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# 2021 级测绘工程专业本科培养方案

#### 一、专业基本信息

| 英文   | 文名称 | Surveyin | Engineering |      |
|------|-----|----------|-------------|------|
| 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 172.5 学分,其中理论课程 133.5 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

| 课程类别                 | 课程属性   | 学分    | 学时   | 学分比例   |
|----------------------|--------|-------|------|--------|
| 区加州大田                | 必修     | 44    | 728  | 25.51% |
| 通识教育课                | 选修     | 2     | 32   | 1.16%  |
| T 1/4 ++ 2/1 1H      | 必修     | 43    | 756  | 24.93% |
| 大类基础课                | <br>选修 | 1     | 16   | 0.58%  |
| 专业核心课                | 必修     | 16    | 256  | 9.28%  |
| -£o 11>o √-> >□      | 必修     | 7     | 112  | 4.06%  |
| 专业方向课                | 选修     | 20.5  | 328  | 11.88% |
| VI. Turketti zzzilla | 必修     | 37    | 840  | 21.45% |
| 独立实践环节               | 选修     | 2     | 40   | 1.16%  |
| 总计                   |        | 172.5 | 3108 | 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<br>18-20 周 | 8  | 1-16 毕业设计/实习 17 周答辩 |      | 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)   |
|---|--|---|
| 1.工程知识: 能够将数学、<br>自然科学、工程基础和专业<br>知识用于解决复杂测绘工 | 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 1.2 能针对具体的测绘对象建立数学模型并求解 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。     | 高等数学 A(1-2)、物理实验 (1-2)、地球科学概论、CAD 基础与应用、数字地形测量学、地图学、遥感原理与应用、土木工程概论、计算机图形学等。<br>高等数学 A(1-2)、线性代数、误差理论与测量平差基础、大地测量学基础、摄影测量学等。<br>计算思维导论、线性代数、地理信息系统原理(双语)、GNSS 原理及其应用、工程测量学、工程制图与识图、计算机图形 |
| 程问题。  | 法用于推演、分析复杂<br>测绘工程问题<br>1.4 能够将数学、自然<br>科学、工程基础和专业<br>知识以及数学模型方<br>法用于复杂测绘工程<br>问题解决方案的比较<br>与综合 | 学、遥感数字图像处理、城市规划概论等。<br>概率论与数理统计 B 、普通物理 B(1-2)、<br>数据结构、控制测量实习、遥感原理与应<br>用实习等。  |
| 2.问题分析: 能够应用数<br>学、自然科学和工程科学的<br>基本原理,识别、表达、并 | 2.1 能运用数学、自然<br>科学和工程科学原理,<br>识别和判断复杂测绘<br>工程问题的关键环节   | 计算思维导论、高等数学 A(1-2)、概率论与数理统计 B、普通物理 B(1-2)、地球科学概论、地图学、工程测量学、数据结构、C#程序设计、地图设计与编绘、遥感数字图像处理等。   |
| 通过文献研究分析复杂测<br>绘工程问题,以获得有效结<br>论。             | 2.2 能基于数学、自然<br>科学和工程科学原理<br>和数学模型方法正确<br>表达复杂测绘工程问  | 线性代数、地理信息系统原理(双语)、<br>误差理论与测量平差基础、GNSS原理及<br>其应用、激光雷达测量技术与应用、土木<br>工程概论、测量程序设计与数据处理、工   |

| 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)   |
|---|--|---|
|   | 题  | 业测量与数据处理、工程测量综合实习、<br>激光雷达测量技术实习、城市规划概论等。   |
|   | 2.3 能认识到解决测绘<br>问题有多种方案可选<br>择,会通过文献研究寻<br>求可替代的解决方案             | 遥感原理与应用、大地测量学基础、摄影<br>测量学、变形监测与灾害预报、科技文献<br>检索等。  |
|   | 2.4 能运用数学、自然<br>科学和工程科学的基<br>本原理,借助文献研<br>究,分析过程的影响因<br>素,获得有效结论 | 概率论与数理统计 B、普通物理 B(1-2)、C<br>语言程序设计、高精度导航地图与位置服<br>务、地理信息系统原理实习、遥感原理与<br>应用实习、激光雷达测量技术实习、毕业<br>设计等。                        |
|   | 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 | C语言程序设计、地图学、地理信息系统原理(双语)、误差理论与测量平差基础、不动产测量与管理、控制测量实习、空间信息综合实习、遥感数字图像处理、近景摄影测量、大数据与地理信息系统、遥感影像深度学习与智能解译等。                  |
| 3.设计/开发解决方案:能够设计针对复杂测绘工程问题的解决方案,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 | 3.2 能够针对特定需求,完成测绘系统、生产流程的设计                                      | 计算思维导论、CAD 基础与应用、GNSS 原理及其应用、摄影测量学、工程测量学、激光雷达测量技术与应用、数据结构、测量程序设计与数据处理、地图学实习、地理信息系统原理实习、控制测量实习、卫星导航定位实习、空间信息综合实习、地图设计与编绘等。 |
| 社会、健康、安全、法律、文化以及环境等因素。  | 3.3 能够进行测绘系统<br>或测绘生产流程的设<br>计,在设计中体现创新<br>意识                    | 变形监测与灾害预报、计算机图形学、工<br>业测量与数据处理、毕业设计、测绘技能<br>大赛实训、遥感应用前景等。   |
|   | 3.4 在测绘系统或测<br>绘生产流程的设计中<br>能够考虑安全、健康、<br>法律、文化及环境等制<br>约因素      | 思想道德与法治、高精度导航地图与位置服务、毕业设计、自然资源调查监测等。  |

| 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)   |
|---|---|---|
|   | 4.1 能够基于科学原理,通过文献研究,采用科学方法,调研和分析复杂测绘工程问题的解决方案                       | 误差理论与测量平差基础、大地测量学基础、智慧城市导论、不动产测量与管理实习、毕业设计、遥感应用前景、遥感数字图形处理、大数据与地理信息系统、遥感影像深度学习与智能解译、科技论文写作(双语)等。  |
| 4.研究: 能够基于科学原理并采用科学方法对复杂测   | 4.2 能够根据测绘对<br>象特征,选择研究路<br>线,设计测绘技术方案                              | 遥感原理与应用、工程制图与识图、地理信息系统原理实习、遥感原理与应用实习、<br>工程测量综合实习、不动产测量与管理实<br>习、测绘地理信息技术前沿等。   |
| 绘工程问题进行研究,包括<br>设计实验、分析与解释数<br>据、并通过信息综合得到合<br>理有效的结论。  | 4.3 能够根据测绘技术方案构建实验系统,安全地开展测绘实验,正确地采集测绘实验数据                          | 数字地形测量学、激光雷达测量技术与应用、测量程序设计与数据处理、工业测量与数据处理、自然资源调查监测、数字地形测量实习、控制测量实习、摄影测量实习、卫星导航定位实习、C#程序设计、近景摄影测量、新型航空遥感数据处理技术等。   |
|   | 4.4 能对实验结果进<br>行分析和解释,并通过<br>信息综合获得合理有<br>效结论                       | 线性代数、科技文献检索、地图学实习、<br>空间信息综合实习、激光雷达测量技术实<br>习、毕业设计、新型航空遥感数据处理技<br>术等。   |
| 5.使用现代工具: 能够针对<br>复杂测绘工程问题, 开发、<br>选择与使用恰当的测绘技<br>术、信息资源、现代测绘仪<br>器和信息技术工具,包括对<br>复杂测绘工程问题的预测 | 5.1 了解测绘常用的现代测绘仪器、信息技术工具和测绘软件的使用原理和方法,并理解其局限性                       | 计算思维导论、工程实践类、复合培养类、<br>C语言程序设计、地理信息系统原理(双语)、现代测绘技术应用、大地测量学基础、GNSS原理及其应用、摄影测量学、<br>工程测量学、数据结构、工程制图与识图、<br>计算机图形学、智慧城市导论、地图学实习、GIS基础应用技能、大数据与地理信息系统、新型航空遥感数据处理技术、遥感影像深度学习与智能解译、测绘地理信息技术前沿等。 |
| 与模拟,并能够理解其局限<br>性。  | 5.2 能够选择与使用恰<br>当的现代测绘仪器、信<br>息资源和测绘软件,对<br>复杂测绘工程问题进<br>行技术设计、数据处理 | 高等数学 A(1-2)、概率论与数理统计 B、CAD 基础与应用、数字地形测量学、误差理论与测量平差基础、不动产测量与管理、城市遥感(双语)、数字地形测量实习、地理信息系统原理实习、遥感原理与应用  |

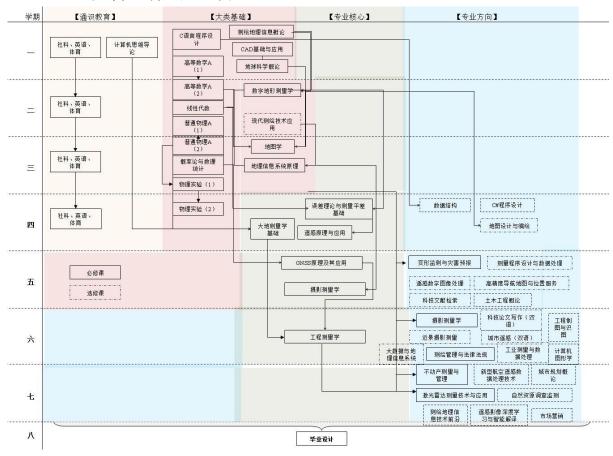
| 毕业生应具备的知识能力  | 相关知识领域  | 实现途径 (课程支撑)   |
|--|---|---|
|  | 与精度分析   | 实习、工程测量综合实习、不动产测量与管理实习、激光雷达测量技术实习、测绘技能大赛实训、C#程序设计、地图设计与编绘、近景摄影测量等。  |
|  | 5.3 能够针对具体的测绘对象,开发或选用满足特定需求的现代测绘仪器、信息技术工具,对复杂测绘工程问题进行预测与模拟,并能够分析其局限性                    | 普通物理 B (1-2)、变形监测与灾害预报、激光雷达测量技术与应用、科技文献检索、高精度导航地图与位置服务、测量程序设计与数据处理、工业测量与数据处理、遥感原理与应用实习、摄影测量实习、新型航空遥感数据处理技术等。                            |
| 6.工程与社会: 能够基于工<br>程相关背景知识进行合理                          | 6.1 了解测绘领域的<br>技术标准体系、知识产<br>权、测绘管理政策和法<br>律法规,理解不同社会<br>文化对工程活动的影<br>响                 | 形势与政策、数字地形测量学、遥感原理<br>与应用、大地测量学基础、测绘管理与法<br>律法规、数字地形测量实习、地理信息系<br>统原理实习、卫星导航定位实习、工程测<br>量综合实习、测绘技能大赛实训、城市规<br>划概论等。                     |
| 分析,评价测绘工程实践和复杂测绘工程问题解决方案对社会、健康、安全、法律以及文化的影响,并理解应承担的责任。 | 6.2 能分析和评价测绘<br>工程实践对社会、健<br>康、安全、法律、文化<br>的影响,以及这些制约<br>因素对工程项目实施<br>的影响,并理解应承担<br>的责任 | 思想道德与法治、中国近现代史纲要、马克思主义基本原理、毛泽东思想和中国特色社会主义理论体系概论、工程实践类、复合培养类、现代测绘技术应用、变形监测与灾害预报、不动产管理与测量、高精度导航地图与位置服务、土木工程概论、空间信息综合实习、毕业设计、GIS 基础与应用技能等。 |
| 7.环境和可持续发展: 能够理解和评价针对复杂测绘                              | 7.1 知晓和理解环境保护和可持续发展的理念和内涵   | 习近平新时代中国特色社会主义思想概论、工程实践类、复合培养类、地球科学概论、测绘地理信息概论、城市遥感(双语)、自然资源调查监测、GIS 基础应用技能、城市规划概论等。  |
| 工程问题的测绘工程实践对环境、社会可持续发展的影响。                             | 7.2 能够从环境保护和可持续发展的角度思考测绘工程实践的可持续性,评价测绘工程实践中可能对人类和环境造成的损害和隐                              | 毛泽东思想和中国特色社会主义理论体系<br>概论、形势与政策、智慧城市导论、自然<br>地理地貌及遥感图像解译实习、毕业设计、<br>大数据与地理信息系统等。   |

