the	
	process, and obtain	
	effective conclusion	
	S	

Graduate Abilities	Related Knowledge	Course Supports
	3.1 Master the techn	Introduction to Computational Thinking, CAD Bas
	ology related to the	ic and Application , GIS base Application Skill , R
	whole process of Su	eal Estate Surveying and Management, Introductio
	rveying and Mappin	n to Smart City, Engineering Surveying, Practical
	g Engineering & Na	Training for Photogrammetry, Practical Training f
	vigation engineering	or Engineering Surveying, Comprehensive Practice
	design, implementati	for Spatial Information, Map Design and Compil
	on and management,	ation.
	as well as the full	
	cycle production met	
3. Design/Develop solutio	hod of Surveying an	
ns: Be able to design sol	d Mapping Engineeri	
utions for complex survey	ng & Navigation pr	
ing and mapping engineer	oducts, and understa	
ing problems, design surv	nd various factors af	
eying and mapping syste	fecting the design o	
m or surveying and mapp	bjectives and technic	
ing production process to	al solutions	
meet specific needs, refl	3.2 Be able to comp	GNSS Programming, CAD Basic and Application,
ect innovation consciousn	lete the design of S	Principle of Geographic Information System, Phot
ess in the design process,	urveying and Mappi	ogrammetry Practice, Application and Principles o
and consider factors suc	ng Engineering & N	f GNSS, Application and Technology of Laser Ra
h as society, health, safet	avigation system and	dar Surveying, Engineering Surveying, Comprehe
y, law, culture and enviro	production process	nsive Practice for Satellite Navigation and Position
nment.	according to specific	ing, Surveying Program Design Practice Contest.
	requirements	
	3.3 Be able to desig	Digital Topographic Surveying, Engineering Surve
	n the Surveying and	ying, Geographic Conditions Monitoring, Invocati
	Mapping Engineerin	on Practice(School of Surveying and Mapping Ski
	g & Navigation syst	lls Contest, School of Surveying and Mapping Pa
	em or production pr	per Contest), Digital Topographic Surveying Practi
	ocess, and embody t	ce, Practical Training for Engineering Surveying,
	he innovation consci	Innovation and Entrepreneurship, Graduation desig
	ousness in the desig	n.
	n	

Graduate Abilities	Related Knowledge	Course Supports
	3.4 In the design of	Introduction to Geomatics, Invocation Practice(S
	Surveying and Map	chool of Surveying and Mapping Skills Contest, S
	ping Engineering &	chool of Surveying and Mapping Paper Contest),
	Navigation system o	Digital Topographic Surveying Practice Practical
	r mapping productio	Training for Engineering Surveying, Innovation an
	n process, the constr	d Entrepreneurship, Graduation design.
	aints of safety, healt	
	h, law, culture and e	
	nvironment can be c	
	onsidered	
	4.1 Based on scienti	Cartography, Principle of Geographic Information
	fic principles, throug	System, Foundation of Geodesy, Engineering Sur
	h literature research,	veying Introduction to Smart City Geographic C
	using scientific met	onditions Monitoring, Practical Training for Remot
	hods, research and a	e Sensing Principles, Cartography Practice, Practi
	nalyze the solutions	cal Training for Satellite Navigation and Positionin
	of complex Surveyin	g.
4. Research: Based on s	g and Mapping Engi	
cientific principles and sci	neering & Navigatio	
entific methods, it can stu	n problems	
dy complex surveying an	4.2 According to the	Introduction to Computational Thinking, Engineeri
d mapping engineering pr	characteristics of Su	ng Drawing and Interpreting, Application and Pri
oblems, including designi	rveying and Mappin	nciples of Remote Sensing, Photogrammetry, App
ng experiments, analyzing	g Engineering & Na	lication and Principles of GNSS, Comparative Pra
and interpreting data, an	vigation objects, the	ctical Training for Navigation and Positioning.
d obtaining reasonable an	research route can b	
d effective conclusions thr	e selected and the te	
ough information synthesi	chnical scheme of S	
s.	urveying and Mappi	
	ng Engineering & N	
	avigation can be des	
	igned	
	4.3 It can construct	GNSS Programming, Application and Technology
	the experimental syst	of Laser Radar Surveying, Practical Training for
	em according to the	Satellite Navigation and Positioning, Surveying Pr
	technical scheme of	ogramming Contest Practice, Practical Training for

Graduate Abilities	Related Knowledge	Course Supports
	Surveying and Map ping Engineering & Navigation, carry out the Surveying and Mapping Engineerin g & Navigation exp eriment safely, and c ollect the Surveying and Mapping Engine ering & Navigation experimental data co rrectly	Control Surveying, Practical Training for Laser R adar Surveying. Technology.
	4.4 The experimental results can be analy zed and explained, a nd reasonable and ef fective conclusions c an be obtained through information synthesis	Document Retrieval of Science and Technology、C artography、Scientific Paper Writing、Engineering Surveying、Practical Training for Real Estate Surveying and Management、Practical Training for Las er Radar Surveying Technology、Comprehensive P ractice for Spatial Information、Graduation design.
5. Using modern tools: Be able to develop, select and use appropriate surv eying and mapping techn ology, information resourc es, modern surveying and mapping instruments and information technology t ools, including prediction and Simulation of comple x surveying and mapping engineering problems, an d understand their limitati ons.	5.1 Understand the principles and metho ds of modern s Surv eying and Mapping Engineering & Navi gation instruments, i nformation technolog y tools and Surveyin g and Mapping Engineering & Navigation software commonly used in surveying and mapping, and understand their limitations	Introduction to Computational Thinking、C Progra mming Language Design、CAD Basic and Applic ation、C# Programming、Digital Topographic Surv eying、Application and Technology of Laser Radar Surveying、Computer Graphics、Big Data an GI S、GIS base Application Skill、Real Estate Surve ying and Management、Introduction to Smart City.

Graduate Abilities	Related Knowledge	Course Supports
	5.2 Be able to select	Engineering Drawing and Interpreting, Digital Top
	and use appropriate	ographic Surveying Practical Training for Remote
	modern Surveying	Sensing Principles, Practical Training for Satellite
	and Mapping Engine	Navigation and Positioning, GIS Practice, Practica
	ering & Navigation i	1 Training for Control Surveying, Comparative Pr
	nstruments, informati	actical Training for Engineering Surveying, Practic
	on resources and Su	al Training for Real Estate Surveying and Manage
	rveying and Mappin	ment, Practical Training for Laser Radar Surveyin
	g Engineering & Na	g Technology, Comprehensive Practice for Spatial
	vigation software to	Information, Graduation design, Surveying and M
	carry out technical d	apping Skills Practice Contest.
	esign, data processin	
	g and accuracy anal	
	ysis for complex Sur	
	veying and Mapping	
	Engineering & Nav	
	igation problems	
	5.3 It can develop o	Theory of Probability and Statistics (B), College
	r select modern Surv	physics A(1-2), Linear Algebra, Document Retri
	eying and Mapping	eval of Science and Technology Fundamentals of
	Engineering & Navi	Error Theory and Surveying Adjustment, Surveyin
	gation instruments a	g Program Design and Data Processing, Practical
	nd information techn	Training for Photogrammetry, Graduation design,
	ology tools to meet	Invocation Practice(School of Surveying and Map
	specific needs for sp	ping Skills Contest, School of Surveying and Ma
	ecific Surveying and	pping Paper Contest).
	Mapping Engineerin	
	g & Navigation obje	
	cts, predict and simu	
	late complex Surveyi	
	ng and Mapping En	
	gineering & Navigati	
	on problems, and an	
	alyze their limitation	
	S	

Graduate Abilities	Related Knowledge	Course Supports
	6.1 Understand the t	Thought Morals Accomplishment and Basic Law
	echnical standard sys	Introduction to Civil Engineering, Digital Topogra
	tem, intellectual prop	phic Surveying, Application and Principles of Re
	erty rights, surveying	mote Sensing, Foundation of Geodesy, Applicatio
	and mapping mana	n and Princples of GNSS Surveying Management
	gement policies, law	and Laws, Digital Topographic Surveying Practic
	s and regulations in	e, GIS Practice, Comparative Practical Training f
	the field of Surveyin	or Engineering Surveying, Engineering practice cl
6. Engineering and Soci	g and Mapping Engi	ass, Graduation design.
ety: Be able to make rea	neering & Navigatio	
sonable analysis based on	n, and understand th	
engineering related back	e influence of differ	
ground knowledge, evalua	ent social cultures o	
te the impact of Surveyin	n engineering activiti	
g and mapping engineerin	es	
g practice and complex s	6.2 Be able to analy	The Outline of the Modern Chinese History, The
urveying and mapping en	ze and evaluate the	Generality of Basic Principle of Marxism, Introdu
gineering problem solutio	impact of Surveying	ction to Mao Zedong Thoughts and Theoretical S
ns on society, health, safe	and Mapping Engin	ystem of the Chinese characteristic socialism, Eng
ty, law and culture, and u	eering & Navigation	ineering Surveying Real Estate Surveying and Ma
nderstand the responsibilit	engineering practice	nagement, Surveying Management and Laws, Def
ies that should be underta	on society, health, sa	ormation Monitoring and Disasters Predicting, Cla
ken.	fety, law and cultur	ssical appreciation and cultural inheritance. Scienti
	e, as well as the im	fic and technological revolution and social develo
	pact of these constra	pment, Ecological civilization and future cities.
	ints on the impleme	
	ntation of engineerin	
	g projects, and unde	
	rstand the responsibil	
	ities that should be	
	borne	
7.Environment and sust	7.1 Know and under	Physics Experiment(1-2). Introduction to Geomatic
ainable development : B	stand the concept an	s. Introduction to Earth Science. Remote Sensing
e able to understand and	d connotation of env	Digital Image Processing, Geographic Conditions
evaluate the impact of co	ironmental protection	Monitoring, Natrual Resources Management, Situ
mplex surveying and map	and sustainable dev	ation and Policy(1-4).

Graduate Abilities	Related Knowledge	Course Supports
ping engineering practice	elopment	
on the environment and s		
ocial sustainable develop	7.2 From the perspe	Marketing Management, Introduction to Earth Sci
ment.	ctive of environment	ence, Real Estate Surveying and Management, Int
	al protection and sus	roduction to Smart City, Geographic Conditions
	tainable developmen	Monitoring, Deformation Monitoring and Disasters
	t, we can think abou	Predicting, Practical Training for Control Surveyi
	t the sustainability o	ng, Practical Training for Real Estate Surveying a
	f Surveying and Ma	nd Management, Compound culture class, Gradua
	pping Engineering &	tion design.
	Navigation engineer	
	ing practice, and eva	
	luate the damage an	
	d hidden danger that	
	may be caused to	
	human and environ	
	ment in the practice	
	of Surveying and	
	Mapping Engineerin	
	g & Navigation engi	
	neering	
	8.1 Have correct val	Thought Morals Accomplishment and Basic Law
	ues, understand the r	The Outline of the Modern Chinese History, The
8. Occupational norms:	elationship between i	Generality of Basic Principle of Marxism, Introdu
With humanities and soci	ndividuals and societ	ction to Mao Zedong Thoughts and Theoretical S
al science literacy, social	y, and understand C	ystem of the Chinese characteristic socialism, Phy
responsibility, can underst	hina's national condit	sical Education(1-4).
and and abide by the pro	ions	
fessional ethics and norm	8.2 Understand the	Thought Morals Accomplishment and Basic Law
s of Surveying and mapp	professional ethics a	The Outline of the Modern Chinese History, Intro
ing industry in the practic	nd norms of the sur	duction to Mao Zedong Thoughts and Theoretical
e of Surveying and mapp	veying and mapping	System of the Chinese characteristic socialism, C
ing, and fulfill the respon	industry of honesty,	ollege Student Occupation Career and Developme
sibility.	justice and integrity,	nt Planning, Introduction to Geomatics, Surveying
	and consciously abi	Management and Laws, Situation and Policy(1-
	de by them in the p	4), Digital Topographic Surveying Practice, Practi

Graduate Abilities	Related Knowledge	Course Supports
	ractice of Surveying and Mapping Engin	cal Training for Real Estate Surveying and Manag ement. Comprehensive Practice for Navigation and
	eering & Navigation projects	Positioning.
	8.3 Understand the s ocial responsibility of Surveying and Ma pping Engineering & Navigation workers for public safety, health, well-being and environmental protection, and be able to consciously perform their responsibilities in Surveying and Mapping Engineering & Navigation engineering practice	The Generality of Basic Principle of Marxism、College Student Occupation Career and Development Planning、Situation and Policy(5-8)、Introduction to Geomatics、Introduction to Earth Science、Surveying Management and Laws、Graduation design.
9. Individuals and team	9.1 Be able to com municate effectively with members of arc hitecture, civil engin eering and other dis ciplines	College Student Occupation Career and Developm ent Planning, Physical Education(1-4), Introductio n to Civil Engineering, Engineering Mechanics, C onspectus of Urban Planning, Surveying Program Design and Data Processing and, Graduation design.
s: Be able to play the rol e of individual, team me mber and leader in the te am under the background of architecture, civil engineering and other disciplines.	9.2 Ability to work independently or cooperatively in a team	Invocation Practice(School of Surveying and Map ping Skills Contest, School of Surveying and Map ping Paper Contest), Digital Topographic Surveying Practice, Practical Training for Remote Sensing Principles, Practical Training for Satellite Navigat ion and Positioning, Practical Training for Control Surveying, Practical Training for Engineering Surveying, Practical Training for Laser Radar Surveying Technology, GIS Software Development Practice.
	9.3 Ability to organi	The Outline of the Modern Chinese History, Cart

Graduate Abilities	Related Knowledge	Course Supports
	ze, coordinate and di	ography Practice, GIS Practice, Comprehensive Pr
	rect the work of the team	actice for Spatial Information. Practical Training f or Laser Radar Surveying Technology. Surveying and Mapping Skills Contest Practice. Graduation design.
10. Communication: Be able to effectively communicate and communicate with surveying and mapping peers and the public on complex surveying and mapping engineering problems, including writing surveying and mapping technology design book and surveying and mapping technology summary, making statements, clearly expressing or responding to instructions, and having a certain international vision, and being able to communicate and exchange in cross-cultural background.	10.1 Be able to acc urately express opini ons, respond to quer ies, and understand t he differences of communication with S urveying and Mapping Engineering & N avigation peers and t he public in written statements and state ments on Surveying and Mapping Engineering & Navigation t echnology design book and survey technology summary 10.2 Understand the international development trends and research hotspots in the field of Surveying and Mapping Engineering & Navigation, and understand and respect the difference s and diversity of different cultures	Cartography Practice、Practical Training for Control Surveying、Comparative Practical Training for Engineering Surveying、Graduation design. College English(1-2)、English Country Culture、Principle of Geographic Information System、Comprehensive Practice for Spatial Information、Application of Modern Surveying and Mapping Technology、GIS base Application Skill、Remote Sensing Application Prospect.
	10.3 Have the abilit y of cross-cultural c ommunication langua	College English(1-2), Scientific Paper writing, Or al English, Selected readings of English Newspapers, English for Specific Purposes, Engineering

Graduate Abilities	Related Knowledge	Course Supports
	ge and written expre	Practice Compound Training Cross-cultural credi
	ssion, and be able t	t requirements for the second classroom (participat
	o carry out basic co	ion in international conferences, exhibitions and v
	mmunication and ex	olunteers, etc.).
	change on Surveying	
	and Mapping Engin	
	eering & Navigation	
	professional issues u	
	nder the cross-cultur	
	al background	
	11.1 Master the man	Introduction to Civil Engineering, Marketing Mana
	agement and econo	gement, Real Estate Surveying and Management,
	mic decision-making	Digital Topographic Surveying Practice, Practical
	methods involved i	Training for Control Surveying, Comparative Pract
	n the project	ical Training for Engineering Surveying, Graduati
		on design.
	11.2 Understand the	Marketing Management Surveying Management a
	whole process cost c	nd Laws, Practical Training for Spatial Informatio
11. Project management:	omposition of Surve	n、Graduation design.
Understand and master t	ying and Mapping E	
he principles of engineeri	ngineering & Naviga	
ng management and econ	tion engineering and	
omic decision-making met	production of Surve	
hods, and can be applied	ying and mapping p	
in surveying and mappin	roducts, and understa	
g, architecture, civil engin	nd the engineering	
eering, environment and o	management and eco	
ther disciplines.	nomic decision-maki	
	ng problems involve	
	d	
	11.3 Under the envir	Comparative Practical Training for Engineering Su
	onment of civil engi	rveying, Practical Training for Real Estate Surveyi
	neering, architecture	ng and Management, Conspectus of Urban Planni
	and other disciplines,	ng、Graduation design.
	in the process of d	
	esigning and develop	

Graduate Abilities	Related Knowledge	Course Supports				
	ing Surveying and					
	Mapping Engineerin					
	g & Navigation sche					
	me, the method of e					
	ngineering managem					
	ent and economic de					
	cision-making can b					
	e used					
	12.1 Under the back	Thought Morals Accomplishment and Basic Law				
	ground of social dev	College Student Occupation Career and Developm				
	elopment, we can re	ent Planning, English for Specific Purposes, Appr				
	alize the necessity of	eciation of Famous British and American Liter				
	self-learning and lif	e. Introduction to Geomatics. Fundamentals of Er				
	elong learning	ror Theory and Surveying Adjustment, Surveying				
12. Lifelong learning: H		Management and Laws, Advanced Technology of				
ave the consciousness of		Surveying.				
self-learning and lifelong	12.2 Have the abilit	The Generality of Basic Principle of Marxism, Int				
learning, and have the abi	y of self-learning an	roduction to Mao Zedong Thoughts and Theoretic				
lity of continuous learnin	d adapting to develo	al System of the Chinese characteristic socialism,				
	pment, including the	Introduction to Earth Science, Scientific Paper Wr				
g and adapting to develo	ability to understan	iting, Introduction to Smart City, Application of				
pment.	d the Surveying and	Artificial Intelligence in GIS, Graduation design,				
	Mapping Engineerin	Invocation Practice(School of Surveying and Map				
	g & Navigation tech	ping Skills Contest, School of Surveying and Ma				
	nical problems, the a	pping Paper Contest).				
	bility to summarize					
	and the ability to as					
	k questions.					