| 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)   |
|---|--|---|
|   | 患  |   |
| 8.职业规范: 具有人文社会  | 8.1 具有正确价值观,<br>理解个人与社会的关<br>系,了解中国国情  | 中国近现代史纲要、马克思主义基本原理、<br>习近平新时代中国特色社会主义思想概<br>论、毛泽东思想和中国特色社会主义理论<br>体系概论、形势与政策、体育(1-4)、"四<br>史"(党史、新中国史、改革开放史、社<br>会主义发展史)、自然资源调查监测、军<br>事理论、军训、遥感影像深度学习与智能<br>解译等。                 |
| 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                                     | 思想道德与法治、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、数字地形测量实习、工程测量综合实习、不动产测量与管理实习、测绘技能大赛实训等。   |
|   | 8.3 理解测绘工作人员<br>对公众的安全、健康、<br>福祉、环境保护的社会<br>责任,能够在测绘工程<br>实践中自觉履行责任            | 马克思主义基本原理、习近平新时代中国<br>特色社会主义思想概论、大学生心理健康、<br>地球科学概论、变形监测与灾害预报、城<br>市遥感(双语)、自然地理地貌及遥感图<br>像解译实习、毕业设计等。   |
| 9.个人和团队: 能够在建筑、土木等多学科背景下的团队中承担个体、团队成员以及负责人的角色。  | 9.1 能与建筑、土木等多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)、<br>土木工程概论、工程制图与识图、自然地<br>理地貌及遥感图像解译实习、工程测量综<br>合实习、不动产测量与管理实习、毕业设<br>计等。<br>大学生心理健康、军事理论、数字地形测<br>量实习、地图学实习、卫星导航定位实习、<br>激光雷达测量技术实习等。<br>控制测量实习、空间信息综合实习、测绘 |
| 10.沟通:能够就复杂测绘<br>工程问题与测绘同行及社<br>会公众进行有效沟通和交<br>流,包括撰写测绘技术设计<br>书和测绘技术总结等、陈述<br>发言、清晰表达或回应指<br>令,并具备一定的国际视 | 指挥团队开展工作 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 | 技能大赛实训等。 测绘管理与法律法规、工程测量综合实习、空间信息综合实习、激光雷达测量技术实习、毕业设计、科技论文写作(双语)、市场营销等。  |

| 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)   |
|--|---|---|
| 野,能够在跨文化背景下进   | 差异性   |   |
| 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   | 大学英语拓展系列课程、测绘地理信息概论、地理信息系统原理(双语)、现代测绘技术应用、遥感应用前景、科技论文写作(双语)等。           |
|  | 10.3 具备跨文化交流<br>的语言和书面表达能<br>力,能就测绘专业问<br>题,在跨文化背景下进<br>行基本沟通和交流                                  | 大学英语(1-2)、大学英语拓展系列课程、<br>城市遥感(双语)、科技论文写作(双语)<br>等。                      |
| 11.项目管理:理解并掌握<br>工程管理原理与经济决策<br>方法,并能在测绘、建筑、<br>土木、环境等多学科环境中 | 11.1 了解测绘工程及<br>测绘产品生产的全流<br>程成本构成,能够理解<br>其中涉及的工程管理<br>与经济决策问题,并能<br>掌握工程项目中涉及<br>的管理与经济决策方<br>法 | 不动产测量与管理、测绘管理与法律法规、<br>空间信息综合实习、毕业设计、市场营销<br>等。                         |
| 应用。  | 11.2 能在土木、建筑<br>等多学科环境下,在设<br>计开发测绘方案的过<br>程中,运用工程管理与<br>经济决策方法                                   | 土木工程概论、工程测量综合实习、毕业设计等。  |
| 10 放白丛豆 日本点之》  | 12.1 能在社会发展的<br>大背景下,认识到自主<br>学习和终身学习的必<br>要性   | 大学生职业生涯与发展规划、数字地形测量学、测绘技能大赛实训、测绘地理信息<br>技术前沿等。                          |
| 12.终身学习: 具有自主学<br>习和终身学习的意识,有不<br>断学习和适应发展的能力。               | 12.2 具有自主学习和<br>适应发展的能力,包括<br>对测绘技术问题的理<br>解能力,归纳总结的能<br>力和提出问题的能力<br>等。                          | 马克思主义基本原理、大学英语(1-2)、体育(1-4)、C语言程序设计、现代测绘技术应用、工程测量学、摄影测量实习、毕业设计、遥感应用前景等。 |

# 十、指导性教学计划(见附表)

## 十一、主要课程逻辑关系结构图



# 2021 Undergraduate Program for Specialty in Surveying and Mapping Engineering

#### I Specialty Name and Code

| English Name Surveying and Map |                   |        | pping Engineering       |
|--------------------------------|-------------------|--------|-------------------------|
| Code                           | 081201 Discipline |        | 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 172.5, including 133.5 credits 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 |
|------------------------|-------------|---------|------------|------------|
| G IFI                  | Compulsory  | 44      | 728        | 25.51%     |
| General Education      | Optional    | 2       | 32         | 1.16%      |
| D: 4 1 : 6 1: 4        | Compulsory  | 43      | 756        | 24.93%     |
| Big Academic Subjects  | Optional    | 1       | 16         | 0.58%      |
| Professional Core      | Compulsory  | 16      | 256        | 9.28%      |
| Professional Direction | Compulsory  | 7       | 112        | 4.06%      |
|                        | Optional    | 20.5    | 328        | 11.88%     |
|                        | Compulsory  | 37      | 840        | 21.45%     |
| Practice               | Optional    | 2       | 40         | 1.16%      |
| Total                  |             | 172.5   | 3108       | 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        |
| 7        | 6-16     | 17    | 1-5<br>18-20 | 8        | 1-16 gradu | ation projec | t 17 defense |

## **IX Graduate Abilities and Matrices**

| Graduate Abilities   | Related Knowledge   | Course Supports  |
|--|---|--|
| 1. Engineering knowledge: Be able to use mathematics, natural science, engineering foundation and professional | 1.1 Be able to use the language tools of mathematics, natural science and engineering science to express surveying and mapping engineering problems | Advanced mathematics a (1-2), physical experiments (1-2), introduction to Earth Science, fundamentals and applications of CAD, digital topographic surveying, cartography, principles and applications of remote sensing, introduction to civil engineering, computer graphics, etc. |
| knowledge to solve complex surveying and mapping engineering problems.   | 1.2 Be able to establish mathematical model and solve for specific surveying and mapping  | Advanced mathematics a (1-2), LINEAR Algebra, error theory and adjustment basis, geodesy basis, photogrammetry, etc.   |

| Graduate Abilities                        | Related Knowledge          | Course Supports                                  |
|---|----------------------------|--|
|   | objects                    |  |
|   | 1.3 Be able to use         |  |
|   | mathematics, natural       |  |
|   | science, engineering       | Introduction to computational thinking, Linear   |
|   | foundation and             | Algebra, Gis (bilingual), GNSS and its           |
|   | professional knowledge     | applications, engineering surveying, engineering |
|   | as well as mathematical    | cartography and cartography, computer            |
|   | model method to deduce     | graphics, Remote Sensing Digital Image           |
|   | and analyze complex        | Processing, introduction to urban planning, etc. |
|   | surveying and mapping      |  |
|   | engineering problems       |  |
|   | 1.4 Can use mathematics,   |  |
|   | natural science,           |  |
|   | engineering foundation     |  |
|   | and professional           |  |
|   | knowledge as well as       | Probability and Mathematical Statistics B,       |
|   | mathematical model         | General Physics B (1-2), data structure, control |
|   | method to compare and      | measurement practice, remote sensing principle   |
|   | synthesize the solutions   | and application practice, etc                    |
|   | of complex surveying and   |  |
|   | mapping engineering        |  |
|   | problems                   |  |
| 2 P 11 1 ' P                              | 2.1 Be able to identify    |  |
| 2. Problem analysis: Be                   | and judge the key links of | Introduction to computational thinking,          |
| able to apply the basic                   | complex surveying and      | advanced mathematics a (1-2), probability and    |
| principles of                             | mapping engineering        | Mathematical Statistics B, General Physics B     |
| mathematics, natural                      | problems by using the      | (1-2), introduction to Earth Science,            |
| science and engineering                   | principles of              | cartography, engineering surveying, data         |
| science to identify,                      | mathematics, natural       | structure, c # program design, map design and    |
| express and analyze                       | science and engineering    | compilation, remote sensing digital image        |
| complex surveying and mapping engineering | science                    | processing, etc                                  |
|   | 2.2 Be able to correctly   | Linear Algebra, geographic information system    |
| problems through                          | express complex            | (bilingual), error theory and surveying          |
| literature research, so as                | surveying and mapping      | adjustment basis, GNSS principle and its         |
| to obtain effective                       | engineering problems       | application, laser radar surveying technology    |
| conclusions.                              | based on the principles of | and application, introduction to civil           |

| <b>Graduate Abilities</b> | Related Knowledge           | Course Supports   |
|---------------------------|-----------------------------|---|
|                           | mathematics, natural        | engineering, surveying program design and data  |
|                           | science and Engineering     | processing, industrial surveying and data   |
|                           | Science and mathematical    | processing, engineering surveying   |
|                           | model                       | comprehensive practice, laser radar surveying   |
|                           |                             | technology practice, introduction to urban  |
|                           |                             | planning, etc   |
|                           | 2.3 Can realize that there  |   |
|                           | are many solutions to       | Drive in least of a multiple in the control of the |
|                           | solve the problem of        | Principles and applications of remote sensing,  |
|                           | Surveying and mapping,      | geodesy, photogrammetry, deformation  |
|                           | and will seek alternative   | monitoring and disaster prediction, scientific  |
|                           | solutions through           | and technical literature retrieval, etc   |
|                           | literature research         |   |
|                           | 2.4 Can use the basic       |   |
|                           | principles of               | Probability theory and Mathematical Statistics  |
|                           | mathematics, natural        | B, General Physics B (1-2), C language  |
|                           | science and Engineering     | program design, high-precision Navigation Map   |
|                           | Science, with the aid of    | and position service, geographic information  |
|                           | literature research,        | system principle practice, remote sensing   |
|                           | analyze the influencing     | principle and application practice, laser radar   |
|                           | factors of the process, and | measurement technology practice, graduation   |
|                           | obtain effective            | project, etc  |
|                           | conclusions                 |   |
| 3. Design/Develop         | 3.1 Master the technology   |   |
| solutions: Be able to     | related to the whole        |   |
| design solutions for      | process of Surveying and    | C language programming, cartography, Gis  |
| complex surveying and     | mapping engineering         | (bilingual), error theory and surveying   |
| mapping engineering       | design, implementation      | adjustment basis, real estate surveying and   |
| problems, design          | and management, as well     | management, control surveying practice, spatial   |
| surveying and mapping     | as the full cycle           | information synthesis practice, remote sensing  |
| system or surveying and   | production method of        | digital image processing, Chikakage   |
| mapping production        | Surveying and mapping       | photogrammetry, big data and gis, remote  |
| process to meet specific  | geographic information      | sensing image depth learning and intelligent  |
| needs, reflect            | products, and understand    | interpretation, etc   |
| innovation                | various factors affecting   |   |
| consciousness in the      | the design objectives and   |   |

| technical solutions  | Introduction to computational thinking, Cad  |
|--|--|
|  |  |
| 3.2 Be able to complete<br>the design of Surveying<br>and mapping system and<br>production process<br>according to specific<br>requirements                        | Foundation and application, GNSS principle and its application, photogrammetry, engineering surveying, laser radar measurement technology and application, data structure, measurement program design and data processing, cartography practice, geographic information system principle practice, control and measurement practice, satellite navigation and positioning practice, space information synthesis practice, map design and compilation, etc  |
| 3.3 Be able to design the surveying and mapping system or production process, and embody the innovation consciousness in the design                                | Deformation monitoring and disaster prediction, computer graphics, industrial surveying and data processing, graduation design, surveying and mapping skills contest training, remote sensing application prospects, etc   |
| 3.4 In the design of Surveying and mapping system or mapping production process, the constraints of safety, health, law, culture and environment can be considered | Ideological and moral and rule of law, High-precision navigation map and location services, graduation design, natural resources survey and monitoring.  |
| 4.1 Based on scientific principles, through literature research, using scientific methods, research and analyze the solutions of complex                           | Error Theory and surveying adjustment basis, geodesy basis, intelligent city introduction, real estate surveying and management practice, graduation design, remote sensing application prospects, remote sensing digital graphics processing, Big Data and geographic   |
|  | the design of Surveying and mapping system and production process according to specific requirements  3.3 Be able to design the surveying and mapping system or production process, and embody the innovation consciousness in the design  3.4 In the design of Surveying and mapping system or mapping production process, the constraints of safety, health, law, culture and environment can be considered  4.1 Based on scientific principles, through literature research, using scientific methods, research and analyze the |

| Graduate Abilities  | Related Knowledge   | Course Supports   |
|---|---|---|
| experiments, analyzing and interpreting data, and obtaining   | engineering problems  | learning and intelligent interpretation, scientific and technical paper writing (bilingual).  |
| reasonable and effective conclusions through information synthesis.   | 4.2 According to the characteristics of Surveying and mapping objects, the research route can be selected and the technical scheme of Surveying and mapping can be designed   | Remote sensing principle and application, engineering cartography and map recognition, gis principle practice, remote sensing principle and application practice, engineering survey comprehensive practice, real estate survey and management practice, and so on.   |
|   | 4.3 It can construct the experimental system according to the technical scheme of Surveying and mapping, carry out the surveying and mapping experiment safely, and collect the surveying and mapping experimental data correctly  4.4 The experimental | Digital topographic survey, laser radar survey technology and application, survey program design and data processing, industrial survey and data processing, Natural Resources Survey and Monitoring, digital topographic survey practice, control survey practice, photogrammetry practice, satellite navigation and positioning practice, c # program design, close-range photogrammetry, new aerial remote sensing data processing technology, etc |
|   | results can be analyzed and explained, and reasonable and effective conclusions can be obtained through information synthesis   | Linear Algebra, science and Technology Literature Retrieval, cartography practice, spatial information comprehensive practice, laser radar measurement technology practice, graduation design, new aviation remote sensing data processing technology.  |
| 5. Using modern tools: Be able to develop, select and use appropriate surveying and mapping technology, information resources, modern surveying and mapping | 5.1 Understand the principles and methods of modern surveying and mapping instruments, information technology tools and mapping software commonly used in surveying and   | Introduction to computational thinking, engineering practice, composite training, C language programming, principles of geographic information system (bilingual), application of modern surveying and mapping technology, geodesy, Gnss principles and applications, photogrammetry, engineering surveying, data structure, engineering mapping  |
| instruments and   | mapping, and understand   | and cartography, computer graphics,   |

| Graduate Abilities  | Related Knowledge  | Course Supports  |
|---|--|--|
| information technology tools, including prediction and Simulation of complex surveying and mapping engineering problems, and understand their | their limitations  | introduction to Smart Cities, cartographic practice, Gis basic application skills, big data and Gis, new aerial remote sensing data processing technology, deep learning and intelligent interpretation of remote sensing images, frontier of Surveying and Mapping Geographic Information Technology, etc.  |
| limitations.  | 5.2 Be able to select and use appropriate modern surveying and mapping instruments, information resources and surveying and mapping software to carry out technical design, data processing and accuracy analysis for complex surveying and mapping engineering problems         | Advanced mathematics a (1-2), probability theory and mathematical statistics B, CAD basis and application, digital topographic surveying, error theory and surveying adjustment basis, real estate surveying and management, Urban Remote Sensing (bilingual), digital topographic surveying practice, geographic information system principle practice, remote sensing principle and application practice, engineering surveying comprehensive practice, real estate surveying and management practice, laser radar surveying technology practice, mapping skills competition training, c # programming, map design and compilation, Chikakage photogrammetry, etc. |
|   | 5.3 It can develop or select modern surveying and mapping instruments and information technology tools to meet specific needs for specific surveying and mapping objects, predict and simulate complex surveying and mapping engineering problems, and analyze their limitations | General Physics B (1-2), deformation monitoring and disaster prediction, laser radar survey technology and application, scientific and technical literature retrieval, high precision navigation map and position service, survey program design and data processing, industrial survey and data processing, remote sensing principle and application practice, photogrammetry practice, new aviation remote sensing data processing technology, etc   |

| Graduate Abilities   | Related Knowledge  | Course Supports  |
|--|--|--|
| 6. Engineering and Society: Be able to make reasonable analysis based on engineering related background knowledge, evaluate the impact of Surveying and mapping engineering practice and complex surveying and mapping engineering problem solutions on society, health, safety, law and culture, and understand the responsibilities that should be undertaken. | 6.1 Understand the technical standard system, intellectual property rights, surveying and mapping management policies, laws and regulations in the field of Surveying and mapping, and understand the influence of different social cultures on engineering activities  6.2 Be able to analyze and evaluate the impact of Surveying and mapping engineering practice on society, health, safety, law and culture, as well as the impact of these constraints on the implementation of engineering projects, and understand the responsibilities that should be borne | Situation and policy, digital topographic surveying, principles and applications of remote sensing, fundamentals of Geodesy, management and laws and regulations of surveying and Mapping, practice of digital topographic surveying, practice of geographic information system principles, practice of satellite navigation and positioning, comprehensive practice of engineering surveying, practice of surveying and Mapping Skills Contest, introduction to urban planning, etc  Ideological Morality and rule of law, outline of history of China, basic principles of Marxism, introduction to the theoretical system of Maoism and socialism with Chinese characteristics, engineering practice, compound cultivation, application of modern surveying and mapping technology, deformation monitoring and disaster prediction, real estate management and surveying, high precision navigation map and location service, introduction to civil engineering, comprehensive practice of spatial information, graduation design, Gis Foundation and application skills, etc |
| 7.Environment and sustainable  | 7.1 Know and understand  | An introduction to Xi Jinping thought on Socialism with Chinese characteristics for a new  |
| development : Be able to understand and  | the concept and  | era, an introduction to engineering practice,<br>composite training, an introduction to Earth  |
| evaluate the impact of   | connotation of   | Science, an introduction to surveying, mapping   |
| complex surveying and  | environmental protection   | and geographic information, urban remote   |
| mapping engineering  | and sustainable  | sensing (bilingual), natural resources   |
| practice on the  | development  | investigation and monitoring, basic application  |
| environment and social   | <b>F</b>   | skills of Gis, an introduction to urban planning,  |
| CHVII OHIIICHI AHGI SOCIAL I   |  |  |

| Graduate Abilities  | Related Knowledge   | Course Supports   |
|---|---|---|
| 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 | An introduction to the theoretical system of Maoism and socialism with Chinese characteristics, situation and policies, introduction to smart cities, physical geography and remote sensing image interpretation practice, graduation project, big data and GIS, etc  |
| 8. Occupational norms: With humanities and social science literacy, social responsibility, can understand and abide by the professional ethics and norms of Surveying and mapping industry in the practice of Surveying | 8.1 Have correct values, understand the relationship between individuals and society, and understand China's national conditions  | An outline of the history of China, an introduction to the basic principles of Marxism, an introduction to Xi Jinping's thought on Socialism with Chinese characteristics for a new era, an introduction to Maoism and the theoretical system of socialism with Chinese characteristics, the situation and policies, sports (1-4), the "Four Histories" (the history of the party, the history of the New China, the history of reform and opening-up, and the history of Socialist Development), natural resources investigation and monitoring, military theory, military training, deep learning of remote sensing images and intelligent interpretation, etc. |
| and mapping, and fulfill the responsibility.  | 8.2 Understand the professional ethics and norms of the surveying and mapping industry of honesty, justice and  | Ideological Morality and rule of law, college<br>students'career and Development Planning,<br>survey and Mapping Geographic Information,<br>survey and Mapping Management and laws and<br>regulations, digital topographic survey practice,   |
|   | integrity, and consciously abide by them in the   | engineering survey comprehensive practice, real estate survey and management practice, survey   |

| Graduate Abilities   | Related Knowledge   | Course Supports   |
|--|---|---|
|  | practice of Surveying and mapping projects  | and mapping skills contest training, etc  |
|  | 8.3 Understand the social responsibility of Surveying and mapping workers for public safety, health, well-being and environmental protection, and be able to consciously perform their responsibilities in surveying and mapping engineering practice | An introduction to the basic principles of Marxism, an introduction to Xi Jinping's thought on Socialism with Chinese characteristics for a new era, an introduction to college students'mental health, an introduction to Earth Science, deformation monitoring and disaster prediction, urban remote sensing (bilingual), physical geography and remote sensing image interpretation practice, graduation project, etc. |
| 9. Individuals and teams: Be able to play the role of individual, team member and  | 9.1 Be able to communicate effectively with members of architecture, civil engineering and other disciplines  | College Students'career and development planning, physical education (1-4), introduction to civil engineering, engineering drawing and mapping, physical geography and remote sensing image interpretation practice, engineering survey comprehensive practice, real estate survey and management practice, graduation design, etc.   |
| leader in the team under<br>the background of<br>architecture, civil<br>engineering and other<br>disciplines.                                  | 9.2 Ability to work independently or cooperatively in a team  9.3 Ability to organize, coordinate and direct the work of the team   | College Students Mental Health, military theory, digital terrain survey practice, mapping practice, satellite navigation positioning practice, laser radar measurement technology practice.  Control survey practice, spatial information comprehensive practice, mapping skills contest training, and so on.   |
| 10. Communication: Be able to effectively communicate and communicate with surveying and mapping peers and the public on complex surveying and | work of the team  10.1 Be able to accurately express opinions, respond to queries, and understand the differences of communication with surveying and mapping peers and the public in   | Surveying and Mapping Management and laws and regulations, engineering survey comprehensive practice, spatial information comprehensive practice, laser radar survey technical practice, graduation design, scientific paper writing (bilingual), marketing and so on   |