X Table of Teaching Arrangement (appendix table)

表 1 测绘工程(智能导航实验班)专业指导性教学计划

课程类别	课程属性	课程名称	学分	总学时	讲课学时	实验学时	上机学时	课外学时	延续教学	开课 学期	教学单位
		思想道德修养与法律基础 Thought Morals Accomplishment and Basic Law	3	48	48					1	马克思主义学院
		中国近现代史纲要 The Outline of the Modern Chinese History	. 3	48	32			16		2	马克思主义学院
		马克思主义基本原理概论★ The Generality of Basic Principle of Marxism	3	48	48					3	马克思主义学院
		毛泽东思想和中国特色社会主义体系理论概 论★ Introduction to Mao Zedong Thoughts and Theoretical System of the Chinese characteristic socialism	5	80	64			16		4	马克思主义学院
		形势与政策(1-4) Situation and Policy(1-4)	2	32	16			16		1-4	马克思主义学院
	必修	大学生职业生涯与发展规划 College Student Occupation Career and Development Planning	1	16	16					1/2	学工部
		大学生心理健康 The Mental health of College Students	1	16	16					1/2	学工部
通		大学英语(1-2) ★ College English(1-2)	6	128	96				32	1-2	人文学院
识		口语	2	32	32					3	文法学院
教		大学英语四级强化	2	32	32					3	文法学院
育		大学英语六级提高	2	32	32					3	文法学院
课		英语报刊选读	2	32	32					3	文法学院
		英语国家文化	2	32	32					4	文法学院
		英美文学名篇赏析	2	32	32					4	文法学院
		专门用途英语	2	32	32					4	文法学院
		升学英语考试	2	32	32					4	文法学院
		体育(1-4) Physical Education(1-4)	4	120	120					1-4	体育部
		计算思维导论 Introduction to Computational Thinking	1.5	56	24			32		1	电信学院
		小 计	33. 5	656	544			80	32		
		建筑艺术与城市设计	2	32						1-8	各院部
	核	哲学视野与人文素养	2	32						1-8	各院部
	14	创新创业与社会发展	2	32						1-8	各院部
	心	生态文明与智慧科技	2	32						1-8	各院部
		至少修读 4 类合	— 计 8 学	—— 2分,	每类	至少修	 译 2	 学分			

课程属性	课程名称	学分	总学时	讲课学时	实验学时	上机学时	课外学时	延续教学	开课 学期	教学单位
	工程实践类		1-8 学期任选							各院部
	复合培养类	1-8 学期任选 各院部								
	程属	程 课程名称 性 工程实践类	程 属 性 课程名称 学 分 工程实践类	程 属 性 课程名称 学 分 时	程 属 性 课程名称 学 好 时 学 时 工程实践类 1	程 属 性 课程名称 学 分 时 时 时 课 学 时 时 工程实践类	程 属 课程名称 学 分 时 课 学 号 时 验 学 学 时 机 学 号 时 工程实践类 1-8 学期任金	程 属 性 课程名称 学 分 号 时 时 课 会 号 号 时 验 号 号 号 号 机 号 号 号 外 号 工程实践类 1-8 学期任选	程 属 性 课程名称 学 分 号 时 时 课 設 号 号 时 1-8 学期任选	程 属 课程名称 学 分 时 课 報 學 時 報 學 學 學 學 學 學 學 學 學 學 學 學 學 學 學 學 學 學 學

跨类任选至少2学分

通识教育课合计至少修读 43.5 学分,其中通识教育必修 33.5 学分(其中口语、大学英语四级强化、大学英语六级提高、英语报刊选读必选 2 学分,英语国家文化、英美文学名篇赏析、专门用途英语、升学英语考试必选 2 学分),通识教育核心 8 学分,通识教育任选 2 学分

课程类别	课程属性	课程名称	学分	总学时	讲课学时	实验学时	上机学时	课外学时	延续教学	开课学期	教学单位		
		高等数学 A (1) ★ Advanced Mathematics A(1)	5	92	80				12	1	理学院		
		高等数学 A (2) ★ Advanced Mathematics A(2)	5	84	80				4	2	理学院		
		线性代数 Linear Algebra	2	40	32				8	2	理学院		
		概率与数理统计 B Theory of Probability and Statistics (B)	3	48	44				4	3	理学院		
		普通物理 A (1) ★ College physics A(1)	3	52	52			4		2	理学院		
		普通物理 A (2) ★ College physics A(2)	3	52	52			4		3	理学院		
		物理实验(1-2) Physics Experiment(1-2)	2	60		60				3-4	理学院		
大类	必	C 语言程序设计 ★ C Language Programming	3	48	24	24				1	遥感科学与技术 系		
基	修	地球科学概论 Introduction to Earth Science	2	32	32					1	地理信息科学系		
础		测绘地理信息概论 Introduction to Geomatics	1	16	16					1	测绘学院		
课		CAD 基础与应用 CAD Basic and Application	2	32	16	16				1	测绘工程系		
		导航装备基础 Foundation of Navigation Equipment	2. 5	40	36	4				2	测绘工程系		
		数字地形测量学★ Digital Topographic Surveying	4	64	52	12				2	测绘工程系		
		地图学 Cartography	2	32	24	8				3	地理信息科学系		
		地理信息系统原理(双语)★ Principle of Geographic Information System	2	32	24	8				3	地理信息科学系		
		遥感原理与应用★ Principles of Remote Sensing and Application	3	48	48					3	遥感科学与技术		
		小 计	44. 5	772	612	132		8	28				
		大类基础课合计必修 44.5 学分											
		GNSS 原理及其应用★ Application and Principles of GNSS	3	48	44	4				3	测绘工程系		
		误差理论与测量平差基础★ Fundamentals of Error Theory and Surveying Adjustment	3	48	48					4	测绘工程系		
专	必	大地测量学基础★ Foundation of Geodesy	3	48	40	8				4	测绘工程系		
业核心	修	摄影测量学★ Principles of Photogrammetry	2	32	32					5	遥感科学与技术 系		
课			3	48	40	8				6	测绘工程系		
		小计	14	224	204	20					VN-74 11-71		
							I	I	I	1	I		

课程类别	课程属性	课程名称	学分	总学时	讲课学时	实验学时	上机学时	课外学时	延续教学	开课学期	教学单位
		嵌入式系统与程序设计 Embedded System and Programming	3	48	48					3	地理信息科学系
		GNSS 程序设计 Programming for GNSS	2	32	24	8				4	测绘工程系
	必	变形监测与灾害预报 Deformation Monitoring and Disasters Predicting	2	32	24	8				5	测绘工程系
	修	高精度导航地图与位置服务 High-Precision Navigation Map and Location Service	2	32	32					5	测绘工程系
		激光雷达测量技术与应用 Application and Technology of Laser Radar Surveying	2	32	24	8				7	测绘工程系
		小 计	11	176	152	24					
		C#程序设计 C# Programming	2	32	16	16				4	地理信息科学系
专		地图设计与编绘 Map Design and Compilation	2	32	16	16				4	地理信息科学系
业		测量程序设计与数据处理 Surveying Programming Design and Data Processing	2	32	16	16				5	测绘工程系
方向		科技文献检索 Document Retrieval of Science and Technology	1	16	16			8		5	图书馆
课		土木工程概论(限选) Introduction to Civil Engineering	3	48	48					5	土木学院
	选	工程制图与识图 (限选) Engineering Drawing and Interpreting	2	32	32					6	理学院
	修	测绘管理与法律法规(限选) Surveying Management and Laws	1	16	16					6	测绘工程系
		室内定位与智能导航(限选) Indoor Positioning and Intelligent Navigation	2	32	28	4				6	地理信息科学系
		计算机图形学(限选) Computer Graphics	2	32	24	8				6	地理信息科学系
		工业智能定位测量 (限选) Industrial Intelligent Positioning Survey	2	32	32					6	测绘工程系
		城市遥感(双语) Urban Remote Sensing	2	32	24	8				6	遥感工程系
		科技论文写作(双语) Scientific Paper writing	1	16	16					6	测绘工程系
专		智慧城市导论 Introduction to Smart City	1	16	16					6	地理信息科学系
业		地理国情监测 (限选) Geographic Conditions Monitoring	1. 5	24	16	8				7	地理信息科学系
方	选修	自然资源管理 Natural Resource Management	1	16	16					7	
向		不动产测量与管理 (限选)Real Estate Surveying and Management	2	32	28	4				7	测绘工程系
课		新型航空遥感数据处理技术 Modern aerial remote sensing data processing technology	2	32	32					7	遥感工程系

课程类别	课程属性	课程名称	学分	总学时	讲课学时	实验学时	上机学时	课外学时	延续教学	开课 学期	教学单位
		遥感影像深度学习与智能解译 Deep learning and intelligent interpretation of remote sensing image	2	32	32					7	遥感工程系
		测绘地理信息技术前沿 Advanced Technology of Surveying, Mapping and GIS		16	16					7	测绘学院
		城市规划概论 Conspectus of Urban Planning	1.5	24	20	4				7	建筑学院
		市场营销 Marketing Management		24	24					7	经管学院
		小 计	35. 5	568	484	84		8			
		专业方向课合计 29 学分,	必修:	11 学	分,日	选至	少修订	支 18 4	学分		

表 2 测绘工程(智能导航实验班)专业指导性教学计划(实践环节)

课程属性	课程名称	学分	折合学时	实验实践	上机	开课 学期	开设 周次	教学单位
	军事理论 Military Theory 军训 Military Training					1	1-3	武装部
	形势与政策(5-8)Situation and Policy(5-8)	0	32			5-8	分散	马院、各学院
	导航装备基础实习 Foundation of Navigation Equipment Pratice	1	20	20		2	17	测绘工程系
	数字地形测量实习 Digital Topographic Surveying Practice	3	60	60		2	18-20	测绘工程系
	卫星导航定位实习 Practical Training for Satellite Navigation and Positioning	2	40	40		3	17-18	测绘工程系
	地图学实习 Cartography Practice	1	20	20		3	19	地理信息科学系
	地理信息系统原理实习 GIS Practice	1	20		20	3	20	地理信息科学系
			20		20	4	17	测绘工程系
课内			20	20		4	18	遥感科学与技术系
	控制测量实习 Practical Training for Control Surveying	2	404	60		4	19-20	测绘工程系
	高精度地图采集实习 High-precision Map	_	0.0				10	NEW / A - TET 75
	Collection Practice	1	20	20		5	19	测绘工程系
	摄影测量实习 Photogrammetry Practice	1	20	20		5	20	遥感科学与技术系
	自然地理地貌及遥感图像解译实习 Natural Geography and Remote Sensing image interpretation Practice	1	20	20		6	16	遥感科学与技术系
	工程测量综合实习Practical Training for Engineering Surveying	4	80	80		6	17-20	测绘工程系
	导航定位综合实习 Comprehensive Practice for Navigation and Positioning	5	120	120		7	1-5	测绘工程系
	激光雷达测量技术实习 Practical Training for Laser Radar Surveying Technology	1	20	10	10	7	20	测绘工程系
	毕业设计与毕业答辩 Graduation design and defense	8	160	160		8	1-16	测绘工程系
	小 计	37	1224	650	50			
课	科研团队创新训练-导航基础研发能力实训 Innovation Training Project of 创新实践及科研 Scientific Research Team	1	20	20		1-3		测绘学院
外	训练 科研团队创新训练-导航产品/系 统研制能力实训 Innovation Training Project of Scientific Research Team	1	20	20		4-5		测绘学院

课程属性	课程名称	学 分	折合学时	实验实践	上机	开课 学期	开设 周次	教学单位
	科研团队创新训练-团队协作与创新创业能力实训 Innovation Training Project of Scientific Research Team	1	20	20		6-7		测绘学院
	测绘技能大赛实训 Surveying and Mapping Skills Practice Contest	2	40	40		4		测绘工程系
	学院测绘技能大赛 School of Surveying and Mapping Skills Contest	1	20	20		4		测绘学院
	测量程序设计大赛实训 Surveying Programing Contest Practice	1	20	20		5		测绘工程系
	测绘科技论文写作大赛 College Students Paper Contest of Surveying and Mapping Science and Technology	1	20	20		5		测绘学院
	北斗创新创业大赛 Beidou Innovation and Entrepreneurship Contest	1	20	20		5		测绘工程系
	导航定位终端嵌入式程序设计大 赛 Navigation and Positioning Terminal Embedded Programming Contest	1	20	20		4		测绘工程系
	"北斗杯"全国青少年科技创新大赛 Beidou Cup National Youth Science and Technology Innovation Contest	1	20	20				测绘工程系
	小 计	11	220	220				

实践环节合计 43 学分,课内必修 37 学分,课外(创新实践及科研训练)必修 6 学分

2020 级地理空间信息工程专业本科培养方案

一、专业基本信息

英文名称	Geospatial Information Engineering					
专业代码	081205T	学科门类	工学			
学 制	四年	授予学位	工学学士			

二、培养目标及特色

培养目标:

本专业培养德、智、体全面发展的地理空间信息复合型工程技术人才,具备数理基础和人文社 科知识,掌握自然地理学和地理信息系统的基础知识、基本理论、分析方法和应用技能,接受科学 思维和工程实践训练,具备利用测绘、遥感、卫星定位导航等技术获取地理数据的能力,掌握一定 的数理统计分析和计算机技术,具有定量分析、研究地理问题的能力。能够胜任城市规划、地理国 情、资源管理、环境保护等领域地理信息系统的设计、生产、研发及管理工作,具有较强的组织管 理能力、创新能力、继续学习能力和国际视野。毕业后经过5年左右的工作和学习,能够达到如下 目标:

- (1) 掌握数学、自然科学、工程基础及先进的地理信息系统理论与技术,胜任地理空间信息工程设计、开发及管理等专业技术工作;
- (2) 具有良好专业素养、丰富的工程管理经验和极强工作责任心,成为地理信息企事业单位 中的技术负责人或技术骨干;
 - (3) 具有继续学习适应发展的能力,能够独立或协同承担地理空间信息科研工作;
 - (4) 具有良好的团队意识、国际化视野和沟通能力,能够承担团队中的领导角色;
 - (5) 具有良好的思想道德修养和科学文化素养,能够承担和履行社会责任。

专业特色:

本专业依托首都建设和学校土木建筑类学科优势,培养服务首都、面向全国的城市信息化建设的专业地理信息人才。适应地理信息高新科技发展,融教学、科研和生产为一体,强调理论与实践密切结合,突出城市空间信息特色,培养地理信息系统新技术、新方法的应用及软件设计开发的综合能力,满足城市空间信息化建设的地理信息系统人才需求。

三、主干学科

测绘科学技术、地理学、计算机应用。

四、主干课程

1. 主干基础课程 (9 门)