| Graduate Abilities       | Related Knowledge          | Course Supports                                   |
|--------------------------|----------------------------|---|
| mapping engineering      | written statements and     |   |
| problems, including      | statements on surveying    |   |
| writing surveying and    | and mapping technology     |   |
| mapping technology       | design book and survey     |   |
| design book and          | technology summary         |   |
| surveying and mapping    | 10.2 Understand the        |   |
| technology summary,      | international development  | College English extension courses, introduction   |
| making statements,       | trends and research        | to mapping and geographic information,            |
| clearly expressing or    | hotspots in the field of   | principles of geographic information system       |
| responding to            | Surveying and mapping,     | (bilingual), application of modern surveying      |
| instructions, and having | and understand and         | and Mapping Technology, prospects of remote       |
| a certain international  | respect the differences    | sensing applications, scientific paper writing    |
| vision, and being able   | and diversity of different | (bilingual) and so on.                            |
| to communicate and       | cultures                   |   |
| exchange in              | 10.3 Have the ability of   |   |
| cross-cultural           | cross-cultural             |   |
| background.              | communication language     |   |
|                          | and written expression,    | College English (1-2), College English            |
|                          | and be able to carry out   | Extension Courses, urban remote sensing           |
|                          | basic communication and    | (bilingual), scientific paper writing (bilingual) |
|                          | exchange on surveying      | and so on.  |
|                          | and mapping professional   |   |
|                          | issues under the           |   |
|                          | cross-cultural background  |   |
| 11. Project              | 11.1 understand the cost   |   |
| management:              | structure of the whole     |   |
| Understand and master    | process of surveying and   |   |
| the principles of        | mapping engineering and    | Real Estate Survey and management, surveying      |
| engineering              | surveying products         | and Mapping Management and laws and               |
| management and           | production, understand     | regulations, spatial information comprehensive    |
| economic                 | the engineering            | practice, graduation design, marketing and so     |
| decision-making          | management and             |   |
| methods, and can be      | economic                   | on.   |
| applied in surveying     | decision-making issues     |   |
| and mapping,             | involved, and grasp the    |   |
| architecture, civil      | management and             |   |

| Graduate Abilities      | Related Knowledge          | Course Supports                                 |
|-------------------------|----------------------------|---|
| engineering,            | economic                   |   |
| environment and other   | decision-making methods    |   |
| disciplines.            | involved in engineering    |   |
|                         | projects                   |   |
|                         | 11.2 application of        |   |
|                         | engineering management     |   |
|                         | and economic               |   |
|                         | decision-making in the     |   |
|                         | design and development     | Civil Engineering Conspectus, engineering       |
|                         | of surveying and mapping   | survey comprehensive practice, graduation       |
|                         | schemes in                 | project and so on.                              |
|                         | multidisciplinary          |   |
|                         | environments such as       |   |
|                         | civil engineering and      |   |
|                         | architecture               |   |
|                         | 12.1 Under the             |   |
|                         | background of social       | College Students Career and Development         |
|                         | development, we can        | Planning, digital terrain surveying, mapping    |
| 12. Lifelong learning:  | realize the necessity of   | skills contest training, mapping and geographic |
| Have the consciousness  | self-learning and lifelong | information technology frontier.                |
| of self-learning and    | learning                   |   |
| lifelong learning, and  | 12.2 Have the ability of   |   |
| have the ability of     | self-learning and adapting | Basic Principles of Marxism, college English    |
| continuous learning and | to development, including  | (1-2), sports (1-4), C language programming,    |
| adapting to             | the ability to understand  | application of modern surveying and Mapping     |
| development.            | the surveying and          | Technology, engineering surveying,              |
|                         | mapping technical          | photogrammetry practice, graduation design,     |
|                         | problems, the ability to   | remote sensing application prospects, etc.      |
|                         | summarize and 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

| \$  | 课程属性   | 课程名称  | 学分    | 总学时         | 讲课学时  | 实践学时 | 上机学时 | 课外学时 | 延续教学 | 开课<br>学期 | 教学单位  |
|-----|--------|---|-------|-------------|-------|------|------|------|------|----------|---|
|     |        | 思想道德与法治 Ideological Morality and<br>Rule of Law   | 3     | 48          | 48    |      |      |      |      | 1        | 马克思主义学院   |
|     |        | 中国近现代史纲要 The Outline of the<br>Modern Chinese History   | 3     | 48          | 32    |      |      | 16   |      | 2        | 马克思主义学院   |
|     |        | 习近平新时代中国特色社会主义思想概论<br>Introduction to Xi Jinping Thought on<br>Socialism with Chinese Characteristics<br>for a New Era  | 2     | 32          | 28    | 4    |      |      |      | 2        | 马克思主义学院   |
|     |        | 马克思主义基本原理★ Basic Principle of<br>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理论体系概<br>论★ Introduction to Mao Zedong Thoughts<br>and Theoretical System of Socialism with<br>Chinese Characteristics  | h     | 80          | 64    |      |      | 16   |      | 4        | 马克思主义学院   |
|     |        | 形势与政策(1-4) Situation and<br>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<br>College Student Occupation Career and<br>Development Planning   | 1     | 16          | 16    |      |      |      |      | 1        | 学工部   |
| 重   | 113    | 大学生心理健康<br>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  |
|     |        | 大学英语拓展系列课程(1-4)<br>College English Training(1-4)  | 2     | 32          | 32    |      |      |      |      | 3        | 人文学院  |
| 女   |        | 大学英语拓展系列课程(5-8)<br>College English Training(5-8)  | 2     | 32          | 32    |      |      |      |      | 4        | 人文学院  |
| Î   |        | 体育(1-4) Physical Education(1-4)   | 4     | 120         | 120   |      |      |      |      | 1-4      | 体育部   |
| Ę   |        | 计算思维导论<br>Introduction to Computational Thinking  | 1. 5  | 56          | 24    |      |      | 32   |      | 1        | 电信学院  |
|     |        | "四史"(党史、新中国史、改革开放史、<br>社会主义发展史) History of the Communist<br>Party of China, History of New China,<br>History of Reform and Opening up and<br>History of Socialist Development | 0.5   | 8           | 8     |      |      |      |      | 1-7      | 马克思主义学阶   |
|     |        | 小 计   | 36    | 696         | 596   | 4    |      | 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 🖺 | 学分,         |       |      |      |      |      | j        | <i>₽</i> → 17-11-11-11-11-11-11-11-11-11-11-11-11-1 |
|     | 任      | 工程实践类   |       |             |       |      | 期任法  |      |      |          | 各院部   |
| - 1 | 仕<br>选 | 复合培养类 1-8 学期任选<br>跨类任选至少 2 学分   |       |             |       |      |      |      |      |          | 各院部   |
|     |        | <b></b>   | 突仕i   | <b>近</b> 全少 | > 2 字 | 分    |      |      |      |          |   |

其中通识教育必修 36 学分(含"四史"(党史、新中国史、改革开放史、社会主义发展史),四选一,1-7 学期内任意学期完成,0.5 学分),通识教育核心 8 学分,通识教育任选 2 学分(含体育类课程 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<br>学期 | 教学单位       |
|------|-----------------|---|----|-----|------|----------|------|----------|----------|----------|------------|
|      |                 | 高等数学 A (1) ★<br>Advanced Mathematics A(1)                                 | 5  | 92  | 80   |          |      |          | 12       | 1        | 理学院        |
|      |                 | 高等数学 A (2) ★<br>Advanced Mathematics A(2)                                 | 5  | 84  | 80   |          |      |          | 4        | 2        | 理学院        |
|      |                 | 线性代数<br>Linear Algebra  | 2  | 40  | 32   |          |      |          | 8        | 2        | 理学院        |
|      |                 | 概率论与数理统计 B<br>Theory of Probability and Statistics (B)                    | 3  | 48  | 44   |          |      |          | 4        | 3        | 理学院        |
|      |                 | 普通物理 A (1) ★<br>College physics A(1)                                      | 3  | 56  | 52   |          |      | 4        |          | 2        | 理学院        |
|      |                 | 普通物理 A(2)★<br>College physics A(2)  | 3  | 56  | 52   |          |      | 4        |          | 3        | 理学院        |
|      | 必               | 物理实验(1-2)<br>Physics Experiment(1-2)                                      | 2  | 60  |      | 60       |      |          |          | 3-4      | 理学院        |
|      | 2               | C语言程序设计 ★ C Programming Language  | 2  | 32  | 24   | 8        |      |          |          | 1        | 地理信息科学系    |
| 大    | 修               | 地球科学概论<br>Introduction to Earth Science                                   | 2  | 32  | 32   |          |      |          |          | 1        | 地理信息科学系    |
| 基    |                 | 测绘地理信息概论 Introduction to<br>Geomatics                                     | 1  | 16  | 16   |          |      |          |          | 1        | 测绘学院       |
|      |                 | 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<br>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<br>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<br>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<br>Surveying and Mapping Technology        | 1  | 16  | 16   |          |      |          |          | 2        | 测绘工程系      |
|      | 选               | GIS 基础应用技能 GIS base Application<br>Skill                                  | 1  | 16  | 8    | 8        |      |          |          | 2        | 地理信息科学系    |
|      | 修               | 遥感应用前景 Remote Sensing Applicantion<br>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 ★<br>Fundamentals of Error Theory and<br>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    | 必修              | GNSS 原理及其应用★ The Application and<br>Principles of GNSS                    |    | 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 | 228  | 28       |      |          |          |          | 74-A-11-A1 |
|      |                 |   |    |     | l    | <u> </u> |      | <u> </u> | <u> </u> |          |            |
|      | 专业核心课合计必修 16 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<br>Deformation Monitoring and Disasters<br>Predicting                          | 2    | 32  | 24   | 8    |      |      |      | 5    | 测绘工程系   |
|      | 必    | 测绘管理与法律法规<br>Surveying Management and Laws   | 1    | 16  | 16   |      |      |      |      | 6    | 测绘工程系   |
|      | 修    | 不动产测量与管理 Real Estate Surveying<br>and Management   | 2    | 32  | 28   | 4    |      |      |      | 7    | 测绘工程系   |
|      |      | 激光雷达测量技术与应用 The Application<br>and Technology of Laser Radar Surveying                   | 2    | 32  | 24   | 8    |      |      |      | 7    | 测绘工程系   |
|      |      | 小 计  | 7    | 112 | 92   | 20   |      |      |      |      |         |
|      |      | C#程序设计<br>C# Programming   | 2    | 32  | 16   | 16   |      |      |      | 4    | 地理信息科学系 |
|      |      | 地图设计与编绘<br>Map Design and Compilation  | 2    | 32  | 16   | 16   |      |      |      | 4    | 地理信息科学系 |
|      |      | 数据结构(限选)<br>Data structure   | 2    | 32  | 24   | 8    |      |      |      | 4    | 地理信息科学系 |
|      |      | 遥感数字图像处理<br>Remote Sensing Digital Image Processing                                      | 2    | 32  | 24   | 8    |      |      |      | 5    | 遥感工程系   |
|      |      | 科技文献检索<br>Document Retrieval of Science and<br>Technology                                | 1    | 16  | 16   |      |      | 8    |      | 5    | 图书馆     |
| 专业   |      | 高精度导航地图与位置服务(限选)<br>High-Precision Navigation Map and<br>Location Service                | 2    | 32  | 32   |      |      |      |      | 5    | 测绘工程系   |
| 方    |      | 土木工程概论(限选)<br>Introduction to Civil Engineering  | 3    | 48  | 48   |      |      |      |      | 5    | 土木学院    |
| 向    |      | 测量程序设计与数据处理(限选) Surveying<br>Data Processing and Programming                             | 2    | 32  | 20   |      | 12   |      |      | 5    | 测绘工程系   |
| 课    | 选    | 工程制图与识图 (限选) Engineering Drawing and Interpreting  | 3    | 48  | 48   |      |      |      |      | 6    | 理学院     |
|      | 修    | 计算机图形学(限选)<br>Computer Graphics  | 2    | 32  | 24   | 8    |      |      |      | 6    | 地理信息科学系 |
|      |      | 工业测量与数据处理(限选)<br>Industry Surveying and Data Processing                                  | 1.5  | 24  | 24   |      |      |      |      | 6    | 测绘工程系   |
|      |      | 城市遥感(双语)(限选)<br>Urban Remote Sensing   | 1.5  | 24  | 16   | 8    |      |      |      | 6    | 遥感工程系   |
|      |      | 近景摄影测量<br>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)<br>Introduction to Smart City  | 1    | 16  | 16   |      |      |      |      | 6    | 地理信息科学系 |
|      |      | 科技论文写作(双语)<br>Scientific Paper writing   | 1    | 16  | 16   |      |      |      |      | 6    | 测绘工程系   |
|      |      | 自然资源调查监测(限选) Natural<br>resources survey and 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<br>learning and intelligent interpretation<br>of remote sensing image | 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<br>学期 | 教学单位 |
|------|--|---|-----|-----|------|------|------|------|------|----------|------|
|      |  | 测绘地理信息技术前沿 Advanced<br>Technology of Surveying, Mapping and GIS | 1   | 16  | 16   |      |      |      |      | 7        | 测绘学院 |
|      |  | 城市规划概论<br>Conspectus of Urban Planning                          |     | 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   | 39  | 624 | 522  | 90   | 12   | 8    |      |          |      |
|      | 专业方向课合计 27.5 学分,必修 7 学分,任选至少修读 20.5 学分 |   |     |     |      |      |      |      |      |          |      |