测绘地理信息概论、工程制图与识图、C语言程序设计、地球科学概论、数字地形测量学、地图学、CAD基础与应用、地理信息系统原理(双语)、遥感原理与应用

2. 主干专业课程 (6门)

空间数据库、空间分析与建模、地理信息系统设计与开发、WebGIS 技术与开发、城市空间信息学、误差理论与测量平差基础

五、主要实践教学环节(12门)

数字地形测量学实习、地图学实习、C#程序实习、空间数据库实习、地理信息系统原理实习、 遥感原理与应用实习、地理信息系统设计与开发实习、摄影测量基础实习、空间分析与建模实习、 自然地理地貌及遥感图像解译实习、空间信息综合实习、毕业设计或论文

六、毕业学分要求

参照北京建筑大学本科学生学业修读管理规定及学士学位授予细则,修满本专业最低计划学分应达到 166 学分,其中,理论课程 130 学分,实践教学环节 36 学分。

七、各类课程结构比例

C. Hadalatan sanka							
课程类别	课程属性	学分	学时	学分比例			
\Z \D \\ \ \ \ \ \\ \	必修	41.5	688	25%			
通识教育课	选修	2	32	1.2%			
	必修	43	756	25.91%			
大类基础课	选修	1	16	0.6%			
专业核心课	必修	16	256	9.64%			
+ .U 19	必修	22	344	13.25%			
专业方向课	选修	4.5	72	2.71%			
V4. 2. 23 0 5 TT 44	必修	34	780	20.49%			
独立实践环节	选修	2	40	1.2%			
总计		166	2984	100%			

八、教学进程表

学期	教学周	考试	实践	学期	教学周	考试	实践
1	4-19 周	20 周	1-3	2	1-16 周	17周	18-20 周
3	1-15 周	16 周	17-20 周	4	1-15 周	16周	17-20 周
5	1-15 周	16 周	17-20 周	6	1-14、 16-19 周	20 周	15 周
7	7-20 周		1-6 周	8	1-16 毕	业设计/实习	17 周答辩

九、毕业生应具备的知识能力及实现矩阵

毕业生应具备的知识能力	相关知识领域	实现途径(课程支撑)
		计算思维导论、C 语言与数据结构、CAD
	科学、工程科学的语言	 基础与应用、工程制图与识图、高等数学
	工具用于地理空间信	 A(1-2)、概率与数理统计 B、普通物理
	息工程问题的表述	 A(1-2)、物理实验 (1-2)、线性代数、土
		 木工程概论、地图学、地球科学概论、计
		算机图形学等、数字图像处理。
	1.2 能针对具体的地理	高等数学 A(1-2)、线性代数、数字地形测
	空间对象建立数学模	量学、地理信息系统原理(双语)、摄影测
	型并求解	量基础、误差理论与测量平差基础、
1.工程知识: 能够将数学、		空间分析与建模、城市地理学CIM技术与应
自然科学、工程基础和专业		用、大数据与地理信息系统、人工智能在地理信
知识用于解决复杂地理空		息系统中的应用。
间信息工程问题。	1.3 能够将相关知识和	计算思维导论、CAD 基础与应用、工程制
	数学模型方法用于推	2 图与识图、线性代数、卫星导航定位技
	演、分析地理信息系统	术、激光雷达测量技术与应用、计算机图
	专业复杂工程问题	形学、城市空间信息学、CIM技术与应用等。
	1.4 能够将相关知识和	C 语言程序设计、数据结构、c#程序设计、
	数学模型方法用于地	Java 程序设计、Python 程序设计、概率
	理信息工程专业复杂	与数理统计 B、三维地理信息技术、近景
	工程问题解决方案的	摄影测量、数字地形测量实习、地图学实
	比较与综合	习、摄影测量基础实习、空间信息综合实
		习、毕业设计等。
	2.1 能够将数学、自然	计算思维导论、C 语言程序设计、高等数
	科学与工程科学的基	学 A(1-2)、概率与数理统计 B、物理实验
	本理论运用到识别、分	(1-2)、线性代数、C#程序设计、地图学、
2.问题分析: 能够应用数	析与表达	地理信息系统原理(双语)、地球科学概论、
学、自然科学和工程科学的		空间分析与建模、摄影测量基础实习、空
基本原理, 识别、表达、并		间分析与建模等。
通过文献研究分析复杂地	2.2 能够基于相关科学	CAD 基础与应用、数字地形测量学、误差
理信息工程问题,以获得有	原理和数学模型方法	理论与测量平差基础、激光雷达测量技术
效结论。	正确表达复杂地理空	与应用、三维地理信息技术、GIS 基础应
294 PU V	间信息工程问题	用技能等。
	2.3 能够认识到解决问	C 语言程序设计、数据结构、科技文献检
	题有多种方案可选择,	索、摄影测量基础、地理信息系统原理实
	会通过文献研究寻求	习、空间信息综合实习等。

毕业生应具备的知识能力	相关知识领域	实现途径 (课程支撑)
	可替代的解决方案	
	2.4 能运用基本原理,	 普通物理 A(1-2)、科技文献检索、卫星导
	借助文献研究,分析过	航定位技术、毕业设计等。
	程的影响因素, 获得有	
	效结论	
	3.1 掌握地理信息系统	计算思维导论、CAD 基础与应用、GIS
	设计/开发全周期、全	基础应用技能、智慧城市导论、空间分析
	流程的基本设计/开发	与建模、地理信息系统设计与开发、空间
	方法和技术, 了解影响	数据库、WebGIS 概论、摄影测量基础实
	设计目标和技术方案	习、空间信息综合实习等。
3.设计/开发解决方案:能	的各种因素	
够设计针对复杂地理空间	3.2 能够设计开发满足	C 语言程序设计、数据结构、CAD 基础与
信息工程问题的解决方案,	特定地理空间信息工	应用、遥感原理、地理信息系统原理(双
设计满足特定需求的系统、	程需求的生产流程及	语)、地理信息系统设计与开发、空间数据
生产流程,并能够在设计环	系统	库、WebGIS 概论、摄影测量基础、卫星
节中体现创新意识,考虑社		导航定位技术、激光雷达测量技术与应用、
会、健康、安全、法律、文		地图设计与编绘、地图学实习、地理信息
化以及环境等因素。		系统原理实习等。
	3.3 能够在地理空间信	测绘地理信息概论、WebGIS 概论、地理
	息工程解决方案设计	信息系统设计与开发、数字地形测量学、
	中体现创新意识, 考虑	大数据与地理信息系统、人工智能在地理信息系
	社会、健康、安全、法	统中的应用、创新实践(GIS大赛)、数字
	律、文化以及环境等因	地形测量实习、创新创业类、毕业设计等。
	素	
	4.1 能够运用科学原理	地球科学概论、地图学、地理信息系统原
	对复杂地理空间信息	理(双语)、智慧城市导论、遥感原理实习、
4.研究: 能够基于科学原理	工程问题、地理问题提	地图学实习等。
并采用科学方法对复杂地	出研究方案	
理空间信息工程问题、地理	4.2 能够基于专业理论	计算思维导论、大数据与地理信息系统、人工
问题进行研究,包括设计实	知识对研究方案进行	智能在地理信息系统中的应用、工程制图与识
验、分析与解释数据、并通	设计、论证与预测	图、遥感原理、摄影测量基础、卫星导航
过信息综合得到合理有效		定位技术、空间信息综合实习等。
的结论。	4.3 能够采用科学方法	C#程序设计、C 语言程序设计、数据结构、
	实施数据采集与分析	空间数据库、误差理论与测量平差基础、
	处理	激光雷达测量技术与应用、遥感数字图像

毕业生应具备的知识能力	相关知识领域	实现途径 (课程支撑)
		处理、摄影测量基础实习等。
	4.4 能够对实验结果进	科技文献检索、地图学、科技论文写作(双
	行信息综合与评判, 取	 语)、空间分析与建模、空间信息综合实习、
	得合理有效结论	- 毕业设计等。
	5.1 能够针对复杂地	大学英语(1-2)、计算思维导论、卫星导
	理空间信息工程问题,	 航与定位、C 语言与数据结构、CAD 基础
	选择恰当的数据获取	与应用、C#程序设计、数字地形测量学、
	方法与技术	激光雷达测量技术与应用、三维地理信息
		技术、计算机图形学、GIS 基础应用技能、
		智慧城市导论、测绘地理信息技术前沿、
		数字地形测量实习、遥感原理实习、地图
		学实习、GIS 软件开发大赛实训等。
5.使用现代工具:能够针对	5.2 能够使用现代数据	空间分析与建模、空间数据库、工程制图
复杂地理空间信息工程问	采集设备和信息技术	与识图、高等数学 A (1-2)、概率与数理
题,开发、选择与使用恰当	软件完成地理信息系	统计 B、数字地形测量学、遥感原理、地
的地理信息系统技术、资	统数据采集、数据处理	图学、摄影测量基础、卫星导航定位技术、
源、数据采集设备和信息技	与精度分析	误差理论与测量平差基础、遥感数字图像
术,包括对复杂理空间信息		处理、数字地形测量实习、遥感原理实习、
工程问题的预测与模拟,并		地理信息系统原理实习、空间信息综合实
能够理解其局限性。		习、毕业设计、测绘技能大赛实训、GIS
		软件开发大赛实训等。
	5.3 能够使用现代工	概率与数理统计 B、普通物理 (1-2)、线
	具,对复杂地理空间信	性代数、科技文献检索、误差理论与测量
	息工程问题、地理问题	平差基础、大数据与地理信息系统、人工
	进行预测与模拟, 并理	智能在地理信息系统中的应用、摄影测量
	解其局限性	基础实习、毕业设计、创新实践(GIS 技
		能大赛、测绘技能大赛、测绘科技论文大
		赛)等。
6.工程与社会:能够基于工	6.1 熟悉地理信息系统	思想道德修养与法律基础、数字地形测量
程相关背景知识进行合理	专业相关技术标准、法	学、遥感原理、空间分析与建模、城市地
分析,评价地理空间信息工	律法规及管理规定,能	理学、卫星导航定位技术、数字地形测量
程实践和复杂地理空间信	够基于工程相关背景	实习、地理信息系统原理实习、工程实践
息工程问题解决方案对社	知识进行合理分析	类、毕业设计等。
会、健康、安全、法律以及	6.2 能够评价地理空间	中国近现代史纲要、马克思主义基本原理
文化的影响,并理解应承担	信息工程实践和复杂	概论、毛泽东思想和中国特色社会主义体

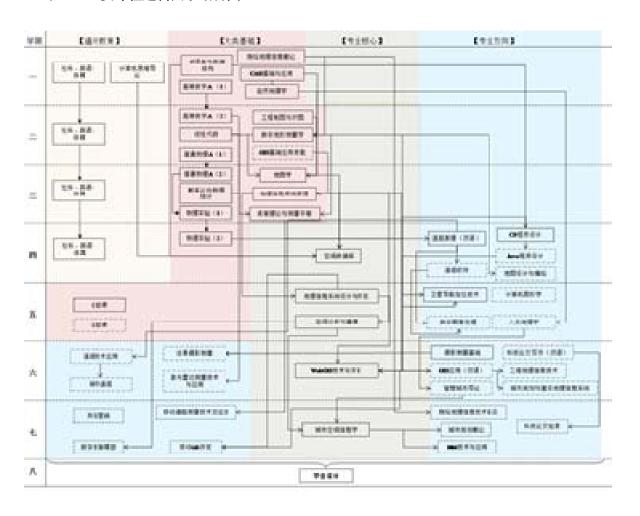
毕业生应具备的知识能力	相关知识领域	实现途径 (课程支撑)
的责任。	地理空间信息工程问	系理论概论、军事理论、工程测量学、城
	题、地理问题的解决方	市空间信息学、城市地理学、经典赏析与
	案对社会、健康、安全、	文化传承、哲学逻辑与文明对话、科技革
	法律以及文化的影响,	命与社会发展、建筑艺术与审美教育、生
	以及这些制约因素对	态文明与未来城市等。
	项目实施的影响,并理	
	解应承担的责任	
	7.1 知晓和理解环境保	物理实验 (1-2)、测绘地理信息概论、地
	护和可持续发展的理	球科学概论、遥感数字图像处理、形势与
	念和内涵	政策 (1-2) 等。
7.环境和可持续发展:能够	7.2 能够从环境保护和	地球科学概论、智慧城市导论、城市地理学、
理解和评价针对复杂地理	可持续发展的角度认	城市空间信息学、大数据与地理信息系统、
空间信息问题的地理空间	知地理空间信息工程	遥感原理、复合培养类、毕业设计等。
信息工程实践对环境、社会	实践活动的可持续性,	
可持续发展的影响。	以及评价测绘工程生	
	产实践中可能对环境	
	及社会造成的损害和	
	隐患	
	8.1 具有人文社会科学	思想道德修养与法律基础、中国近现代史
	素养,树立正确的世界	纲要、马克思主义基本原理概论、毛泽东
	观、人生观和价值观	思想和中国特色社会主义体系理论概论、
		军事理论、体育(1-4)、军训等。
	8.2 理解诚实公正、诚	思想道德修养与法律基础、中国近现代史
8.职业规范: 具有人文社会	信守则的测绘行业职	纲要、毛泽东思想和中国特色社会主义体
科学素养、社会责任感,能	业道德和规范,并能在	系理论概论、大学生职业生涯与发展规划、
够在地理空间信息工程实	地理空间信息工程实	测绘地理信息概论、地理信息系统设计与
践中理解并遵守地理信息	践中自觉遵守	开发、WebGIS概论、形势与政策 (1-2)、
系统行业职业道德和规范,		数字地形测量实习、空间信息综合实习等。
履行责任。	8.3 理解地理空间信息	马克思主义基本原理概论、大学生职业生
/K11 X III .	工程工作人员对公众	涯与发展规划、测绘地理信息概论、地球
	的安全、健康、福祉、	科学概论、毕业设计等。
	环境保护的社会责任,	
	能够在地理空间信息	
	工程实践中自觉履行	
	责任	
9.个人和团队: 能够在多学	9.1 能与建筑、土木等	大学生职业生涯与发展规划、体育(1-4)、
	<u> </u>	<u> </u>

毕业生应具备的知识能力	相关知识领域	实现途径 (课程支撑)
科背景下的团队中承担个	学科的成员有效沟通,	工程力学、城市地理学、C#程序设计、毕
体、团队成员以及责任人的	合作共事	业设计等。
角色。	9.2 能够在团队中独立	军事理论、军训、创新实践(测绘技能大
	或合作开展工作	赛、测绘科技论文大赛)、数字地形测量实
		习、遥感原理实习、测绘技能大赛实训、
		GIS 软件开发大赛实训等。
	9.3 能够组织、协调和	中国近现代史纲要、军事理论、地图学实
	指挥团队开展工作	习、地理信息系统原理实习、空间信息综
		合实习、激光雷达测量技术实习、毕业设
		计等。
	10.1 能够在撰写设计	地图学实习、地理信息系统设计与开发、
	书、技术报告以及陈述	WebGIS 概论、空间信息综合实习、毕业
	发言中,就复杂地理空	设计等。
10.沟通:能够就复杂地理	间信息工程问题与地	
空间信息工程问题与地理	理信息同行及社会公	
信息同行及社会公众进行	众进行有效沟通和交	
有效沟通和交流,包括撰写	流	
报告和设计文稿、陈述发	10.2 具备一定的国际	大学英语(1-2)、遥感原理、地理信息
言、清晰表达或回应指令,	视野,了解测绘领域的	系统原理(双语)、空间信息综合实习、
并具备一定的国际视野,能	国际前沿发展趋势和	大学英语拓展系列课程(1-8)、GIS 基
够在跨文化背景下进行沟	研究热点	础应用技能、遥感应用前景等。
通和交流。	10.3 具有跨文化交流	大学英语(1-2)、科技论文写作(双语)、
W/H X VIII.	的语言和书面表达能	大学英语拓展系列课程(1-8)等。
	力,能够就地理空间信	
	息问题在跨文化背景	
	下进行沟通和交流	
	11.1 掌握工程项目中	地理信息系统设计与开发、地理信息系统
	涉及的管理与经济决	原理(双语)、毕业设计等。
	策方法	
11.项目管理:理解并掌握	11.2 了解地理信息系	地理信息系统设计与开发、地理信息系统
工程管理原理与经济决策	统生产的成本构成,理	原理(双语)毕业设计等。
方法,并能在多学科环境中	解其中涉及的工程管	
应用。	理与经济决策问题	
	11.3 能在多学科环境	空间信息综合实习、不动产测量与管理实
	下,在设计开发的过程	习、地理信息系统设计与开发、城市地理
	中,运用工程管理与经	学、毕业设计等。

毕业生应具备的知识能力	相关知识领域	实现途径 (课程支撑)
	济决策方法	
	12.1 具有自主学习和	思想道德修养与法律基础、大学生职业生
	终身学习的意识	涯与发展规划、大学英语(1-2)、测绘地
		理信息概论、误差理论与测量平差基础、
		测绘管理与法律法规、测绘地理信息技术
12.终身学习: 具有自主学		前沿、大学英语拓展系列课程(1-8)等。
习和终身学习的意识,有不	12.2 具有不断学习和	马克思主义基本原理概论、毛泽东思想和
断学习和适应发展的能力。	适应发展的能力	中国特色社会主义体系理论概论、测绘地
		理信息概论、科技论文写作(双语)、智慧
		城市导论、测绘地理信息技术前沿、毕业
		设计、创新实践(测绘技能大赛、测绘科
		技论文大赛、GIS 技能大赛)等。

十、指导性教学计划(见附表)

十一、主要课程逻辑关系结构图



2020 Undergraduate Program for Specialty

in Geospatial Information Engineering

I Specialty Name and Code

English Name	Geospatial Information Engineering			
Code	081205T	Disciplines	Bachelor of Engineering	
Length of Schooling	4 years	Degree	Bachelor of Engineering	

II Educational Objectives and Features

Objectives: This program is to cultivate geospatial information inter-disciplinary engineering talents, fully developed in morality, intelligence and physique, well equipped with mathematical science and social science, and highly skilled in basic knowledge, theory, analysis method and application skills of physical geography and geographical information system. The students are required to have the systematic training of scientific thinking and engineering practice, have the ability to use surveying and mapping, remote sensing, satellite positioning and navigation and other technologies to acquire geographic data, master mathematical statistical analysis and computer technology, and have the ability of quantitative analysis and geographical research, so that they are competent in design, production, R&D and management of geographical information system, including urban planning, geographical conditions, resource management and environmental protection. Besides, the graduates have a good ability of organizing, innovation, learning, and international vision as well. After about 5 years of work and study after graduation, the graduates can achieve the following goals:

- (1) the knowledge of mathematics, natural science, engineering foundation and advanced theory and technology of geographic information system (GIS), competent in geospatial information engineering design, development and management, and other professional and technical work;
- (2) Have good professional quality, rich engineering management experience and strong sense of responsibility, and become the technical leader or technical backbone of surveying and mapping geographic information enterprises and institutions;
- (3) Have the ability to continue learning and adapt to development, and can independently or jointly undertake the research work of surveying and mapping geographic information;
- (4) Good team awareness, international vision and communication skills, capable of taking the leading role in the team;
- (5) Have good ideological and moral cultivation, scientific and cultural literacy, and can assume and fulfill social responsibilities.

Features: This program features integrating the teaching, research and production together with the development of high-technology, stressing the combination of theory and practice, highlighting the urban

spatial information characteristics, and pinpointing the comprehensive ability of application of new GIS technologies and software development. Based on the construction of Beijing and with the advantages of the civil construction disciplines of the University, this program aims to cultivate professional GIS talents for the urban informatization construction of Beijing and the whole country.

III Major Disciplines

Surveying Science and Technology, Geography, Computer Application

IV Major Courses

1. Basic Courses

Introduction to Geomatics, Engineering Drawing and Read Drawing, C Language Programming, Physical Geography, Digital Topographic Surveying, Cartography, CAD Basic and Application, The Principle of Geographic Information System (Bilingual), Principles of Remote Sensing

2. Specialty Courses

Spatial Database, Spatial Analysis and Modeling, Programming and Development for GIS, WebGIS Technology and Development, Urban Spatial Information Science, Fundamentals of Error Theory and Surveying Adjustment

V Major Practical Training

Digital Topographic Surveying Practice, Cartography Practice, C# Programming Practice, Spatial Analysis and Modeling Practice, The Principle of Geographic Information System Practice, Principles of Remote Sensing Practice, Programming and Development of GIS Practice, Photogrammetry Fundamental Practice, Spatial Analysis and Modeling Practice, Natural Geography and Remote Sensing Practice, Comprehensive Practice, Graduation Project or Thesis

VI Graduation Requirements

In accordance with "Management Regulations for the Undergraduate Students of Beijing University of Civil Engineering and Architecture" and "Bachelor's Degree Awarding Regulations", the minimum credits required by specialty for graduate is 166, including 130 credits of theoretical courses and 36 credits of practice teaching.

VII Proportion of Course

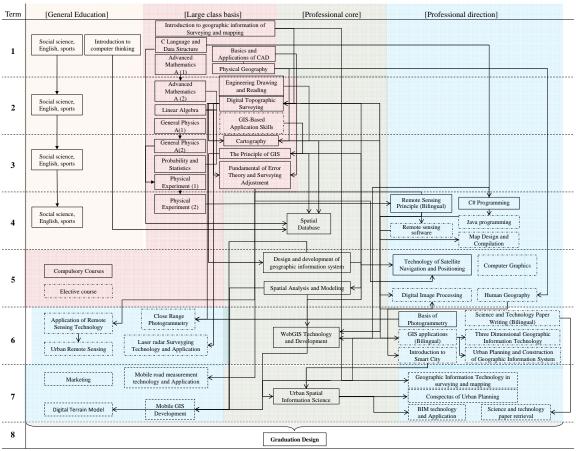
Course Category	Course Type	Credits	Class Hour	Proportion
	Compulsory	41.5	688	25%
General Education	Optional	2	32	1.2%
	Compulsory	43	756	25.91%
Big Academic Subjects	Optional	1	16	0.6%

Course Category	Course Type	Credits	Class Hour	Proportion
Professional Core	Compulsory	16	256	9.64%
	Compulsory	22	344	13.25%
Professional Direction	Optional	4.5	72	2.71%
	Compulsory	34	780	20.49%
Practice	Optional	2	40	1.2%
Total		166	2984	100%

VIII Table of Teaching Program

Semester	Teaching	Exam	Practice	Semester	Teaching	Exam	Practice
1	4-19	20	1-3	2	1-16	17	18-20
3	1-15	16	17-20	4	1-15	16	17-20
5	1-15	16	17-20	6	1-16	17	18-20
7	7-20		1-6	8	1-16 Under	graduate Des	ign or Thesis
/	7-20		1-0	0	17	Graduation r	eply

IX Table of Teaching Arrangement



X Graduate Abilities and Matrices

Graduate Abilities	Related Knowledge	Course Supports
	1.1 Be able to use the language	Introduction to Computational Thinking, C
	tools of mathematics, natural	Language and Data Structure, CAD Basic and
	science and engineering	Application, Engineering Drawing and Read
	science to express geospatial	Drawing, Advanced Mathematics A (1-2),
	information engineering	Theory of Probability and Statistics (B),
	problems.	College physics B(1), Physics
		Experiment(1-2), Linear Algebra, Introduction
		to Civil Engineering, Cartography,
		Introduction to Geoscience, Computer
		Graphics, Remote Sensing Image Processing.
	1.2 Be able to build and solve	Advanced Mathematics A (1-2), Linear
	mathematical model for	Algebra, Digital Topographic Surveying, The
	specific geospatial objects.	Principle of Geographic Information System
		(Bilingual Education), Photogrammetry
1.Engineering knowledge:		Fundamental, Fundamentals of Error Theory
have the ability of solving		and Surveying Adjustment, Spatial Analysis
complex engineering		and Modeling, Urban geography, CIM
problems with mathematics,		Technology and Application, Big Data and
natural science, engineering		Geographic Information System, Application
foundation and professional		of Artificial Intelligence in GIS.
knowledge.	1.3 Be able to apply relevant	Introduction to Computational Thinking, CAD
	knowledge and mathematical	Basic and Application, Engineering Drawing
	model method to deduce and	and Read Drawing, Linear Algebra, Satellite
	analyze complex engineering	Navigation and Positioning Technology, Laser
	problems of GIS Specialty	Radar Surveying Technology and Application,
		Computer Graphics, Urban Spatial
		Information Science, CIM Technology and
		Application.
	1.4 Be able to use the relevant	C Language Programming, Data Structure, C#
	knowledge and mathematical	Programming, Java Programming, Python
	model method to compare and	Programming, Theory of Probability and
	synthesize the solutions of	Statistics B, Technology of 3D GIS, Close
	complex engineering problems	Range Photogrammetry, Digital Topographic
	in Geographic Information	Surveying Practice, Cartography Practice,
	Engineering Specialty	Photogrammetry Fundamental Practice,

Graduate Abilities	Related Knowledge	Course Supports
		Spatial Information Practice, Undergraduate
		Design, etc.
	2.1 Be able to apply the basic	Introduction to Computational Thinking, C
	theories of mathematics,	Language Programming, Advanced
	natural science and engineering	Mathematics A (1-2), Theory of Probability
	science to identification,	and Statistics (B), Physics Experiment (1-2),
	analysis and expression.	Linear Algebra, C# Programming,
		Cartography, The Principle of Geographic
		Information System (Bilingual Education),
		Introduction to Geoscience, Spatial Analysis
2. Problem analysis: Be		and Modeling, Photogrammetry Fundamental
able to apply the basic		Practice, Spatial Analysis and Modeling.
principles of mathematics,	2.2 Be able to correctly express	CAD Basic and Application, Digital
natural science and	complex geospatial	Topographic Surveying, Fundamentals of
Engineering Science,	information engineering	Error Theory and Surveying Adjustment,
identify, express, and	problems based on relevant	Laser Radar Surveying Technology and
analyze the complex	scientific principles and	Application, Technology of 3D GIS,
geographic information	mathematical model method.	GIS-based Application Skills, etc.
engineering problems	2.3 Be able to recognize that	C Language Programming, Data Structure,
through literature research	there are multiple solutions to	Document Retrieval of Science and
to obtain the effective	the problem, and seek	Technology, Photogrammetry Fundamental,
conclusion.	alternative solutions through	The Principle of Geographic Information
	literature research	System Practice, Spatial Information Practice,
		etc.
	2.4 Be able to use the basic	College physics A (1-2), Document Retrieval
	principles, with the help of	of Science and Technology, Satellite
	literature research, analyze the	Navigation and Positioning Technology,
	influencing factors of the	Undergraduate Design, etc.
	process, and obtain effective	
	conclusions	
3. Design/Develop	3.1 Master the basic design /	Introduction to Computational Thinking, CAD
solutions: Be able to solve	development methods and	Basic and Application, GIS-based Application
complex geospatial	technologies of the whole cycle	Skills, Introduction to Smart City, Spatial
information engineering	and process of GIS design/	Analysis and Modeling, Programming and
problems with design	development, and understand	Development of GIS, Spatial Database,
solutions. The design meets	the various factors affecting the	WebGIS Technology and Development,

Graduate Abilities	Related Knowledge	Course Supports
the specific needs of	design objectives and technical	Photogrammetry Fundamental Practice,
system, the unit	solutions.	Spatial Information Practice, etc.
(components) or process,	3.2 Be able to design and	C Language Programming, Data Structure,
and can embody the sense	develop production processes	CAD Basic and Application, Principles of
of innovation in the design	and systems to meet the needs	Remote Sensing, The Principle of Geographic
process, considering the	of specific Geospatial	Information System (Bilingual Education),
society, health, and safety,	Information Engineering	Programming and Development of GIS,
law, culture and		Spatial Database, WebGIS Technology and
environment factors.		Development, Photogrammetry Fundamental,
		Satellite Navigation and Positioning
		Technology, Laser Radar Surveying
		Technology and Application, Map Design and
		Compilation, Cartography Practice, The
		Principle of Geographic Information System
		Practice, etc.
	3.3 Be able to reflect	Introduction to Geomatics, WebGIS
	innovation awareness in	Technology and Development, Programming
	geospatial information	and Development of GIS, Digital Topographic
	engineering solution design,	Surveying, Big Data and Geographic
	and consider social, health,	Information System, Application of Artificial
	safety, legal, cultural and	Intelligence in GIS, Innovative practice (GIS
	environmental factors	Competition), Digital Topographic Surveying
		Practice, Innovation and Entrepreneurship,
		Undergraduate Design, etc.
4. Study: Be able to study	4.1 Be able to use scientific	Introduction to Geoscience, Cartography, The
complex engineering	principles to put forward	Principle of Geographic Information System
problems, including the	research plans for complex	(Bilingual Education), Introduction to Smart
design of experiments,	geospatial information	City, Principles of Remote Sensing Practice,
analysis and interpretation	engineering problems and	Cartography Practice, etc.
of data, and get a reasonable	geographic problems	
and effective conclusion	4.2 Be able to design,	Introduction to Computational Thinking, Big
through the comprehensive	demonstrate and predict	Data and Geographic Information System,
information by using	research plans based on	Application of Artificial Intelligence in GIS,
scientific methods based on	professional theoretical	Engineering Drawing and Read Drawing,
scientific theory.	knowledge	Principles of Remote Sensing,
		Photogrammetry Fundamental, Satellite

Graduate Abilities	Related Knowledge	Course Supports
		Navigation and Positioning Technology,
		Spatial Information Practice, etc.
	4.3 Be able to use scientific	C# Programming, C Language Programming,
	methods to collect and analyze	Data Structure, Spatial Database,
	data.	Fundamentals of Error Theory and Surveying
		Adjustment, Laser Radar Surveying
		Technology and Application, Remote Sensing
		Image Processing, Photogrammetry
		Fundamental Practice, etc.
	4.4 Be able to synthesize and	Document Retrieval of Science and
	evaluate the experimental	Technology, Cartography, Academic Writing
	results and get reasonable and	(Bilingual Education), Spatial Analysis and
	effective conclusions.	Modeling, Spatial Information Practice,
		Undergraduate Design or Thesis, etc.
	5.1 Be able to select	College English (1-2), Introduction to
	appropriate data acquisition	Computational Thinking, Satellite Navigation
	methods and technologies for	and Positioning Technology, C Language and
	complex geospatial	Data Structure, CAD Basic and Application,
5. Using modern tools: be	information engineering	C# Programming, Digital Topographic
able to develop, select and	problem.	Surveying, Laser Radar Surveying Technology
use appropriate GIS		and Application, Technology of 3D GIS,
technology, resources, data		Computer Graphics, GIS-based Application
collection equipment and		Skills, Introduction to Smart City, Advanced
information technology for		Technology of Surveying, Mapping and GIS,
complex geospatial		Digital Topographic Surveying Practice,
information engineering		Principles of Remote Sensing Practice,
problems, including		Cartography Practice, GIS Software
prediction and Simulation		Development Competition Practical Training.
of complex spatial	5.2 Be able to use modern data	Spatial Analysis and Modeling, Spatial
information engineering	acquisition equipment and	Database, Engineering Drawing and Read
problems, and understand	information technology	Drawing, Advanced Mathematics A (1-2),
their limitations.	software to complete GIS data	Theory of Probability and Statistics (B),
	acquisition, data processing	Digital Topographic Surveying, Principles of
	and accuracy analysis.	Remote Sensing, Cartography,
		Photogrammetry Fundamental, Satellite
		Navigation and Positioning Technology,

Graduate Abilities	Related Knowledge	Course Supports
		Fundamentals of Error Theory and Surveying
		Adjustment, Digital Topographic Surveying
		Practice, Principles of Remote Sensing
		Practice, The Principle of Geographic
		Information System Practice, Spatial
		Information Practice, Undergraduate Design or
		Thesis, Surveying and Mapping Skills Practice
		Contest, GIS Software Development
		Competition Practical Training, etc.
	5.3 Be able to use modern tools	Theory of Probability and Statistics (B),
	to predict and simulate	College physics (1-2), Linear Algebra,
	complex geospatial	Document Retrieval of Science and
	information engineering	Technology, Fundamentals of Error Theory
	problems and geographic	and Surveying Adjustment, Big Data and
	problems, and understand their	Geographic Information System, Application
	limitations.	of Artificial Intelligence in GIS,
		Photogrammetry Fundamental Practice,
		Undergraduate Design or Thesis, Innovative
		Practice (National University GIS Application
		Skills Contest, Surveying and Mapping Skills
		Contest, Surveying and Mapping Science and
		Technology Paper Contest), etc.
6. Engineering and society:	6.1 Be familiar with relevant	Thought Morals Accomplishment and Basic
be able to conduct	technical standards, laws and	Law, Digital Topographic Surveying,
reasonable analysis based	regulations and management	Principles of Remote Sensing, Spatial Analysis
on the relevant background	regulations of GIS, and be able	and Modeling, Urban geography, Satellite
knowledge of the project,	to make reasonable analysis	Navigation and Positioning Technology,
evaluate the impact of	based on relevant engineering	Digital Topographic Surveying Practice, The
geospatial information	background knowledge.	Principle of Geographic Information System
engineering practice and		Practice, Engineering Practice, Undergraduate
complex geospatial		Design or Thesis, etc.
information engineering	6.2 Be able to evaluate the	The Outline of the Modern Chinese History,
problem solutions on	impact of geospatial	The Generality of Basic Principle of Marxism,
society, health, safety, law	information engineering	Introduction to Mao Zedong Thoughts and
and culture, and understand	practice and complex	Theoretical System of the Chinese
the responsibilities to be	geospatial information	characteristic socialism, Introduction to Mao