# 表 2 测绘工程专业指导性教学计划(实践环节)

| 属     | 油和材料  | 学  | 折合  | 实验  | 上  | 开课  | 开设     | ****                     |
|-------|---|----|-----|-----|----|-----|--------|--------------------------|
| 性     | 课程名称  | 分  | 学时  | 实践  | 机  | 学期  | 周次     | 教学单位                     |
|       | <b>三</b> 事理论  | 0  |     |     |    |     |        |                          |
|       | ilitary Theory  | 2  | 36  |     |    | 1   | 1-3    | 武装部                      |
| 1 1 1 | 三训  | 2  | 112 |     |    | 1   | 1-3    | 此表印                      |
| Mi    | ilitary Training  |    | 112 |     |    |     |        |                          |
| 形     | /   |    |     |     |    |     | 47 414 | 马克思主义学院、                 |
| Si    | ituation and Policy(5-8)  | _  | 32  |     |    | 5-8 | 分散     | 各学院                      |
| 数     | 女字地形测量实习  |    |     |     |    |     |        |                          |
| 1 1 1 | igital Topographic Surveying Practice                           | 3  | 60  | 60  |    | 2   | 18-20  | 测绘工程系                    |
| 地     | 也图学实习   | 0  | 40  | 40  |    | 0   | 17 10  | <b>地理</b> 层自利 <b>兴</b> 安 |
|       | Cartography Practice  | 2  | 40  | 40  |    | 3   | 17-18  | 地理信息科学系                  |
| 1 1   | b理信息系统原理实习  | 2  | 40  |     | 40 | 3   | 19-20  | 地理信息科学系                  |
| l —   | IS Practice   |    | 10  |     | 10 |     | 10 20  | 地是自心作了外                  |
|       | 控制测量实习<br>ractical Training for Control Surveying               | 2  | 40  | 40  |    | 4   | 19-20  | 测绘工程系                    |
| _     | E感原理与应用实习   |    |     |     |    |     |        |                          |
| 1 1   | rinciples and Applications of Remote                            | 1  | 20  | 20  |    | 4   | 18     | 遥感工程系                    |
| 1 1   | nsing Practice  | 1  | 20  | 20  |    | 4   | 10     | <b>一</b>                 |
|       | 長影测量实习  |    |     |     |    |     |        | N                        |
| 课 Pı  | ractical Training for Photogrammetry                            | 1  | 20  | 20  |    | 5   | 20     | 遥感工程系                    |
| 内内    | 卫星导航定位实习  |    |     |     |    |     |        |                          |
| l l l | ractical Training for Satellite Navigation                      | 1  | 20  | 20  |    | 5   | 19     | 测绘工程系                    |
|       | d Positioning   |    |     |     |    |     |        |                          |
| 1 1 1 | 1然地理地貌及遥感图像解译实习   |    |     |     |    |     |        | N                        |
| 1 1   | atural Geography and Remote Sensing image terpretation Practice | 1  | 20  | 20  |    | 6   | 16     | 遥感工程系                    |
| _     | 工程测量综合实习  |    |     |     |    |     |        |                          |
| 1 1   | omparative Practical Training for                               | 4  | 80  | 80  |    | 6   | 17-20  | 测绘工程系                    |
| 1 1   | gineering Surveying   | т  | 00  | 00  |    | O   | 11 20  | 例坛工生水                    |
|       | Z间信息综合实习  |    |     |     |    |     |        | )FILA                    |
| Sr    | patial Information Practice                                     | 5  | 100 | 100 |    | 7   | 1-5    | 测绘学院                     |
| 1 1   | 不动产测量与管理实习  |    |     |     |    |     |        |                          |
| 1 1   | ractical Training for Real Estate Surveying                     | 1  | 20  | 10  | 10 | 7   | 18     | 测绘工程系                    |
|       | d Management  |    |     |     |    |     |        |                          |
| 1 1   | 数光雷达测量技术实习<br>ractical Training for Laser Radar Surveying       | 0  | 40  | 00  | 00 | 7   | 10.00  | 测从工和系                    |
| 1 1   | chnology  | 2  | 40  | 20  | 20 | 7   | 19-20  | 测绘工程系                    |
|       | E业设计与毕业答辩   |    |     |     |    |     |        |                          |
| 1 1 1 | raduation 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  |    |     |     |    |     |        |                          |
|       | and Mapping Skills Practice                                     | 2  | 40  | 40  |    | 4   | 1-10   | 测绘工程系                    |
|       | Contest   |    |     |     |    |     |        |                          |
| 课创    | 新实践及科研。学院测绘技能大赛 School of                                       |    |     |     |    |     |        |                          |
| 外     | Surveying and Mapping Skills                                    | 1  | 20  | 20  |    | 4   |        | 测绘学院                     |
| 21    | 训练 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  |    | 0   |        | 1/3/2/1E/N               |

| 课程属性 | 课程名称   | 学分   | 折合学时        | 实验实践 | 上机         | 开课<br>学期 | 开设<br>周次 | 教学单位    |
|------|--|------|-------------|------|------------|----------|----------|---------|
|      | 全国测绘科技论文大赛<br>Mostrule Cup-National Paper<br>Contest | 1    | 20          | 20   |            |          |          | 测绘学院    |
|      | GIS 软件开发大赛实训<br>GIS Software Development<br>Practice |      | 20          | 20   |            |          |          | 地理信息科学系 |
|      | 科研训练<br>Scientific research training                 | 1    | 20          | 20   |            |          |          | 测绘工程系   |
|      | 小 计  | 7    | 140         | 140  |            |          |          |         |
|      | 实践环节合计 39 学分,课内必修 37 学分                              | 子, 课 | <b>以外</b> ( | 创新乡  | <b>F践及</b> | 科研训练     | ) 必修 2 🕯 | 学分      |

# 2021 级测绘工程专业(智能导航实验班)本科培养方案

#### 一、专业基本信息

| 英文 | 名称 | Surveying and Mappin | (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 180 学分,其中理论课程 137 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

| 课程类别           | 课程属性 | 学分   | 学时   | 学分比例   |
|----------------|------|------|------|--------|
| 这加松大畑          | 必修   | 44   | 728  | 24.44% |
| 通识教育课          | 选修   | 2    | 32   | 1.11%  |
| 大类基础课          | 必修   | 44.5 | 780  | 24.72% |
| 专业核心课          | 必修   | 14   | 224  | 7.78%  |
| <b>七小子</b> 点阴  | 必修   | 14   | 224  | 7.78%  |
| 专业方向课          | 选修   | 18.5 | 296  | 10.00% |
| <b>外子母眼女</b> 井 | 必修   | 37   | 860  | 20.56% |
| 独立实践环节         | 选修   | 6    | 120  | 3.33%  |
| 总计             |      | 180  | 3264 | 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 |
| 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<br>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

| 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 | 高等数学 A(1-2)、物理实验 (1-2)、 |
|                      | 程科学的语言工具用于测绘    | 地球科学概论、CAD 基础与应用、       |
|                      | 与导航问题的表述        | 导航装备基础、数字地形测量学、地        |
|                      |                 | 图学、遥感原理与应用、GNSS 程序      |
|                      |                 | 设计、土木工程概论、计算机图形学        |
|                      |                 | 等。                      |
|                      | 1.2 能针对具体的测绘与导  | 高等数学 A(1-2)、线性代数、误差     |
| <br>  1.工程知识: 能够将数学、 | 航对象建立数学模型并求解    | 理论与测量平差基础、大地测量学基        |
| 自然科学、工程基础和专业         |                 | 础、摄影测量学等。               |
| 知识用于解决复杂测绘工          | 1.3 能够将数学、自然科学、 | 计算思维导论、线性代数、地理信息        |
| 程问题。                 | 工程基础和专业知识以及数    | 系统原理(双语)、GNSS 原理及其      |
|                      | 学模型方法用于推演、分析复   | 应用、工程测量学、工程制图与识图、       |
|                      | 杂测绘与导航问题        | 计算机图形学、遥感数字图像处理、        |
|                      |                 | 城市规划概论等。                |
|                      | 1.4 能够将数学、自然科学、 | 概率论与数理统计 B 、普通物理        |
|                      | 工程基础和专业知识以及数    | B(1-2)、嵌入式系统与程序设计、控     |
|                      | 学模型方法用于复杂测绘与    | 制测量实习、遥感原理与应用实习         |
|                      | 导航问题解决方案的比较与    | 等。                      |
|                      | 综合              |                         |
|                      | 2.1 能运用数学、自然科学  | 计算思维导论、高等数学 A(1-2) 、    |
| 2.问题分析: 能够应用数        | 和工程科学原理,识别和判断   | 概率论与数理统计 B 、普通物理        |
| 学、自然科学和工程科学的         | 复杂测绘与导航问题的关键    | B(1-2)、地球科学概论、地图学、工     |
| 基本原理,识别、表达、并         | 环节              | 程测量学、C#程序设计、地图设计        |
| 通过文献研究分析复杂测          |                 | 与编绘、遥感数字图像处理等。          |
| 绘工程问题,以获得有效结         | 2.2 能基于数学、自然科学和 | 线性代数、地理信息系统原理(双         |
| 论。                   | 工程科学原理和数学模型方    | 语)、误差理论与测量平差基础、         |
|                      | 法正确表达复杂测绘与导航    | GNSS 原理及其应用、嵌入式系统与      |