Graduate Abilities	Related Knowledge	Course Supports
undertaken.	engineering problems,	Zedong Thoughts and Theoretical System of
	solutions to geographical	the Chinese characteristic socialism, Military
	problems on society, health,	Theory, Engineering Surveying, Urban Spatial
	safety, law and culture, as well	Information Science, Urban geography,
	as the impact of these	Classical appreciation and cultural inheritance,
	constraints on project	Philosophical vision and civilization dialogue,
	implementation, and	Scientific and technological revolution and
	understand the responsibilities	social development, Architectural art and
	to be undertaken.	aesthetic education, Ecological Civilization
		and future City, etc.
	7.1 To know and understand	Physics Experiment (1-2), Introduction to
	the concept and connotation of	Geomatics, Introduction to Geoscience,
	environmental protection and	Remote Sensing Image Processing, Situation
7.5	sustainable development.	and Policy(1-4), etc.
7. Environment and	7.2 Be able to recognize the	Introduction to Geoscience, Introduction to
sustainable development:	sustainability of geospatial	Smart City, Urban geography, Urban Spatial
Be able to understand and	information engineering	Information Science, Big Data and
evaluate the influence of	practice activities from the	Geographic Information System, Principles of
geospatial engineering	perspective of environmental	Remote Sensing, Compound Culture,
practice with complex	protection and sustainable	Undergraduate Design or Thesis.
engineering problems for	development, and evaluate the	
sustainable development of	possible damage and hidden	
environment and society.	dangers to the environment and	
	society in the production	
	practice of Surveying and	
	mapping engineering.	
8. Occupational norms:	8.1 Equip with the quality of	Thought Morals Accomplishment and Basic
Equip with the quality of	humanistic social sciences, set	Law, The Outline of the Modern Chinese
humanistic social sciences,	up correct world outlook,	History, The Generality of Basic Principle of
sense of social	outlook on life and values.	Marxism, Introduction to Mao Zedong
responsibility, understand		Thoughts and Theoretical System of the
and follow professional		Chinese characteristic socialism, Military
ethics and criteria in		Theory, Physical Education (1-4), Military
engineering, be		Training, etc.
conscientious in the	8.2 Understand the	Thought Morals Accomplishment and Basic
performance of one's	professional ethics and norms	Law, The Outline of the Modern Chinese

Graduate Abilities	Related Knowledge	Course Supports
duties.	of geospatial information	History, Introduction to Mao Zedong Thoughts
	industry in terms of honesty,	and Theoretical System of the Chinese
	fairness and integrity, and	characteristic socialism, College Student
	consciously abide by them in	Occupation Career and Development
	geospatial information	Planning, Introduction to Geomatics,
	engineering practice	Programming and Development of GIS,
		WebGIS Technology and Development,
		Situation and Policy (1-2), Digital Topographic
		Surveying Practice, Spatial Information
		Practice, etc.
	8.3 Understand the social	The Generality of Basic Principle of Marxism,
	responsibility of geospatial	College Student Occupation Career and
	information engineering staff	Development Planning, Introduction to
	for the safety, health,	Geomatics, Introduction to Geoscience,
	well-being and environmental	Undergraduate Design or Thesis, etc.
	protection of the public, and be	
	able to consciously perform	
	their responsibilities in	
	geospatial information	
	engineering practice	
	9.1 Able to effectively	College Student Occupation Career and
	communicate and work with	Development Planning, Physical Education
	members of architecture, civil	(1-4), Engineering Mechanics, Urban
	engineering and other	geography, C# Programming, Undergraduate
	disciplines	Design or Thesis, etc.
9. Individuals and teams:	9.2 Be able to work	Military Theory, Military Training, Innovative
Be able to play an important	independently or	Practice (Surveying and Mapping Skills
role of individual, team	collaboratively in a team	Contest, Surveying and Mapping Science and
member and person in		Technology Paper Contest), Digital
charge in the team of		Topographic Surveying Practice, Principles of
multi-subject background.		Remote Sensing Practice, Surveying and
		Mapping Skills Practice Contest, GIS
		Software Development Competition Practical
		Training, etc.
	9.3 Be able to organize,	The Outline of the Modern Chinese History,
	coordinate and direct team	Military Theory, Cartography Practice, The

Graduate Abilities	Related Knowledge	Course Supports
	work 10.1 Be able to effectively communicate and exchange	Principle of Geographic Information System Practice, Spatial Information Practice, Laser Radar Surveying Technology and Application Practice, Undergraduate Design or Thesis, etc. Cartography Practice, Programming and Development of GIS, WebGIS Technology
10. Communication: Be able to communicate effectively with industry peers in complex engineering, including	with geographic information peers and the public on complex geospatial information engineering issues in writing design books, technical reports and presentations	and Development, Spatial Information Practice, Undergraduate Design or Thesis, etc.
writing reports and design papers, summary statement, express oneself and response instruction clearly. Have international perspective and the ability of communicating between or among interlocutors of different cultural background	10.2 Have international vision and understand the international cutting-edge development trend and research hotspot in the field of Surveying and mapping 10.3 Have the ability of cross-cultural communication in language and writing, and be able to communicate and exchange geospatial information issues in a	College English (1-2), Principles of Remote Sensing, The Principle of Geographic Information System(Bilingual Education), Spatial Information Practice, College English training (1-8), GIS-based Application Skills, Remote Sensing Application Prospect, etc. College English(1-2), Academic Writing (Bilingual Education), College English training (1-8), etc.
11. Project management: Understand and master the method of development and management for economic decision method and application in multi subject environment.	cross-cultural context 11.1 Master the management and economic decision-making methods involved in engineering projects 11.2 Understand the cost structure of GIS production and the engineering management and economic decision-making issues involved	Programming and Development of GIS, The Principle of Geographic Information System (Bilingual Education), Undergraduate Design or Thesis, etc. Programming and Development of GIS, The Principle of Geographic Information System (Bilingual Education), Undergraduate Design or Thesis, etc.

Graduate Abilities	Related Knowledge	Course Supports
	11.3 Be able to use engineering	Spatial Information Practice, Immovable
	management and economic	Property Measurement and Management
	decision-making methods in	Practice, Programming and Development of
	the process of design and	GIS, Urban geography, Undergraduate Design
	development in a	or Thesis, etc.
	multidisciplinary environment.	
	12.1 Have the awareness of	Thought Morals Accomplishment and Basic
	autonomous learning and	Law, College Student Occupation Career and
	lifelong learning	Development Planning, College English(1-2),
		Introduction to Geomatics, Fundamentals of
		Error Theory and Surveying Adjustment,
		Surveying and Mapping Management and
		Laws, Advanced Technology of Surveying,
10 1 1 1 1		Aping and GIS, College English training
12. Lifelong learning: Have		(1-8), etc.
the awareness of	12.2 Have the ability to learn,	The Generality of Basic Principle of Marxism,
autonomous learning and	and adapt to the development.	Introduction to Mao Zedong Thoughts and
lifelong learning and the		Theoretical System of the Chinese
ability to learn, and adapt to		characteristic socialism, Introduction to
the development.		Geomatics, Academic Writing (Bilingual
		Education), Introduction to Smart City,
		Advanced Technology of Surveying,
		Undergraduate Design or Thesis, Innovative
		Practice (Surveying and Mapping Skills
		Contest, Surveying and Mapping Science and
		Technology Paper Contest, GIS Skills
		Competition), etc.

表 1 地理空间信息工程专业指导性教学计划(1)

课程类别	课程属性	课程名称	学分	总学时	讲课学时	实验学时	上机学时	课外学时	延续教学	开课 学期	教学单位
		思想道德修养与法律基础 Thought Morals Accomplishment and Basic Law	3	48	48					1	马克思主义学院
		中国近现代史纲要 The Outline of the Modern Chinese History	3	48	32			16		2	马克思主义学院
		马克思主义基本原理概论★ The Generality of Basic Principle of Marxism	3	48	48					3	马克思主义学院
		毛泽东思想和中国特色社会主义体系理论概论★ Introduction to Mao Zedong Thoughts and Theoretical System of the Chinese characteristic socialism	5	80	64			16		4	马克思主义学院
	必	形势与政策(1-4) Situation and Policy(1-4)	2	32	32					1-4	马克思主义学院
	修	大学生职业生涯与发展规划 College Student Occupation Career and Development Planning	1	16	16					1/2	学工部
通		大学生心理健康 The Mental health of College Students	1	16	16					2	学工部
识		大学英语(1-2) ★ College English(1-2)	6	128	96				32	1-2	人文学院
教		大学英语拓展系列课程(1-4) College English training(1-4)	2	32	32					3	人文学院
育		大学英语拓展系列课程(5-8) College English training(5-8)	2	32	32					4	人文学院
		体育(1-4) Physical Education(1-4)	4	120	120					1-4	体育部
课		计算思维导论 Introduction to Computational Thinking	1.5	56	24			32		1	电信学院
		小 计	33. 5	656	560			64	32		
		建筑艺术与城市设计	2	32						1-8	各院部
	 核	哲学逻辑与人文素养	2	32						1-8	各院部
		创新创业与社会发展	2	32						1-8	各院部
	心	生态文明与智慧科技	2	32						1-8	各院部
		至少修读 4 类合	计 8 学	2分,	每类	至少修	译 2	学分			
		工程实践类			1	-8 学	期任道	先			各院部
	任修	复合培养类	各院部								
		跨	类任进	至少	2 学	分					
		通识教育课合计至少修读 43.5 学分。									
	其中通识教育必修 33.5 学分,通识教育核心 8 学分,通识教育任选 2 学分(含体育课 1 学分)									エチガノ	

表 1 地理空间信息工程专业指导性教学计划(2)

课程类别	课程属性	课程名称	学分	总学时	讲课学时	实验学时	上机学时	课外学时	延续教学	开课 学期	教学单位
		高等数学 A (1) ★ Advanced Mathematics A(1)	5	92	80				12	1	理学院
		高等数学 A (2) ★ Advanced Mathematics A(2)	5	84	80				4	2	理学院
		线性代数 Linear Algebra	2	40	32				8	2	理学院
		概率与数理统计 B Theory of Probability and Statistics (B)		48	44				4	3	理学院
		普通物理 A (1) ★ College physics A(1)	3	56	52			4		2	理学院
		普通物理 A (2) ★ College physics A(2)	3	56	52			4		3	理学院
		物理实验(1-2)Physics Experiment(1-2)	2	60		60				3-4	理学院
	.iv	C语言程序设计★ C Language Programming	2	32	24	8				1	地理信息科学系
大	必	地球科学概论 Introduction to Geoscience	2	32	32					1	地理信息科学系
类	修	测绘地理信息概论 Introduction to Geomatics	1	16	16					1	测绘学院
基		CAD 基础与应用 CAD Basic and Application	2	32	16	16				1	测绘工程系
础		数字地形测量学★ Digital Topographic Surveying	4	64	52	12				2	测绘工程系
课		地图学 Cartography	3	48	40	8				3	地理信息科学系
		地理信息系统原理(双语) The Principle of Geographic Information System(Bilingual Education)	3	48	40	8				3	地理信息科学系
		遥感原理与应用 Principles of Remote Sensing	3	48	48					3	遥感工程系
		合 计	43	756	608	112		8	28		
		GIS基础应用技能 GIS-based Application Skills	1	16	8	8				2	地理信息科学系
	选	现代测绘技术应用 Modern Surveying and Mapping Technology Application	1	16						2	测绘工程系
	修	遥感应用前景 Remote Sensing Application Prospect	1	16						3	遥感工程系
		大类学科基础课合计 44	学分	,必值	多 43 🕏	学分,	任选	1 学	分		

表 1 地理空间信息工程专业指导性教学计划(3)

课程类别	课程属性	课程名称	学分	总学时	讲课学时	实验学时	上机学时	课外学时	延续教学	开课 学期	教学单位
		空间数据库 Spatial Database	3	48	32	16				4	地理信息科学系
		误差理论与测量平差基础★ Fundamentals of Error Theory and Surveyir Adjustment		32	32					4	测绘工程系
专	N	空间分析与建模 Spatial Analysis and Modeling	3	48	40	8				5	地理信息科学系
业核心	必修	地理信息系统设计与开发 Programming and Development of GIS	3	48	24	24				5	地理信息科学系
课	113	WebGIS 技术与开发 WebGIS Technology and Development	3	48	24	24				6	地理信息科学系
		城市空间信息学 Urban Spatial Information Science	2	32	24	8				7	地理信息科学系
		小计	16	256	176	80					
		专业核	心课	合计业	公修 16	3 学分					
		C#程序设计 C# Programming	3	48	32	16				4	地理信息科学系
		GNSS 原理及其应用 The Application and Principles of GNSS	2	32	28	4				5	测绘工程系
		摄影测量学 Photogrammetry	3	48	44	4				5	遥感工程系
专		人工智能在地理信息系统中的应用 Application of Artificial Intelligence in GIS	1. 5	24	16	8				5	地理信息科学系
п.		数据结构 Data Structure	1. 5	24	16	8				5	地理信息科学系
业	必	遥感数字图像处理 Remote Sensing Image Processing	1. 5	24	16	8				5	遥感工程系
/3	修	计算机图形学 Computer Graphics	2	32	20	12				6	地理信息科学系
向		工程制图与识图 Engineering Drawing and Read Drawing	2	32	32					6	理学院
课		大数据与地理信息系统 Big Data and Geographic Information System	1. 5	24	16	8				6	地理信息科学系
		CIM 技术与应用 CIM Technology and Application	2	24	16	8				7	地理信息科学系
		城市地理学 Urban geography	2	32	32					7	地理信息科学系
		小 计	22	344	268	76					

课程类别	课程属性	课程名称	学分	总学时	讲课学时	实验学时	上机学时	课外学时	延续教学	开课学期	教学单位
		地图设计与编绘 Map Design and Compilation	2	32	16	16				4	地理信息科学系
		Java 程序设计 Java Programming	2	32	24	8				6	地理信息科学系
		人文地理学 Human Geography	1.5	32	16	16				5	地理信息科学系
		遥感软件 Remote Sensing Software	2	32	16	16				5	遥感工程系
		Python 语言 Python language	2	32	24	8				4	地理信息科学系
		科技论文写作(双语) Academic Writing (Bilingual Education)	1	16	16					6	遥感工程系
		科技文献检索 Document Retrieval of Science and Technology	1	16	16			8		7	图书馆
		GIS 应用(双语) GIS Applications(Bilingual Education)	1. 5	24	16	8				6	地理信息科学系
专	\ 	三维地理信息技术 Technology of 3D GIS	2	32	16	16				6	地理信息科学系
业	选	遥感技术应用 Applications of Remote Sensing Technology	2	32	16	16				6	遥感工程系
方	修	移动 GIS 开发 Mobile GIS Development	2	32	16	16				7	地理信息科学系
向		激光雷达测量技术与应用 Laser Radar Surveying Technology and Application	2	32	24	8				6	地理信息科学系
课		测绘地理信息技术前沿 Advanced Technology of Surveying, Mapping and GIS	1	16	16					7	测绘学院
		智慧城市导论 Introduction to Smart City	1	16	16					6	地理信息科学系
		城市遥感(双语)Urban Remote Sensing(Bilingual Education)	2	32	24	8				6	遥感工程系
		城市规划概论 Conspectus of Urban Planning	1. 5	24	20	4				7	建筑学院
		市场营销 Marketing Management	1.5	24	24					7	经管学院
		自然资源管理 Natural Resources Management	1	16						7	测绘学院
		测绘法律法规 SurveyingManagement and Laws	1	16						6	测绘学院
		小计	30	488	316	140		8			
		专业方向课合计 26.5 学	分,	必修 2	22 学	分,日	E选 4.	5 学分	}		

表 2 地理空间信息工程专业指导性教学计划(实践环节)

课程属性	课程名称	学分	折合学时	实验实践	上机	开课 学期	开设 周次	教学单位
	军事理论 Military Theory	2	36			1	1.0	武装部
	军训 Military Training	2	112			1	1-3	此 表前
	形势与政策 (5-8) Situation and Policy(5-8)		32			5-8	分散	马院、各学院
	数字地形测量实习 Digital Topographic Surveying Practice	3	60	60		2	18-20	测绘工程系
	地图学实习 Cartography Practice	2	40			3	17-18	地理信息科学系
	C#程序实习 C# Programming Practice	2	40			4	18-19	地理信息科学系
	空间数据库实习 Spatial Database Practice	2	40			4	20	地理信息科学系
	地理信息系统原理实习The Principle of Geographic Information System Practice	2	40			3	19-20	地理信息科学系
课内	遥感原理与应用实习Principles of Remote Sensing Practice	1	20			3	17	遥感工程系
	地理信息系统设计与开发实习 Programming and Development of GIS Practice	2	40			5	19-20	地理信息科学系
	摄影测量基础实习 Photogrammetry Fundamental Practice	1	20			5	18	遥感工程系
	空间分析与建模实习 Spatial Analysis and Modeling Practice	1	20			5	17	地理信息科学系
	自然地理地貌及遥感图像解译实习 Natural Geography and Remote Sensing image interpretation Practice	1	20	20		6	15	遥感工程系
	空间信息综合实习 Spatial Information Practice	5	100	100		7	1-5	测绘学院
	毕业设计或论文 Undergraduate Design or Thesis	8	160	160		8	1-16	地理信息科学系
	合计	34	780	340				

课程属性		课程名称		折合学时	实验实践	上机	开课 学期	开设周次	教学单位
课	创新实践	GIS 软件开发大赛实训 GIS Software Development Competition Practical Training	1	20	20		4		地理信息科学系
外	及科研训练	学院 GIS 选拔比赛 School GIS Selection Competition	1	20	20		5		地理信息科学系
		全国大学生 GIS 应用技能大赛 National University GIS Application Skills Contest	1	20	20				地理信息科学系
		超图开发大赛 SuperMap Development Competition	1	20	20				地理信息科学系
		天地图开发大赛 Map World Development Competition	1	20	20				地理信息科学系
		则泰杯全国论文大赛 The Mostrule Cup State Essay Competition	1	20	20				地理信息科学系
课	创新实践	Mapgis 开发大赛 Mapgis Development Competition	1	20	20				地理信息科学系
外	及科研训练	测绘技能大赛实训 Surveying and Mapping Skills Practice Contest	2	40	40		4		测绘工程系
		学院测绘技能大赛 School of Surveying and Mapping Skills Contest	1	20	20		4		测绘工程系
		测量数据处理与程序设计大赛实训 Surveying Data Processing and Program Design Practice Contest	1	20	20		5		测绘工程系
		遥感科学与技术创新实践及科研 训练	2	40	40		6		遥感工程系
		小 计	13	260					

实践环节合计 36 学分,课内必修 34 学分,创新实践及科研训练选修 2 学分

2020 级遥感科学与技术专业本科培养方案

一、专业基本信息

英文名称	名称 Remote Sensing Science and Technology						
专业代码	081202	学科门类	工学				
学 制	四年	授予学位	工学学士				

二、培养目标及特色

培养目标:

面向首都及国家城乡建设的需要,培养德智体美劳全面发展的社会主义事业合格建设者和可靠接班人,能够在国土资源调查、国家基础测绘、城乡建设与规划、自然资源监测、环境保护、文化遗产保护及灾害预警与应急响应等领域从事地面、航空、航天遥感信息采集与处理、分析、应用开发及项目管理方面工作的高级专业骨干人才。

毕业后经过5年左右的工作和学习,能够达到如下目标:

- (1) 具有良好的思想道德修养和科学文化素养,较强的工作责任心,事业心、良好的职业道 德,能够承担和履行社会责任,能积极服务于国家与社会。
- (2) 胜任摄影测量与遥感方面的生产、设计与开发、规划与管理,以及相关方面的研究与教育工作。
- (3) 具有组织管理与协调能力,良好的团队意识、国际化视野和沟通能力,能解决复杂遥感 工程问题并在工程中担任重要角色。
- (4) 具有终身学习和跟随遥感领域新技术发展的能力,掌握现代工具、软件的使用方法,具有竞争潜力。
- (5) 具备测绘地理信息行业工程师及注册测绘师的能力,成为遥感领域相关企事业单位的技术负责人或技术骨干。

专业特色:

本专业依托首都建设和学校土木建筑类学科和学院测绘学科背景优势,注重扎实的摄影测量与 遥感体系课程的贯穿和建设。着力培养学生的两个能力:第一,在各个教学环节注重"原创能力", 强调"编程能力"。第二,确保学生具有摄影测量遥感的生产实践能力。此外,结合学院的研究特 色方向,在地面激光扫描文化遗产保护、移动道路测量系统应用等方面的课程突出优势和特色。

三、主干学科

测绘科学与技术

四、主干课程

1. 主干基础课程

测绘地理信息概论、数字地形测量学、C 语言程序设计、地球科学概论、地图学

2. 主干专业课程

遥感原理与应用、航空航天数据获取、摄影测量学、遥感数字图像处理、城市遥感(双语)、 计算机视觉

五、主要实践教学环节

数字地形测量学实习、摄影测量学实习、计算机视觉实习、遥感原理实习、遥感数字图像处理 实习、遥感综合实习、自然地理地貌及遥感图像解译实习、(近景与激光雷达、移动测量、微波遥 感)新技术综合实习、地理信息系统原理实习、空间信息综合实习、毕业设计。

六、毕业学分要求

参照北京建筑大学本科学生学业修读管理规定及学士学位授予细则,修满本专业最低计划学分应达到 167.5 学分,其中理论课程 128.5 学分,实践教学环节 39 学分。

七、各类课程结构比例

O. D. X.W. T. M. 1. 300 1/2	<u>•</u>			
课程类别	课程属性	学分	学时	学分比例
\Z\U***\\	必修	41.5	688	24.78%
通识教育课	选修	2	32	1.19%
上光甘加田	必修	43	756	25.67%
大类基础课	选修	1	16	0.6%
专业核心课	必修	14	224	8.36%
± .U. → ← \H	必修	21.5	344	12.84%
专业方向课	选修	5.5	88	3.28%
独立实践环节	必修	39	880	23.28%
总计		167.5	3028	100

八、教学进程表

学期	教学周	考试	实践	学期	教学周	考试	实践
1	4-19 周	20 周	1-3 周	2	1-16 周	17-周	18-20 周
3	1-15 周	16周	17-20 周	4	1-16 周	17周	18-20 周
5	1-16 周	17 周	18-20 周	6	1-15 , 18-19 周	20 周	16-17 周
7	6-14 周	15 周	1-5、16-20 周	8	1-16 毕	业设计/实习	17 周答辩

九、毕业生应具备的知识能力及实现矩阵

九、毕业生应具备的知识 毕业生应具备的知识能力	相关毕业要求指标点	实现途径 (课程支撑,粗体为必修课)
	1.1 能够将数学、物理、 地学科学、工程的语言 工具用于遥感工程问 题的表述	C语言程序设计、地图学、数据结构、 工程制图与识图、高等数学 A(1-2)、概率与数理统计 B、线性代数、普通物理 B(1-2)、工程制图与识图、CAD 基础与 应用、遥感原理与应用、遥感数字图像 处理、地球科学概论、大地测量基础、 计算机图形学等。
 工程知识: 能够应用数学、物理、计算机、地学科学、工程的基础和专业知识用于解决遥感领域复 	1.2 能针对具体的遥感 对象建立数学模型并 求解 , 满足测绘的精 度要求	高等数学 A(1-2)、线性代数、概率与数理统计 B、普通物理 B(1-2)、数字地形测量学、地理信息系统原理(双语)、摄影测量学、大地测量学基础、误差理论与测量平差基础等。
<mark>杂工程问题。</mark>	1.3 能够将遥感相关知识和数学模型方法用于推演、分析遥感专业复杂工程问题	高等数学 A(1-2)、线性代数、遥感数字 图像处理、工程制图与识图、GNSS 原 理及其应用、激光雷达测量技术与应用、 微波遥感、计算机视觉等。
	1.4 能够将遥感相关知识和数学模型方法用于遥感专业复杂工程问题解决方案的比较与综合	概率与数理统计 B、近景摄影测量、遥感技术应用、摄影测量学、摄影测量学 实习、新技术实习、空间信息综合实习、 毕业设计等。
2.问题分析: 能够应用数 学、物理、计算机、地学 科学和工程的基本原理, 识别、表达、并通过文献 研究分析复杂遥感工程问	2.1 能够将数学、物理、 计算机、地学科学和工程的基本理论运用到识别判断、分析与表达 遥感复杂工程问题	计算思维导论、C语言程序设计、高等数学 A(1-2)、概率与数理统计 B、线性代数、普通物理 B(1-2)、工程制图与识图、CAD 基础与应用、地图学、地理信息系统原理(双语)、面向对象的程序设计、遥感数字图像处理、大地测量基础等。
题,以获得有效结论。	2.2 能够认识到解决问 题有多种方案可选择, 会通过文献研究寻求	科技文献检索、大地测量学基础、遥感 技术应用、城市遥感(双语)、摄影测量 学、面向对象的程序设计等。

毕业生应具备的知识能力	相关毕业要求指标点	实现途径 (课程支撑,粗体为必修课)
	可替代的解决方案	
	2.3 能运用基本原理, 借助文献研究,分析过 程的影响因素,获得有 效结论	科技文献检索、GNSS 原理及其应用、 近景摄影测量、遥感原理等。
3. 设计/开发解决方案:能够设计针对复杂遥感、摄影测量、测绘工程问题的	3.1 能够根据测绘、遥感、地理信息工程用户的需求,设计技术方案,了解影响设计目标和技术方案的各种因素	地理信息系统原理(双语)、遥感数字图像处理、遥感软件、可视化语言 IDI、计算机视觉、GIS 软件使用、地理信息系统原理实习、遥感数字图像处理实习、空间信息综合实习等。
解决方案,设计满足遥感数据获取、处理、应用等方面需求的系统、生产流程,并能够在设计环节中体现创新意识,考虑社会、	3.2 能够开发满足遥感数据获取、处理、应用等方面需求的生产流程及系统	遥感软件、遥感技术应用、移动道路测量技术及应用、GIS 软件使用、GNSS原理及其应用、激光雷达测量技术与应用、航空航天数据获取实习、面向对象的程序设计、遥感数字图像处理实习等。
健康、安全、法律、文化 以及环境等因素。	3.3 能够在遥感工程解 决方案设计中体现创 新意识,考虑社会、健 康、安全、法律、文化 以及环境等因素	生态文明与未来城市、数字地形测量学、测绘地理信息概论、遥感技术应用、移动道路测量技术及应用、智慧城市导论、遥感科学与技术创新实践及科研训练、数字地形测量实习、毕业设计等。
4.研究: 能够基于科学原理并采用科学方法对复杂遥感工程问题进行研究,	4.1 <mark>能够运用科学原理</mark> 及文献研究等方法对 复杂遥感工程问题现 状进行调研	地图学、地理信息系统原理(双语)、科技文献检索、航空航天数据获取、摄影测量学、近景摄影测量、微波遥感、遥感数字图像处理、遥感数字图像处理实习等。
包括现状调研、获取分析 与解释数据、并通过信息 综合 得到合理有效的结 论。	4.2能够基于专业理论 知识对研究方案进行 设计、论证与预测	GNSS 原理及其应用、遥感原理与应用、 遥感技术应用、遥感综合实习、空间信 息综合实习、近景摄影测量等。
	4.3能够采用科学方法 实施数据采集与分析	CAD 基础与应用、误差理论与测量平差 基础、激光雷达测量技术与应用、摄影

毕业生应具备的知识能力	相关毕业要求指标点	实现途径(课程支撑,粗体为必修课)
	处理	测量基础、摄影测量学实习、航空航天 数据获取。
	4.4能够对实验结果进 行信息综合与评判,取 得合理有效结论	物理实验 (1-2)、数字地形测量实习、 地图学、激光雷达测量技术与应用、遥 感图像解译、空间信息综合实习等。
5. 使用现代工具: 能够针	5.1 能够针对复杂遥感 工程问题,选择恰当的 现代遥感技术与硬件、 软件	现代测绘技术应用、数字地形测量学、 GIS 基础应用技能、摄影测量学实习、 航空航天数据获取、地图学实习、遥感 综合实习、(近景与激光雷达、移动测量、 微波遥感)新技术实习、GIS 软件开发 大赛实训等。
对复杂遥感工程问题,开 发、选择与使用恰当的遥 感、测绘技术与资源;现 代测绘仪器和遥感处理软 件,能够对复杂遥感工程 问题的预测与模拟,并能 够理解其局限性。	5.2 能够使用现代测绘 仪器和信息技术软件 完成 遥感 数据采集、 数据处理与精度分析	GIS 基础应用技能、数字地形测量实习、 遥感原理与应用实习、大地测量学基础、 GNSS 原理及其应用、误差理论与测量 平差基础、航空航天数据获取、地理信 息系统原理实习、空间信息综合实习、 毕业设计等。
	5.3 能够使用现代工 具,对复杂 遥感 工程 问题进行预测与模拟, 并理解其局限性	遥感软件、微波遥感、误差理论与测量 平差基础、高光谱遥感、遥感综合实习、 GIS 软件设计与使用、新型航空遥感数 据处理技术、新技术实习、深度学习与 遥感智能解译等。
6. 工程与社会: 能够基于 工程相关背景知识进行合 理分析,评价遥感工程实 践和复杂工程问题解决方	6.1 熟悉遥感专业相关 技术标准、法律法规及 管理规定,能够基于工 程相关背景知识进行 合理分析	测绘管理与法律法规、思想道德修养与 法律基础、数字地形测量学、遥感原理 与应用、大地测量学基础、GNSS 原理 及其应用、测绘地理信息概论、遥感图 像解译等。
案对社会、健康、安全、 法律以及文化的影响,并 理解应承担的责任。	6.2 能够评价遥感测绘成果对社会、健康、法律以及文化、国家安全、领土完整的重要性,以及这些制约因素	思想道德修养与法律基础、马克思主义 基本原理概论、中国近现代史纲要、毛 泽东思想和中国特色社会主义体系理论 概论、空间信息综合实习、军事理论、 科技革命与社会发展、生态文明与未来

毕业生应具备的知识能力	相关毕业要求指标点	实现途径 (课程支撑,粗体为必修课)
	对项目实施的影响,并 理解应承担的责任理 解遥感工程实践应承 担的责任	城市、形势与政策 (1-2)、遥感综合实 习、毕业设计等。
7. 环境和可持续发展: 能够理解和评价针对复杂遥感工程问题的测绘工程实践对环境、社会可持续发展的影响。	7.1 知晓和理解环境保护和可持续发展的理念和内涵	毛泽东思想和中国特色社会主义体系理 论概论、测绘地理信息概论、地球科学 概论、地理国情监测、形势与政策(1-2)、 自然地理地貌与遥感解译实习等。
	7.2 能够从环境保护和可持续发展的角度认知遥感 工程实践活动的可持续性,以及评价遥感 工程生产实践中可能对环境及社会造成的损害和隐患	生态文明与未来城市、地理国情监测、 地球科学概论、智慧城市导论、形势与 政策 (1-2)、自然地理地貌与遥感解译 实习等。
8. 职业规范: 具有人文社 会科学素养、社会责任感,	8.1 具有人文社会科学 素养 和健康的体魄, 树立正确的世界观、人 生观和价值观	思想道德修养与法律基础、中国近现代 史纲要、马克思主义基本原理概论、毛 泽东思想和中国特色社会主义体系理论 概论、军事理论、体育(1-4)、军训、 大学生职业生涯与发展规划、形势与政 策(1-2)、经典赏析与文化传承、哲学 视野与文明对话、科技革命与社会发展 等。
能够在遥感工程实践中理解并遵守测绘、地理信息 行业职业道德和规范,履 行责任。	8.2 理解诚实公正、诚信守则的遥感行业职业道德和规范,并能在遥感 工程实践中自觉遵守	思想道德修养与法律基础、毛泽东思想和中国特色社会主义体系理论概论、大学生职业生涯与发展规划、测绘地理信息概论、测绘管理与法律法规、形势与政策(1-2)、数字地形测量实习、空间信息综合实习等。
	8.3 理解遥感工作人员 对公众的安全、健康、 福祉、环境保护的社会 责任,能够在遥感工程	思想道德修养与法律基础、中国近现代 史纲要、马克思主义基本原理概论、毛 泽东思想和中国特色社会主义体系理论 概论、大学生职业生涯与发展规划、测