| 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)          |
|---|-----------------|----------------------|
|   | 问题              | 程序设计、激光雷达测量技术与应      |
|   |                 | 用、土木工程概论、工业智能定位测     |
|   |                 | 量、工程测量综合实习、激光雷达测     |
|   |                 | 量技术实习、城市规划概论等。       |
|   | 2.3 能认识到解决测绘与导  | 遥感原理与应用、大地测量学基础、     |
|   | 航问题有多种方案可选择,会   | 摄影测量学、变形监测与灾害预报、     |
|   | 通过文献研究寻求可替代的    | 科技文献检索等。             |
|   | 解决方案            |                      |
|   | 2.4 能运用数学、自然科学和 | 概率论与数理统计B、普通物理       |
|   | 工程科学的基本原理,借助文   | B(1-2)、C 语言程序设计、高精度导 |
|   | 献研究,分析过程的影响因    | 航地图与位置服务、地理信息系统原     |
|   | 素,获得有效结论        | 理实习、遥感原理与应用实习、激光     |
|   |                 | 雷达测量技术实习、毕业设计等。      |
|   | 3.1 掌握测绘与导航工程设  | C语言程序设计、导航装备基础、地     |
|   | 计、实施、管理等全流程相关   | 图学、地理信息系统原理(双语)、     |
|   | 技术,以及测绘与导航产品研   | 误差理论与测量平差基础、嵌入式系     |
|   | 发的全周期生产方法,了解影   | 统与程序设计、不动产测量与管理、     |
|   | 响设计目标和技术方案的各    | 室内定位与智能导航、控制测量实      |
|   | 种因素。            | 习、遥感数字图像处理、近景摄影测     |
|   |                 | 量、大数据与地理信息系统、遥感影     |
| 3.设计/开发解决方案:能   |                 | 像深度学习与智能解译等。         |
| 3.以1/开及辟伏刀条: 能  | 3.2 能够针对特定需求,完成 | 计算思维导论、CAD 基础与应用、    |
|   | 测绘与导航系统、产品研发流   | GNSS 原理及其应用、摄影测量学、   |
| 问题的解决方案,设计满足  | 程的设计            | 工程测量学、GNSS 程序设计、激光   |
| 特定需求的测绘系统或测<br>  绘生产流程,并能够在设计   |                 | 雷达测量技术与应用、导航装备基础     |
| (本生) "加性, 开能够住及)<br>(本)<br>(本)<br>(本)<br>(本)<br>(本)<br>(本)<br>(本)<br>(本 |                 | 实习、地图学实习、地理信息系统原     |
| 社会、健康、安全、法律、  |                 | 理实习、摄影测量实习、卫星导航定     |
|   |                 | 位实习、导航定位综合实习、地图设     |
| 文化以及环境等因素。  |                 | 计与编绘等。               |
|   | 3.3 能够进行测绘与导航系  | 变形监测与灾害预报、计算机图形      |
|   | 统或产品研发流程的设计,在   | 学、工业智能定位测量、导航定位嵌     |
|   | 设计中体现创新意识       | 入式研发实习、毕业设计、测绘技能     |
|   |                 | 大赛实训、遥感应用前景等。        |
|   | 3.4 在测绘与导航系统或产  | 思想道德与法治、高精度导航地图与     |
|   | 品研发流程的设计中能够考    | 位置服务、毕业设计、自然资源调查     |
|   | 虑安全、健康、法律、文化及   | 监测等。                 |

| 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)  |
|---|--|---|
|   | 环境等制约因素  |   |
| 4.研究: 能够基于科学原理并采用科学方法对复杂测   | 4.1 能够基于科学原理,通过文献研究,采用科学方法,调研和分析复杂测绘与导航问题的解决方案  4.2 能够根据测绘与导航对象特征,选择研究路线,设计测绘与导航技术方案  4.3 能够根据测绘与导航技 | 误差理论与测量平差基础、大地测量学基础、智慧城市导论、创新实践及科研训练、毕业设计、遥感应用前景、遥感数字图形处理、大数据与地理信息系统、遥感影像深度学习与智能解译、科技论文写作(双语)等。遥感原理与应用、工程制图与识图、地理信息系统原理实习、导航定位嵌入式研发实习、遥感原理与应用实习、工程测量综合实习、测绘地理信息技术前沿等。数字地形测量学、激光雷达测量技术 |
| 绘工程问题进行研究,包括<br>设计实验、分析与解释数<br>据、并通过信息综合得到合<br>理有效的结论。                                  | 术方案构建实验系统,安全地<br>开展测绘与导航实验,正确地<br>采集测绘与导航实验数据  | 与应用、室内定位与智能导航、工业智能定位测量、自然资源调查监测、导航装备基础实习、数字地形测量实习、控制测量实习、高精度地图采集实习、摄影测量实习、卫星导航定位实习、创新实践及科研训练、C#程序设计、近景摄影测量、新型航空遥感数据处理技术等。   |
|   | 4.4 能对实验结果进行分析<br>和解释,并通过信息综合获得<br>合理有效结论  | 线性代数、GNSS 程序设计、科技文献检索、地图学实习、高精度地图采集实习、导航定位综合实习、激光雷达测量技术实习、毕业设计、新型航空遥感数据处理技术等。   |
| 5.使用现代工具: 能够针对复杂测绘工程问题, 开发、选择与使用恰当的测绘技术、信息资源、现代测绘仪器和信息技术工具,包括对复杂测绘工程问题的预测与模拟,并能够理解其局限性。 | 5.1 了解测绘常用的现代测绘与导航仪器、信息技术工具和测绘与导航软件的使用原理和方法,并理解其局限性  | 计算思维导论、工程实践类、复合培养类、C语言程序设计、地理信息系统原理(双语)、现代测绘技术应用、大地测量学基础、GNSS原理及其应用、摄影测量学、工程测量学、数据结构、工程制图与识图、计算机图形学、智慧城市导论、地图学实习、GIS基础应用技能、大数据与地理信息系统、新型航空遥感数据处理技术、遥感影像深度学习与智能解译、                     |

| 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)           |
|---------------|----------------|----------------------|
|               |                | 测绘地理信息技术前沿等。         |
|               | 5.2 能够选择与使用恰当的 | 高等数学 A(1-2)、概率论与数理统  |
|               | 现代测绘与导航仪器、信息资  | 计 B、CAD 基础与应用、导航装备   |
|               | 源和测绘与导航软件,对复杂  | 基础、数字地形测量学、误差理论与     |
|               | 测绘与导航工程问题进行技   | 测量平差基础、不动产测量与管理、     |
|               | 术设计、数据处理与精度分析  | 工业智能定位测量、城市遥感(双      |
|               |                | 语)、导航装备基础实习、数字地形     |
|               |                | 测量实习、地理信息系统原理实习、     |
|               |                | 控制测量实习、高精度地图采集实      |
|               |                | 习、遥感原理与应用实习、卫星导航     |
|               |                | 定位实习、工程测量综合实习、激光     |
|               |                | 雷达测量技术实习、C#程序设计、     |
|               |                | 地图设计与编绘、近景摄影测量等。     |
|               | 5.3 能够针对具体的测绘与 | 普通物理 B (1-2) 、嵌入式系统与 |
|               | 导航对象,开发或选用满足特  | 程序设计、GNSS 程序设计、变形监   |
|               | 定需求的现代测绘与导航仪   | 测与灾害预报、激光雷达测量技术与     |
|               | 器、信息技术工具,对复杂测  | 应用、科技文献检索、室内定位与智     |
|               | 绘与导航工程问题进行预测   | 能导航、导航定位嵌入式研发实习、     |
|               | 与模拟,并能够分析其局限性  | 高精度导航地图与位置服务、遥感原     |
|               |                | 理与应用实习、摄影测量实习、导航     |
|               |                | 定位综合实习、毕业设计等。        |
|               | 6.1 了解测绘与导航领域的 | 形势与政策、数字地形测量学、遥感     |
|               | 技术标准体系、知识产权、测  | 原理与应用、大地测量学基础、测绘     |
|               | 绘管理政策和法律法规,理解  | 管理与法律法规、数字地形测量实      |
|               | 不同社会文化对工程活动的   | 习、地理信息系统原理实习、卫星导     |
| 6.工程与社会:能够基于工 | 影响             | 航定位实习、工程测量综合实习、测     |
| 程相关背景知识进行合理   |                | 绘技能大赛实训、城市规划概论等。     |
| 分析,评价测绘工程实践和  | 6.2 能分析和评价测绘与导 | 思想道德与法治、中国近现代史纲      |
| 复杂测绘工程问题解决方   | 航工程实践对社会、健康、安  | 要、马克思主义基本原理、毛泽东思     |
| 案对社会、健康、安全、法  | 全、法律、文化的影响,以及  | 想和中国特色社会主义理论体系概      |
| 律以及文化的影响,并理解  | 这些制约因素对工程项目实   | 论、工程实践类、复合培养类、现代     |
| 应承担的责任。       | 施的影响,并理解应承担的责  | 测绘技术应用、变形监测与灾害预      |
|               | 任              | 报、不动产管理与测量、高精度导航     |
|               |                | 地图与位置服务、土木工程概论、导     |
|               |                | 航定位综合实习、毕业设计、GIS 基   |
|               |                | 础与应用技能等。             |