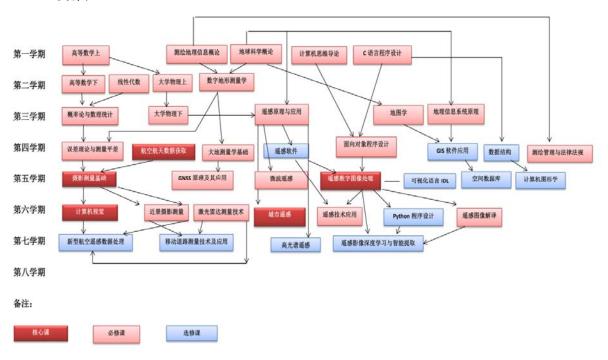
毕业生应具备的知识能力	相关毕业要求指标点	实现途径 (课程支撑,粗体为必修课)
	实践中自觉履行责任	绘管理与法律法规、测绘地理信息概论、 地球科学概论、自然地理地貌及遥感图 像解译实习、城市遥感等。
	9.1 能与测绘、地理信息、计算机 等学科的成员有效沟通,合作共事	工程制图与识图、地球科学概论、计算机视觉、面向对象的程序设计、遥感图像解译等。
9. 个人和团队: 能够在多 学科背景下的团队中承担 个体、团队成员以及责任 人的角色。	9.2 能够在团队中独立 或合作开展工作	军事理论、军训、数字地形测量实习、 遥感原理与应用实习、新技术实习、GIS 软件开发大赛实训等。
	9.3 能够组织、协调和 指挥团队开展工作	数字地形测量实习、地图学实习、地理信息系统原理实习、航空航天数据获取、空间信息综合实习、新技术实习、学院 测绘技能大赛等。
10. 沟通: 能够就复杂遥 感工程问题与行及社会公	10.1 能够就遥感专业问题,以口头、文稿、图表等方式,准确表达自己的观点,回应质疑,理解与同行和社会公众交流的差异性。	地图学实习、城市遥感(双语)、科技论文写作(双语)、遥感数字图像处理实习、面向对象程序设计实习、遥感科学与技术创新实践及科研训练、毕业设计等。
感工程问题与行及社会公 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。	10.2 具备一定的国际视野,了解遥感领域的	大学英语(1-2)、城市遥感(双语)、 地理信息系统原理(双语)、新型航空
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	国际前沿发展趋势和研究热点,理解和尊重世界不同文化的差异性和多样性。	遥感数据处理、遥感应用前景等。

毕业生应具备的知识能力	相关毕业要求指标点	实现途径 (课程支撑,粗体为必修课)
	11.1 掌握工程项目中 涉及的管理与经济决 策方法	数字地形测量学实习、现代测绘技术应用、航空航天数据获取实习、(近景与激光雷达、移动测量、微波遥感)新技术实习等。
11.项目管理: 理解并掌握 遥感工程项目或产品的设 计和实施的全周期、全流 程管理原理与经济决策方 法,并能在多学科环境中 应用。	11.2 了解遥感、测绘工程及产品全周期、全流程的成本构成,能在多学科环境下,理解其中涉及的工程管理与经济决策问题	现代测绘技术应用、测绘管理与法律法规、航空航天数据获取、遥感综合实习、 毕业设计等。
<u>I型</u> 月 ○	11.3 能在多学科环境下,在设计开发遥感工程解决方案的过程中,运用工程管理与经济决策方法。	遥感技术应用、 激光雷达测量技术与应用、现代测绘技术应用、遥感应用前景、 (近景与激光雷达、移动测量、微波遥感)新技术实习
12. <mark>终身学习: 具有自主 学习和终身学习遥感领域 新知识的意识,有不断学习和适应遥感技术发展的能力。</mark>	12.1 具有自主学习和 终身学习的意识,掌握 必要的学习方法	大学生职业生涯与发展规划、计算机思维导论、科技革命与社会发展、测绘地理信息概论、测绘管理与法律法规、遥感应用前景等。
	12.2 具有理解和迁移 知识、识别和综述遥感 学科新发展的能力	大学生职业生涯与发展规划、智慧城市 导论、遥感应用前景、新型航空遥感数 据处理技术、测绘地理信息概论、遥感 影像深度学习与智能解译、毕业设计、 遥感科学与技术创新实践及科研训练 等。

十、指导性教学计划(见附表)

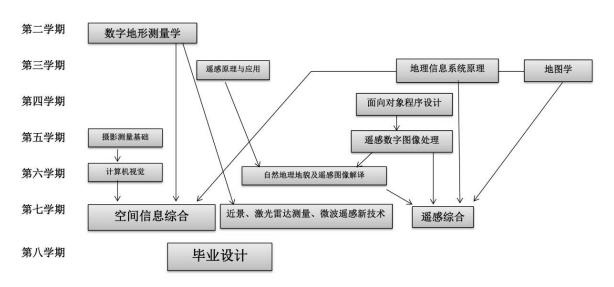
十一、主要课程、实践环节逻辑关系结构图

1、主要课程



2、主要实践环节

第一学期



备注: 字体大小与实践环节时长对应

2020 Undergraduate Program for Specialty

in Remote Sensing Science and Technology

I Specialty Name and Code

English Name	Remote Sensing Science and Technology		
Code	081202	Disciplines	Bachelor of Engineering
Length of Schooling	4 years	Degree	Bachelor of Engineering

II Educational Objectives and Features

Objectives: To meet the needs of urban and rural construction of the capital and the country, advanced knowledge of mathematics, humanities and Social Sciences, basic theory, basic knowledge and basic skills of Remote Sensing Science and technology should be cultivated, accept training of scientific thinking and engineering practice, and have strong ability of acquisition, processing, analysis, application of remote sensing data in aviation, aerospace and on the ground, processing and development of remote sensing image and international vision Professional backbone and leading talents. After about 5 years of work and study after graduation, the following goals can be achieved:

- (1) With good ideological and moral cultivation, scientific and cultural literacy, strong sense of responsibility, able to undertake and fulfill social responsibility.
- (2) With organization management and coordination ability, good team consciousness, international vision and communication ability, able to solve complex remote sensing engineering problems and play an important role in the project.
- (3) With the ability of lifelong learning and following the development of new technologies in the field of remote sensing, mastering the use of modern tools and software, it has competitive potential.
- (4) Have the ability of engineer in surveying and mapping geographic information industry, and be competent for the production, management, development, research and education in the fields of geospatial information collection and processing, information-based surveying and mapping, natural resource investigation and monitoring, and urban emergency. Become the technical director or technical backbone of relevant enterprises and institutions in the field of remote sensing.

Features: This program relies on the background advantages of capital construction and civil construction discipline of the University and surveying and mapping discipline of the college, and pays attention to the penetration and construction of solid photogrammetry and remote sensing system courses. Two abilities of students should be cultivated: first, we should pay attention to "original ability" and "programming ability" in each teaching link. Second, to ensure that students have the ability of production and practice of photogrammetry and remote sensing. In addition, combined with the research characteristic

direction of the college, the courses in the aspects of ground laser scanning cultural heritage protection, mobile road measurement system application and so on have outstanding advantages and characteristics.

III Major Disciplines

1. Main basic courses

Introduction to surveying and mapping geographic information, digital topographic survey, C language, introduction to earth science, cartography

2. Major courses

Remote sensing principle and application, aerospace data acquisition, photogrammetry, remote sensing digital image processing, urban remote sensing (Bilingual), computer vision

IV Major Practical Training

Digital topographic surveying practice, photogrammetry practice, computer vision practice, remote sensing principle practice, remote sensing digital image processing practice, remote sensing comprehensive practice, natural geography and landform and remote sensing image interpretation practice, (close range and lidar, mobile measurement, microwave remote sensing) new technology comprehensive practice, geographic information system principle practice, spatial information comprehensive practice, graduation Design

V Graduation Requirements

In accordance with "Management Regulations for the Undergraduate Students of Beijing University of Civil Engineering and Architecture" and "Bachelor's Degree Awarding Regulations", the minimum credits required by specialty for graduate is 167.5, including 128.5 credits of theoretical courses and 39 credits of practice teaching.

VI Proportion of Course

Course Category	Course Type	Credits	Class Hour	Proportion
	Compulsory	41.5	688	24.78%
General Education	Optional	2	32	1.19%
	Compulsory	43	756	25.67%
Big Academic Subjects	Optional	1	16	0.6%
Professional Core	Compulsory	14	224	8.36%
B 6 : 1B: ::	Compulsory	21.5	344	12.84%
Professional Direction	Optional	5.5	88	3.28%
Practice	Compulsory	39	880	23.28%
total		167.5	3028	100

VII Table of Teaching Arrangement

Semester	Teaching	Exam	Practice	Semester	Teaching	Exam	Practice
1	4-19	20	1-3	2	1-16	17	18-20
3	1-15	16	17-20	4	1-16	17	18-20
5	1-16	17	18-20	6	1-15 , 18-19	20	16-17
7	6-14	15	1-5、16-20	8		s for graduati	1 0

VIII Graduate Abilities and Matrices

	III Graduate Abilities and Matrices				
Graduate Abilities	Related Knowledge	Course Supports			
	1.1 be able to use the	Introduction to computational thinking, C			
	language tools of	language, engineering drawing and map			
	mathematics, physics and	recognition, advanced mathematics a (1-2),			
	geosciences for the	General Physics A (1-2), physical geography,			
	expression of remote	etc.			
	sensing engineering				
	problems:				
1. Engineering	1.2 be able to build	Probability and Mathematical Statistics B,			
	mathematical model for	principle of geographic information system			
knowledge:	specific remote sensing	(Bilingual), photogrammetry basis, geodesy			
Engineering	objects	basis, error theory and survey adjustment basis,			
knowledge: be able to		remote sensing principle, etc.			
apply the basic and professional	1.3 be able to apply the	Linear algebra, remote sensing digital image			
-	relevant knowledge and	processing, lidar measurement technology and			
knowledge of mathematics, physics and Geosciences to	mathematical model	application, microwave remote sensing, digital			
	methods to deduce and	photogrammetry, etc.			
	analyze the complex				
solve complex engineering problems.	engineering problems of				
engineering problems.	remote sensing				
	1.4 be able to apply	Physical experiment (1-2), close range			
	relevant knowledge and	photogrammetry, application of remote sensing			
	mathematical model	technology, basic practice of photogrammetry,			
	methods to the comparison	comprehensive practice of spatial information,			
	and synthesis of solutions	graduation design, etc.			
	to complex engineering				
	problems of remote				

Graduate Abilities	Related Knowledge	Course Supports
	sensing	
2. Problem analysis: be able to apply the basic principles of mathematics, physics and Geosciences to identify, express and analyze complex remote sensing engineering problems through literature research, so as to	2.1 be able to apply the basic theories of mathematics, physics and Geosciences to identification, analysis and expression. 2.2 be able to correctly express complex remote sensing engineering problems based on relevant scientific principles and mathematical model methods	Introduction to computational thinking, C language and data structure, probability and Mathematical Statistics B, linear algebra, object-oriented programming, deep learning and pattern recognition, etc. Scientific and technological literature retrieval, geodetic basis, remote sensing technology application, urban remote sensing, microwave remote sensing, remote sensing integrated practice, etc.
obtain effective conclusions.	2.3 be able to recognize that there are many options for solving problems, and be able to find alternative solutions through literature research	Scientific and technological literature retrieval, close range photogrammetry, remote sensing technology application, new technology practice, graduation design, scientific research training, etc.
3. Design/Develop solutions: be able to design solutions for complex remote sensing and photogrammetric surveying and mapping engineering problems, design systems and production processes that meet specific	3.1 master the basic design / development methods and technologies of Surveying and mapping geographic information engineering design / development in the whole cycle and process, and understand the various factors that affect the design objectives and technical solutions.	Principles of geographic information system (Bilingual), introduction to smart city, remote sensing software, use of GIS software, practice of principles of geographic information system, comprehensive practice of spatial information, etc.
needs, embody innovation awareness in the design process,	3.2 be able to design and develop production processes and systems that	Remote sensing software, remote sensing technology application, GIS software use, object-oriented programming, remote sensing

Graduate Abilities	Related Knowledge	Course Supports
and consider social,	meet specific remote	image processing practice, etc.
health, safety, legal,	sensing needs	
cultural and		
environmental factors.	3.3 be able to embody the	Ecological civilization and future city,
	innovative consciousness	introduction to surveying and mapping
	in the design of remote	geographic information, digital
	sensing engineering	photogrammetry, mobile road survey
	solutions, and consider the	technology and application, introduction to
	social, health, safety, legal,	smart city remote sensing science and
	cultural and environmental	technology innovation practice, scientific
	factors	research training, graduation project, etc.
	4.1 be able to use scientific	Remote sensing principle, aerospace data
	principles to put forward	acquisition, close range photogrammetry,
	research plans for complex	microwave remote sensing, hyperspectral
4. Research: be able to	remote sensing	remote sensing, etc.
research complex	engineering problems	
remote sensing	4.2 be able to design,	Satellite navigation and positioning
engineering problems	demonstrate and predict	technology, remote sensing technology
based on scientific	the research scheme based	application, remote sensing comprehensive
principles and	on professional theoretical	practice, space information comprehensive
scientific methods,	knowledge	practice, close range photogrammetry, etc
including designing	4.3 be able to use scientific	CAD basis and application, digital topographic
experiments,	methods to implement data	survey, error theory and survey adjustment
analyzing and	collection, analysis and	basis, lidar measurement technology and
interpreting data, and	processing	application, photogrammetry basic practice,
getting reasonable and	processing	aerospace data acquisition.
effective conclusions	4.4 be able to carry out	Physical experiment (1-2), satellite navigation
through information	information synthesis and	and positioning technology, lidar measurement
integration.	evaluation on the	technology and application, digital topographic
	experimental results, and	measurement practice, aerospace data
	obtain reasonable and	acquisition practice, etc.
	effective conclusions	acquisition practice, etc.
5 Haina madam tast-	5.1 be able to select	Modern surveying and manning technology
5. Using modern tools:		Modern surveying and mapping technology
be able to develop,	appropriate modern remote	application, GIS basic application skills,
select and use	sensing technology and	photogrammetry basic practice, aerospace Data
appropriate remote	hardware, software	Acquisition Remote Sensing comprehensive
sensing, mapping		practice, (close range and lidar, mobile

Graduate Abilities	Related Knowledge	Course Supports
technology, resources,		measurement, microwave remote sensing) new
modern mapping		technology practice, GIS software
instruments and		development competition practice, etc.
remote sensing	5.2 be able to use modern	Cartography, GIS basic application skills
processing software	surveying and mapping	digital topographic survey practice, aerospace
for complex remote	instruments and	data acquisition, GIS principle practice, spatial
sensing engineering	information technology	information comprehensive practice,
problems, including	software to complete	graduation project, etc.
prediction and	remote sensing data	
Simulation of complex	collection, data processing	
remote sensing	and accuracy analysis	
engineering problems,	5.3 be able to use modern	Remote sensing software, microwave remote
and understand their	tools to predict and	sensing, hyperspectral remote sensing, design
limitations.	simulate complex remote	and use of GIS software, new air remote
	sensing engineering	sensing data processing technology, etc.
	problems, and understand	
	their limitations	
	6.1 be familiar with	Ideological and moral cultivation and legal
6. Society and	relevant technical	basis, engineering drawing and map
engineering: be able to	standards, laws and	recognition, cartography, survey of geographic
conduct reasonable	regulations and	information, geodetic basis, etc.
analysis based on	management regulations of	
relevant background	remote sensing specialty,	
knowledge of the	and be able to conduct	
project, evaluate the	reasonable analysis based	
impact of remote	on relevant background	
sensing engineering	knowledge of the project	
practice and complex	6.2 be able to evaluate the	The outline of modern Chinese history, the
engineering problem	social, health, safety, legal	introduction to the basic principles of
solutions on society,	and cultural impact of	Marxism, military theory, classic appreciation
health, safety, law and	remote sensing	and cultural heritage, philosophical vision and
culture, and	engineering practice and	civilization dialogue, scientific and
understand the	complex mapping	technological revolution and social
responsibilities to be	engineering solutions, and	development, architectural art and aesthetic
undertaken	the impact of these	education, ecological civilization and future
	constraints on project	urban graduation design, etc