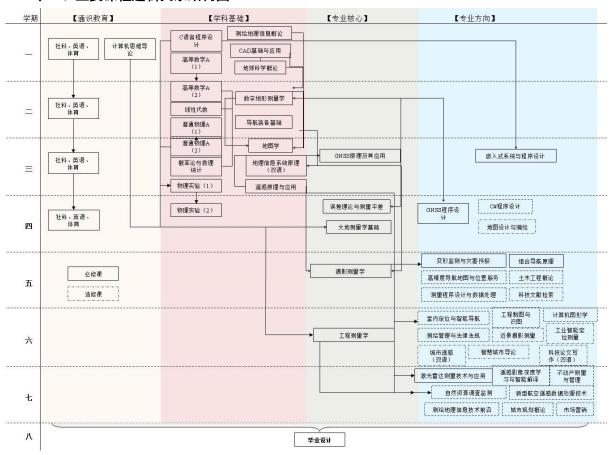
| 毕业生应具备的知识能力   | 相关知识领域                      | 实现途径 (课程支撑)                             |
|---|-----------------------------|---|
| 7.环境和可持续发展: 能够理解和评价针对复杂测绘工程问题的测绘工程实践对环境、社会可持续发展的影响。 | 7.1 知晓和理解环境保护和              | 习近平新时代中国特色社会主义思                         |
|   | 可持续发展的理念和内涵                 | 想概论、工程实践类、复合培养类、                        |
|   |                             | 地球科学概论、测绘地理信息概论、                        |
|   |                             | 城市遥感(双语)、自然资源调查监                        |
|   |                             | 测、GIS 基础应用技能、城市规划概                      |
|   |                             | 论等。                                     |
|   | 7.2 能够从环境保护和可持              | 毛泽东思想和中国特色社会主义理                         |
|   | 续发展的角度思考测绘与导                | 论体系概论、形势与政策、智慧城市                        |
|   | 航工程实践的可持续性,评价               | 导论、高精度地图采集实习、自然地                        |
|   | 测绘与导航工程实践中可能                | 理地貌及遥感图像解译实习、毕业设                        |
|   | 对人类和环境造成的损害和                | 计、大数据与地理信息系统等。                          |
|   | 隐患                          |   |
| 8.职业规范: 具有人文社会                                      | 8.1 具有正确价值观,理解个             | 中国近现代史纲要、马克思主义基本                        |
|   | 人与社会的关系,了解中国国               | 原理、习近平新时代中国特色社会主                        |
|   | 情                           | 义思想概论、毛泽东思想和中国特色                        |
|   |                             | 社会主义理论体系概论、形势与政                         |
|   |                             | (第、体育 (1-4) 、"四史" (党史、                  |
|   |                             | 新中国史、改革开放史、社会主义发                        |
|   |                             | 展史)、自然资源调查监测、军事理                        |
|   |                             | 论、军训、遥感影像深度学习与智能                        |
| 科学素养、社会责任感,能  | 0 0 细胞混合 // 工 / 混合之间        | 解译等。<br>思想道德与法治、大学生职业生涯与                |
| 够在测绘工程实践中理解   | 8.2 理解诚实公正、诚信守则的测绘与导航行业职业道德 | 发展规划、测绘地理信息概论、测绘                        |
| 并遵守测绘行业职业道德和规范,履行责任。                                | 和规范,并能在测绘与导航工               | (京) |
|   | 和                           | 习、工程测量综合实习、导航定位综                        |
|   | 1年天政门 日光过 1                 | 合实习、测绘技能大赛实训等。                          |
|   |                             | 马克思主义基本原理、习近平新时代                        |
|   | 员对公众的安全、健康、福祉、              | 中国特色社会主义思想概论、大学生                        |
|   | 环境保护的社会责任,能够在               | 心理健康、地球科学概论、变形监测                        |
|   | 测绘与导航工程实践中自觉                | 与灾害预报、城市遥感(双语)、自                        |
|   | 履行责任                        | 然地理地貌及遥感图像解译实习、毕                        |
|   |                             | 业设计等。                                   |
| 9.个人和团队: 能够在建                                       | 9.1 能与建筑、土木等学科的             | 大学生职业生涯与发展规划、体育                         |
| 筑、土木等多学科背景下的  | 成员有效沟通,合作共事                 | (1-4)、土木工程概论、工程制图                       |
| 团队中承担个体、团队成员  |                             | 与识图、自然地理地貌及遥感图像解                        |
| 以及负责人的角色。   |                             | 译实习、工程测量综合实习、不动产                        |

| 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)            |
|--|-----------------|------------------------|
|  |                 | 测量与管理实习、毕业设计等。         |
|  | 9.2 能够在团队中独立或合  | 大学生心理健康、军事理论、数字地       |
|  | 作开展工作           | 形测量实习、地图学实习、卫星导航       |
|  |                 | 定位实习、激光雷达测量技术实习        |
|  |                 | 等。                     |
|  | 9.3 能够组织、协调和指挥团 | 控制测量实习、导航定位综合实习、       |
|  | 队开展工作           | 测绘技能大赛实训等。             |
|  | 10.1 能就测绘与导航专业问 | 导航装备基础、科技文献检索、测绘       |
|  | 题,在测绘与导航技术设计    | <b>管理与法律法规、工程测量综合实</b> |
|  | 书、测绘与导航技术总结等书   | 习、导航定位综合实习、激光雷达测       |
| 10.沟通: 能够就复杂测绘   | 面表述以及陈述发言中,准确   | 量技术实习、毕业设计、科技论文写       |
| 工程问题与测绘同行及社  | 表达观点,回应质疑,理解与   | 作(双语)、市场营销等。           |
| 会公众进行有效沟通和交  | 测绘与导航同行及社会公众    |                        |
| 流,包括撰写测绘技术设计   | 交流的差异性          |                        |
| 书和测绘技术总结等、陈述   | 10.2 了解测绘与导航专业领 | 大学英语拓展系列课程、测绘地理信       |
| 发言、清晰表达或回应指  | 域的国际发展趋势、研究热    | 息概论、地理信息系统原理(双语)、      |
| 令,并具备一定的国际视  | 点,理解和尊重不同文化的差   | 现代测绘技术应用、遥感应用前景、       |
| 野,能够在跨文化背景下进   | 异性和多样性          | 科技论文写作(双语)等。           |
| 行沟通和交流。  | 10.3 具备跨文化交流的语言 | 大学英语(1-2)、大学英语拓展系      |
|  | 和书面表达能力,能就测绘与   | 列课程、城市遥感(双语)、科技论       |
|  | 导航专业问题,在跨文化背景   | 文写作(双语)等。              |
|  | 下进行基本沟通和交流      |                        |
|  | 11.1 了解测绘工程及测绘产 | 不动产测量与管理、测绘管理与法律       |
|  | 品生产的全流程成本构成,能   | 法规、导航定位综合实习、毕业设计、      |
| 11.项目管理:理解并掌握  | 够理解其中涉及的工程管理    | 市场营销等。                 |
| 工程管理原理与经济决策  | 与经济决策问题,并能掌握工   |                        |
|  | 程项目中涉及的管理与经济    |                        |
| 方法,并能在测绘、建筑、土木、环境等多学科环境中                                   | 决策方法            |                        |
| 上水、环境等多子符环境中<br>  应用。                                      | 11.2 能在土木、建筑等多学 | 土木工程概论、工程测量综合实习、       |
| \(\begin{align*} \ldots \frac{1}{12} \cdot \\ \end{align*} | 科环境下,在设计开发测绘方   | 毕业设计等。                 |
|  | 案的过程中,运用工程管理与   |                        |
|  | 经济决策方法          |                        |
| 12.终身学习: 具有自主学   | 12.1 能在社会发展的大背景 | 大学生职业生涯与发展规划、数字地       |
| 习和终身学习的意识,有不   | 下,认识到自主学习和终身学   | 形测量学、测绘技能大赛实训、测绘       |
| 断学习和适应发展的能力。   | 习的必要性           | 地理信息技术前沿等。             |
| 四十つ4世界及成的配力。   | 12.2 具有自主学习和适应发 | 马克思主义基本原理、大学英语         |

| 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)           |
|-------------|---------------|-----------------------|
|             | 展的能力,包括对测绘与导航 | (1-2) 、体育(1-4) 、C 语言程 |
|             | 技术问题的理解能力,归纳总 | 序设计、现代测绘技术应用、工程测      |
|             | 结的能力和提出问题的能力  | 量学、摄影测量实习、毕业设计、遥      |
|             | 等。            | 感应用前景等。               |

## 十、指导性教学计划(见附表)

### 十一、主要课程逻辑关系结构图



# 2021 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 180, including 137credits 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 IFI .:               | Compulsory  | 44      | 728        | 24.44%     |
| General Education      | Optional    | 2       | 32         | 1.11%      |
| Big Academic Subjects  | Compulsory  | 44.5    | 780        | 24.72%     |
| Professional Core      | Compulsory  | 14      | 224        | 7.78%      |
| B 6 : 1B: ::           | Compulsory  | 14      | 224        | 7.78%      |
| Professional Direction | Optional    | 18      | 288        | 10.00%     |
| D                      | Compulsory  | 37      | 860        | 20.56%     |
| Practice               | Optional    | 6       | 120        | 3.33%      |
| Total                  |             | 180     | 3264       | 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<br>20 | 8        | 1-16 grad | luation projec | t 17 defense |

#### **IX Graduate Abilities and Matrices**

| The Grandett Homeles and Practices |                                 |   |  |
|------------------------------------|---------------------------------|---|--|
| Graduate Abilities                 | Related Knowledge               | Course Supports                           |  |
| 1. Engineering                     |                                 | Advanced mathematics a (1-2), physical    |  |
| knowledge: Be able to use          | 1.1 Be able to use the language | experiments (1-2), introduction to Earth  |  |
| mathematics, natural               | tools of mathematics, natural   | Science, fundamentals and applications of |  |
| science, engineering               | science and engineering science | CAD, Foundation of Navigation             |  |
| foundation and professional        | to express Surveying and        | Equipment, digital topographic            |  |
| knowledge to solve                 | Mapping Engineering &           | surveying, cartography, principles and    |  |
| complex surveying and              | Navigation problems             | applications of remote sensing,           |  |
| mapping engineering                | ivavigation prooferits          | Programming for GNSS , introduction to    |  |
| problems.                          |                                 | civil engineering, computer graphics, etc |  |

| Graduate Abilities   | Related Knowledge   | Course Supports  |
|--|---|--|
|  | 1.2 Be able to establish mathematical model and solve for specific Surveying and Mapping Engineering & Navigation objects   | Advanced mathematics a (1-2), LINEAR Algebra, error theory and adjustment basis, geodesy basis, photogrammetry, etc  |
|  | 1.3 Be able to use mathematics, natural science, engineering foundation and professional knowledge as well as mathematical model method to deduce and analyze complex Surveying and Mapping Engineering &   | Introduction to computational thinking, Linear Algebra, Gis (bilingual), GNSS and its applications, engineering surveying, engineering cartography and cartography, computer graphics, Remote Sensing Digital Image Processing, introduction to urban planning, etc.   |
|  | Navigationproblems  1.4 Can use mathematics, natural science, engineering foundation and professional knowledge as well as mathematical model method to compare and synthesize the solutions of complex Surveying and Mapping Engineering & Navigation problems   | Probability and Mathematical Statistics B,<br>General Physics B(1-2), embedded system<br>and program design, control measurement<br>practice, remote sensing principle and<br>application practice, etc.   |
| 2. Problem analysis: Be able to apply the basic principles of mathematics, natural science and engineering science to identify, express and analyze complex surveying and mapping engineering problems through literature research, so as to obtain effective conclusions. | 2.1 Be able to identify and judge the key links of complex Surveying and Mapping Engineering & Navigation problems by using the principles of mathematics, natural science and engineering science  2.2 Be able to correctly express complex Surveying and Mapping Engineering & Navigation problems based on | Introduction to computational thinking, advanced mathematics A(1-2), probability and mathematical statistics B, general physics B(1-2), introduction to earth science, cartography, engineering surveying, C# programming, map design and compilation, remote sensing digital image processing, etc.  Principle of linear algebra, the geographic information system (bilingual), error theory and measurement adjustment, GNSS principle and its application, |