Graduate Abilities	Related Knowledge	Course Supports
	implementation, and	
	understand the	
	responsibilities to be	
	undertaken	
	7.1 know and understand	Introduction to Mao Zedong Thought and
	the concept and	socialist system with Chinese characteristics,
	connotation of	introduction to surveying and mapping
	environmental protection	geographic information, physical geography,
	and sustainable	situation and policy (1-2), physical geography
7.Environment and	development	and remote sensing interpretation practice, etc.
sustainable	7.2 be able to recognize	Ecological civilization and future city, physical
development : be able	the sustainability of remote	geography, introduction to smart city, physical
to understand and	sensing engineering	geography and geomorphology and remote
evaluate the impact of	practice activities from the	sensing interpretation practice, cartography
Surveying and	perspective of	practice, etc.
mapping engineering	environmental protection	
practice on the	and sustainable	
sustainable	development, as well as	
development of	evaluate the possible	
environment and	damages and hidden	
society	dangers to the environment	
	and society caused by the	
	production practice of	
	remote sensing	
	engineering	
8. Occupational	8.1 have the quality of	Ideological and moral cultivation and legal
norms: have the	Humanities and Social	basis, outline of modern Chinese history,
quality of Humanities	Sciences, establish correct	introduction to basic principles of Marxism,
and Social Sciences	world outlook, outlook on	introduction to Mao Zedong Thought and
and a sense of social	life and values,	theory of socialism with Chinese
responsibility, be able		characteristics, military theory, physical
to understand and		education (1-4), military training, classic
abide by the		appreciation and cultural heritage,
professional ethics and		philosophical vision and civilization dialogue,
norms of Surveying		scientific and technological revolution and
and mapping and		social development, etc

Graduate Abilities	Related Knowledge	Course Supports
geographic	8.2 understand the	College Students' career and development
information industry	professional ethics and	planning, survey of geographic information,
in the practice of	norms of the remote	situation and policy (1-2), digital topographic
remote sensing	sensing industry in terms	survey practice, remote sensing comprehensive
engineering, and fulfill	of honesty, justice and	practice, remote sensing principle practice, etc
their responsibilities.	integrity, and consciously	
	abide by the ideological	
	and moral cultivation and	
	legal basis	
	8.3 understand the social	College Students' career and development
	responsibility of remote	planning, introduction to surveying and
	sensing workers for the	mapping geographic information, physical
	safety, health, well-being	geography, remote sensing principle practice,
	and environmental	physical geography and geomorphology and
	protection of the public,	remote sensing image interpretation practice,
	and be able to consciously	urban remote sensing, etc.
	perform their	
	responsibilities in the	
	practice of remote sensing	
	engineering	
	9.1 be able to effectively	College Students' career and development
	communicate with	planning, introduction to smart city,
	members of Surveying and	comprehensive practice of spatial information,
	mapping, geographic	graduation project, etc.
9.Individuals and	information, computer and	
teams: be able to	other disciplines, and work	
assume the roles of	together with them	
individual, team	9.2 be able to work	Cartography practice, GIS principle practice,
member and	independently or	remote sensing digital image processing
responsible person in a	cooperatively in the team	practice, new technology practice, Zetai cup
multi-disciplinary		national paper competition, GIS software
team.		development competition practice, etc.
	9.3 be able to organize,	Military training, digital topographic survey
	coordinate and command	practice, digital topographic survey practice,
	the team to carry out the	aerospace data acquisition, space information
	work	comprehensive practice, new technology

Graduate Abilities	Related Knowledge	Course Supports
		practice, college mapping skills competition,
		etc.
	10.1 be able to effectively	Urban remote sensing (Bilingual), scientific
	communicate and	paper writing (Bilingual), cartography practice,
	exchange with peers and	remote sensing digital image processing
	the public on complex	practice, object-oriented programming
10. Communication:	remote sensing	practice, remote sensing science and
be able to effectively	engineering issues during	technology innovation practice and scientific
communicate and	the writing of design	research training, etc.
exchange with the	books, technical reports	
bank and the public on	and presentations	
complex remote	10.2 have a certain	College English (1-2), scientific and
sensing engineering	international vision and	Technological Paper Writing (Bilingual), urban
issues, including	understand the	remote sensing (Bilingual), principles of
writing reports and	international cutting-edge	geographic information system (Bilingual),
design papers, making	development trend and	College English expansion courses (1-8), new
statements, clearly	research hotspot in the	aviation remote sensing data processing,
expressing or	field of remote sensing	in-depth learning and pattern recognition
responding to		introduction, remote sensing application
instructions, and have		prospect, etc.
a certain international	10.3 have the ability of	College English (1-2), scientific and
vision, and be able to	cross-cultural	Technological Paper Writing (Bilingual), urban
communicate and	communication in	remote sensing (Bilingual), College English
exchange in a	language and written	expansion courses (1-8), etc.
cross-cultural context	expression, be able to	
	communicate and	
	exchange on remote	
	sensing issues in	
	cross-cultural context	
11. Project	11.1 master the	Digital topographic survey, modern mapping
management:	management and economic	technology application, aerospace data
understand and master	decision-making methods	acquisition practice, (close range and lidar,
engineering	involved in engineering	mobile measurement, microwave remote
management	projects	sensing) new technology practice, etc.
principles and	11.2 understand the cost	Modern surveying and mapping technology
economic	composition of remote	application, aerospace data acquisition

Graduate Abilities	Related Knowledge	Course Supports
decision-making methods, and be able	sensing and mapping production, and understand	practice, remote sensing comprehensive practice, space information comprehensive
to apply them in a multidisciplinary environment.	the engineering management and economic decision-making issues involved in it	practice, graduation project, etc.
12. Lifelong learning: Have the awareness of autonomous learning	12.1 The consciousness of autonomous learning and lifelong learning.	College Students' career and development planning, introduction to computational thinking, scientific and technological revolution and social development, application prospect of remote sensing, application of modern surveying and mapping technology, etc.
and lifelong learning and the ability to learn, and adapt to the development.	12.2 Have the ability of eternal learning and adapting development.	Introduction to smart city, remote sensing application prospect, new air remote sensing data processing technology, introduction to deep learning and pattern recognition, graduation project, remote sensing science and technology innovation practice and scientific research training, etc.

表 1 遥感科学与技术专业指导性教学计划

课程类别	课程属性	课程名称	学分	总学时	讲课学时	实验学时	上机学时	课外学时	延续教学	开课 学期	教学单位
		思想道德修养与法律基础 Thought Morals Accomplishment and Basic Law	3	48	48					1	马克思主义学院
		中国近现代史纲要 The Outline of the Modern Chinese History	3	48	32			16		2	马克思主义学院
		马克思主义基本原理概论★ The Generality of Basic Principle of Marxism	3	48	48					3	马克思主义学院
		毛泽东思想和中国特色社会主义体系理论概 论★ Introduction to Mao Zedong Thoughts and Theoretical System of the Chinese characteristic socialism	5	80	64			16		4	马克思主义学院
		形势与政策(1-4) Situation and Policy(1-4)	2	32	32					1-4	马克思主义学院
	必修	大学生职业生涯与发展规划 College Student Occupation Career and Development Planning	1	16	16					1/2	学工部
	12	大学生心理健康The Mental health of College Students	1	16	16					2	学工部
		大学英语(1-2) ★ English(1-2)	6	128	96				32	1-2	人文学院
通识		大学英语拓展系列课程(1-4) College English training(1-4)	2	32	32					3	人文学院
教育		大学英语拓展系列课程(5-8) College English training(5-8)	2	32	32					4	人文学院
课		体育(1-4) Physical Education(1-4)	4	120	120					1-4	体育部
		计算思维导论 Introduction to computational thinking	1. 5	56	24			32		1/2	电信学院
		小 计	33. 5	656	560			64	32		
		建筑艺术与城市设计	2	32						1-8	各院部
	核	哲学逻辑与人文素养	2	32						1-8	各院部
		创新创业与社会发展	2	32						1-8	各院部
	心	生态文明与智慧科技	2	32						1-8	各院部
		修读 4 类合计 8 学分,每类至少修读 2 学分									
		工程实践类	1-8 学期任选							各院部	
	任	复合培养类	1-8 学期任选						各院部		
	选	跨多	类任选	至少	2 学分	分					
		通识教育课合·	计至少	〉 修读	43. 5	学分	0				
		其中通识教育必修 33.5 学分,通识教育核	心 8	全分,	通识	教育信	£选 2	学分	(含体	本育课	1 学分)

课程类别	课程属性	课程名称	学分	总学时	讲课学时	实验学时	上机学时	课外学时	延续教学	开课 学期	教学单位
		高等数学 A (1) ★ Advanced Mathematics A(1)	5	92	80				12	1	理学院
		高等数学 A (2) ★ Advanced Mathematics A(2)	5	84	80				4	2	理学院
		线性代数 Linear Algebra	2	40	32				8	2	理学院
		概率与数理统计 B Theory of Probability and Statistics (B)	3	48	44				4	3	理学院
		普通物理 A (1) ★ College physics A(1)	3	56	52			4		2	理学院
		普通物理 A (2) ★ College physics A(2)	3	56	52			4		3	理学院
		物理实验(1-2) Physics Experiment(1-2)	2	60		60				3-4	理学院
大	必	C语言程序设计 C Programming Language	2	32	24	8				1	地理信息科学系
		地球科学概论 Introduction to Earth Science	2	32	32					1	地理信息科学系
类	修	测绘地理信息概论 Introduction to Geomatics	1	16	16					1	测绘学院
基		CAD 基础与应用 CAD Basic and Application	2	32	16	16				1	测绘工程系
		数字地形测量学★ Digital Topographic Surveying	4	64	52	12				2	测绘工程系
础		地图学 Cartography	3	48	40	8				3	地理信息科学系
课		地理信息系统原理(双语) The Principle of Geographic Information System	3	48	40	8				3	地理信息科学系
		遥感原理与应用★ Principles of Remote Sensing	3	48	48					3	遥感工程系
		小 计	43	756	608	112		8	28		
		现代测绘技术应用 Application of Modern Surveying and Mapping Technology	1	16	16					2	测绘工程系
	选	GIS 基础应用技能 GIS base Application Skill	1	16	8	8				2	地理信息科学系
	修	遥感应用前景 Remote Sensing Application Prospect	1	16	16					3	遥感工程系
		小 计	3	48	40	8					
Ī		大类基础课合计 44 🖰	学分,	必修	43 学	分,	选修:	1 学分			
		航空航天数据获取 Aerospace data acquisition	2	32	28	4				4	遥感工程系
专		城市遥感(双语) Urban Remote Sensing	3	48	40	8				6	遥感工程系
业	必	摄影测量学 Photogrammetry	3	48	44	4				5	遥感工程系
核	修	遥感数字图像处理 Digital Image Processing	3	48	40	8				5	遥感工程系
心	12	计算机视觉 Computer vision	3	48	40	8				6	遥感工程系
课		小计	14	224	192	32					
		专业核心	、课合	计必何	多 14 :	学分					

			分	总学时	课学时	验学时	机学时	外学时	续 教 学	开课 学期	教学单位
		GNSS 原理及其应用 GNSS principle and application	2	32	28	4				5	测绘工程系
		面向对象程序设计 object oriented programming	2	32	32					4	遥感工程系
		误差理论与测量平差基础 Fundamentals of	3	48	48					4	测绘工程系
		Error Theory and Surveying Adjustment 激光雷达测量技术与应用	2	32	24	8				6	遥感工程系
		Laser radar Surveying Technology 遥感技术应用(研讨式教学)Applications of	2	32	21	0					迪 恋工注水
	必	Remote Sensing in different fields (seminar)	2	32	16	16				6	遥感工程系
	修	近景摄影测量 Close Range Photogrammetry	2	32	26	6				6	遥感工程系
		微波遥感 Microwave Remote Sensing	2	32	32					5	遥感工程系
		大地测量学基础 Geodesy Fundamental	2	32	24	8				4	测绘工程系
		遥感图像解译 Remote sensing image interpretation	1. 5	24	24					6	遥感工程系
		工程制图与识图 Engineering Drawing and Interpreting	2	32	32					6	理学院
		测绘管理与法律法规 Surveying Management and Laws	1	16	16					6	测绘工程系
		小计	21.5	344	302	42					
专		空间数据库 Spatial Database	2	32						5	地理信息科学系
业		数据结构 Data structure	2	32						4	遥感工程系
方		移动道路测量技术及应用 Technology and Application of Mobile Mapping System	1	16	8	8				7	地理信息科学系
向		新型航空遥感数据处理技术 Modern aerial remote sensing data processing technology	2	32	32					7	遥感工程系
课		计算机图形学 Computer Graphics	2	32						5	地理信息科学系
		高光谱遥感									
		Hyperspectral remote sensing	2	32	24	8				6	遥感工程系
		科技论文写作(双语)Academic Writing (Billinguish)	1	16	16					6	遥感工程系
	选	科技文献检索 document retrieval of science and technology	1	16	16			8		5	图书馆
	修	遥感影像深度学习与智能解译 Deep learning and intelligent interpretation of remote sensing image	2	32	32					7	遥感工程系
		智慧城市导论 Introduction to smart city	1	16	16					6	地理信息科学系
		遥感软件 Remote Sensing Software	2	32	16	16				4	遥感工程系
		GIS 软件使用 GIS Software	2	32	16	16				4	地理信息科学系
		可视化语言 IDL The Language IDL	2	32	16	16				5	遥感工程系
		Python 程序设计 Python Programming	2	32	16	16				6	遥感工程系
		地理国情监测 Geographic Conditions Monitoring	1. 5	24	16	8				7	地理信息科学系
	-	大数据与地理信息系统 Big data and GIS	1. 5	24	16	8				6	地理信息科学系
		小 计	27	432	240	96		8		<u> </u>	20年间100年7
-	世上 1										<u> </u>

表 2 遥感科学与技术专业指导性教学计划(实践环节)

课程属性	课程名称	学分	折合学时	实验实践	上机	开课 学期	开设 周次	教学单位		
	军事理论 Military Theory 军训	2	36			1	1-3	武装部		
	Military Training 形势与政策(5-8) Situation and Policy(5-8)	2	32			5-8	分散	马院、各学院		
	数字地形测量实习 Digital Topographic Surveying Practice	3	60	60		2	18-20	测绘工程系		
	地图学实习 Cartography Practice	2	40	40		3	17-18	地理信息科学系		
	摄影测量学实习 Photogrammetry Fundamental Practice	1	20	20		5	18	遥感工程系		
	地理信息系统原理实习 The Principle of Geographic Information System Practice	2	40	40		3	19-20	地理信息科学系		
	遥感数字图像处理实习 Digital Image Processing Practice	2	40	40		5	19-20	遥感工程系		
课内	计算机视觉实习 Computer vision practice	1	20	20		6	17	遥感工程系		
13	空间信息综合实习 Spatial Information Practice	5	100	100		7	1-5	测绘学院		
	遥感综合实习 Remote Sensing Comprehensive Practice	3	60	60		7	18-20	遥感工程系		
	遥感原理与应用实习 Principles and Applications of Remote Sensing Practice	1	20	20		4	18	遥感工程系		
	自然地理地貌及遥感图像解译实习Natural geography and remote sensing image interpretation Practice	1	20	20		6	16	遥感工程系		
	(近景与激光雷达、移动测量、微波遥感)新技术 实习 New technology Practice	2	40	40		7	16-17	遥感工程系		
	面向对象程序设计实习 Object oriented programming Practice	2	40	40		4	19-20	遥感工程系		
	毕业设计 Undergraduate Design or Thesis	8	160	160		8	1-16	遥感工程系		
	小计	37	840	660						
	遥感科学与技术创新实践及科研 训练	2	40	40				遥感工程系		
	全国论文大赛 National Paper 创新实践及科研	1	20	20				遥感工程系		
课外	GIS 软件开发大赛实训 GIS 训练 Software Development Practice	1	20	20				地理信息科学系		
	学院测绘技能大赛 School of Surveying and Mapping Skills Contest	1	20	20				测绘工程系		
	小 计	5	100	100						
	实践环节合计 39 学分,其中课内 37 学分,课外 2 学分(创新实践及科研训练必修 2 学分)									