| Graduate Abilities          | Related Knowledge                | Course Supports                             |
|-----------------------------|----------------------------------|---|
|                             | natural science and engineering  | laser radar measurement technology and      |
|                             | science and mathematical         | application, introduction to civil          |
|                             | model                            | engineering, industrial intelligent         |
|                             |                                  | positioning surveying, engineering          |
|                             |                                  | surveying practice, overview of laser radar |
|                             |                                  | measurement technology practice, urban      |
|                             |                                  | planning, etc.                              |
|                             | 2.3 Can realize that there are   |   |
|                             | many solutions to solve the      | Principles and applications of remote       |
|                             | problem of Surveying and         | sensing, geodesy, photogrammetry,           |
|                             | Mapping Engineering &            | deformation monitoring and disaster         |
|                             | Navigation, and will seek        | prediction, scientific and technical        |
|                             | alternative solutions through    | literature retrieval, etc                   |
|                             | literature research              |   |
|                             |                                  | Probability theory and Mathematical         |
|                             | 2.4 Can use the basic principles | Statistics B, General Physics B (1-2), C    |
|                             | of mathematics, natural science  | language program design, high-precision     |
|                             | and Engineering Science, with    | Navigation Map and position service,        |
|                             | the aid of literature research,  | geographic information system principle     |
|                             | analyze the influencing factors  | practice, remote sensing principle and      |
|                             | of the process, and obtain       | application practice, laser radar           |
|                             | effective conclusions            | measurement technology practice,            |
|                             |                                  | graduation project, etc                     |
| 3. Design/Develop           | 3.1 Master the technology        | C language program design, navigation       |
| solutions: Be able to       | related to the whole process of  | equipment foundation, the principle of      |
| design solutions for        | Surveying and Mapping            | cartography, geographic information         |
| complex surveying and       | Engineering & Navigation         | system (bilingual), error theory and        |
| mapping engineering         | engineering design,              | measurement adjustment, embedded            |
| problems, design surveying  | implementation and               | systems and program design, real estate,    |
| and mapping system or       | management, as well as the full  | indoor positioning and intelligent          |
| surveying and mapping       | cycle production method of       | navigation, measurement and management      |
| production process to meet  | Surveying and Mapping            | control survey practice, remote sensing     |
| specific needs, reflect     | Engineering & Navigation         | digital image processing, close shot        |
| innovation consciousness in | products, and understand         | photogrammetry, big data and geographic     |
| the design process, and     | various factors affecting the    | information system, remote sensing image    |
| consider factors such as    | design objectives and technical  | deep learning and intelligent solutions     |

| Graduate Abilities   | Related Knowledge   | Course Supports   |
|--|---|---|
| society, health, safety, law, culture and environment.   | solutions   | Translation, etc.   |
|  | 3.2 Be able to complete the design of Surveying and Mapping Engineering & Navigation system and production process according to specific requirements                                       | Introduction to computational thinking, Cad Foundation and application, GNSS principle and its application, photogrammetry, engineering surveying, GNSS program design, laser radar measurement technology and application, basic practice of navigation equipment, mapping study, geographic information system principle, photogrammetry, satellite navigation and positioning practice, navigation and positioning comprehensive practice, map design and compilation, etc |
|  | 3.3 Be able to design the Surveying and Mapping Engineering & Navigation system or production process, and embody the innovation consciousness in the design                                | Deformation monitoring and disaster prediction, computer graphics, Industrial Intelligent Positioning Measurement, navigation and positioning embedded research and development practice, graduation design, mapping skills contest training, remote sensing application prospects.   |
|  | 3.4 In the design of Surveying and Mapping Engineering & Navigation system or mapping production process, the constraints of safety, health, law, culture and environment can be considered | Ideological and moral and rule of law, High-precision navigation map and location services, graduation design, natural resources survey and monitoring.   |
| 4. Research: Based on scientific principles and scientific methods, it can study complex surveying | 4.1 Based on scientific principles, through literature research, using scientific methods, research and analyze   | Error theory and Survey Adjustment Basis, Geodesy Basis, Introduction to Smart City, Innovation Practice and Scientific Research Training, graduation project,  |

| Graduate Abilities  | Related Knowledge  | Course Supports   |
|---|--|---|
| and mapping engineering problems, including designing experiments, analyzing and interpreting data, and obtaining reasonable and effective conclusions through information synthesis. | Related Knowledge  the solutions of complex Surveying and Mapping Engineering & Navigation problems  4.2 According to the characteristics of Surveying and   | Remote sensing application prospect, Remote sensing digital Graphics processing, big data and geographic information System, Remote sensing image deep learning and intelligent interpretation, Scientific paper writing (Bilingual), etc. Remote sensing principle and application, engineering cartography and map recognition, geographic information  |
|   | Mapping Engineering & Navigation objects, the research route can be selected and the technical scheme of Surveying and Mapping Engineering & Navigation can be designed  | system principle practice, navigation and positioning embedded research and development practice, remote sensing principle and application practice, engineering survey comprehensive practice, mapping and geographic information technology frontier and so on.   |
|   | 4.3 It can construct the experimental system according to the technical scheme of Surveying and Mapping Engineering & Navigation, carry out the Surveying and Mapping Engineering & Navigation experiment safely, and collect the Surveying and Mapping Engineering & Navigation experimental data correctly | Digital topographic survey, laser radar survey technology and application, indoor positioning and intelligent navigation, industrial intelligent positioning survey, Natural Resources Survey and Monitoring, basic practice of navigation equipment, digital topographic survey practice, control survey practice, high precision map collection practice, photogrammetry practice, satellite navigation positioning practice, innovative practice and scientific research training, c # program design, close-range photogrammetry, new aerial remote sensing data processing technology, etc |
|   | 4.4 The experimental results can<br>be analyzed and explained, and<br>reasonable and effective<br>conclusions can be obtained  | LINEAR Algebra, GNSS program design, science and Technology Literature Retrieval, mapping practice, high-precision map collection practice,   |

| Graduate Abilities            | Related Knowledge                | Course Supports                             |
|-------------------------------|----------------------------------|---|
|                               | through information synthesis    | navigation and positioning comprehensive    |
|                               |                                  | practice, laser radar measurement           |
|                               |                                  | technology practice, graduation design,     |
|                               |                                  | new aviation remote sensing data            |
|                               |                                  | processing technology.                      |
|                               |                                  | Introduction to computational thinking,     |
|                               |                                  | engineering practice, composite training, C |
|                               |                                  | language programming, principles of         |
|                               |                                  | geographic information system               |
|                               | 5.1 Understand the principles    | (bilingual), application of modern          |
|                               | and methods of modern s          | surveying and mapping technology,           |
|                               | Surveying and Mapping            | geodesy, Gnss principles and applications,  |
|                               | Engineering & Navigation         | photogrammetry, engineering surveying,      |
|                               | instruments, information         | data structure, engineering mapping and     |
| 5. Using modern tools: Be     | technology tools and Surveying   | cartography, computer graphics,             |
| able to develop, select and   | and Mapping Engineering &        | introduction to Smart Cities, cartographic  |
| use appropriate surveying     | Navigation software commonly     | practice, Gis basic application skills, big |
| and mapping technology,       | used in surveying and mapping,   | data and Gis, new aerial remote sensing     |
| information resources,        | and understand their limitations | data processing technology, deep learning   |
| modern surveying and          |                                  | and intelligent interpretation of remote    |
| mapping instruments and       |                                  | sensing images, frontier of Surveying and   |
| information technology        |                                  | Mapping Geographic Information              |
| tools, including prediction   |                                  | Technology, etc                             |
| and Simulation of complex     | 5.2 Be able to select and use    | Higher mathematics (1-2 A) B, probability   |
| surveying and mapping         | appropriate modern Surveying     | theory and mathematical statistics, CAD     |
| engineering problems, and     | and Mapping Engineering &        | and application, navigation equipment,      |
| understand their limitations. | Navigation instruments,          | digital topographic surveying, the error    |
|                               | information resources and        | theory and measurement adjustment, real     |
|                               | Surveying and Mapping            | estate, industrial intelligent positioning  |
|                               | Engineering & Navigation         | measurement, measurement and                |
|                               | software to carry out technical  | management of city remote sensing based     |
|                               | design, data processing and      | internship (bilingual), navigation          |
|                               | accuracy analysis for complex    | equipment, digital topographic survey       |
|                               | Surveying and Mapping            | practice, the principle of geographic       |
|                               | Engineering & Navigation         | information systems practice, control,      |
|                               | problems                         | measurement practice, High-precision map    |

| Graduate Abilities           | Related Knowledge                 | Course Supports                               |
|------------------------------|-----------------------------------|---|
|                              |                                   | collection practice, remote sensing           |
|                              |                                   | principle and application practice, satellite |
|                              |                                   | navigation and positioning practice,          |
|                              |                                   | engineering surveying comprehensive           |
|                              |                                   | practice, lidar measurement technology        |
|                              |                                   | practice, C# program design, map design       |
|                              |                                   | and compilation, close-range                  |
|                              |                                   | photogrammetry, etc.                          |
|                              |                                   | General Physics B (1-2), embedded             |
|                              | 5.3 It can develop or select      | system and program design, GNSS               |
|                              | modern Surveying and              | program design, deformation monitoring        |
|                              | Mapping Engineering &             | and disaster prediction, laser radar          |
|                              | Navigation instruments and        | measurement technology and application,       |
|                              | information technology tools to   | science and technology literature retrieval,  |
|                              | meet specific needs for specific  | indoor positioning and intelligent            |
|                              | Surveying and Mapping             | navigation, navigation and positioning        |
|                              | Engineering & Navigation          | embedded development practice,                |
|                              | objects, predict and simulate     | high-precision navigation map and             |
|                              | complex Surveying and             | position service, remote sensing principle    |
|                              | Mapping Engineering &             | and application practice, photogrammetry      |
|                              | Navigation problems, and          | practice, navigation and positioning          |
|                              | analyze their limitations         | comprehensive practice, graduation            |
|                              |                                   | design, etc                                   |
| 6. Engineering and           |                                   | Situation and policy, digital topographic     |
| Society: Be able to make     | 6.1 Understand the technical      | surveying, principles and applications of     |
| reasonable analysis based    | standard system, intellectual     | remote sensing, fundamentals of Geodesy,      |
| on engineering related       | property rights, surveying and    | management and laws and regulations of        |
| background knowledge,        | mapping management policies,      | surveying and Mapping, practice of digital    |
| evaluate the impact of       | laws and regulations in the field | topographic surveying, practice of            |
| Surveying and mapping        | of Surveying and Mapping          | geographic information system principles,     |
| engineering practice and     | Engineering & Navigation, and     | practice of satellite navigation and          |
| complex surveying and        | understand the influence of       | positioning, comprehensive practice of        |
| mapping engineering          | different social cultures on      | engineering surveying, practice of            |
| problem solutions on         | engineering activities            | surveying and Mapping Skills Contest,         |
| society, health, safety, law |                                   | introduction to urban planning, etc           |

| Graduate Abilities                              | Related Knowledge               | Course Supports                               |
|---|---------------------------------|---|
| and culture, and understand                     |                                 | Ideological morality and the rule of law,     |
| the responsibilities that                       |                                 | modern history of China, and basic            |
| should be undertaken.                           | 6.2 Be able to analyze and      | principle of marxism and MAO zedong           |
|   | evaluate the impact of          | thought and introduction to socialist theory  |
|   | Surveying and Mapping           | with Chinese characteristics, engineering     |
|   | Engineering &                   | practice class, composite, and application    |
|   | Navigationengineering practice  | of modern surveying and mapping               |
|   | on society, health, safety, law | technology, deformation monitoring and        |
|   | and culture, as well as the     | disaster forecasting, real estate             |
|   | impact of these constraints on  | management and measurement, high              |
|   | the implementation of           | precision navigation map and location         |
|   | engineering projects, and       | services, overview of civil engineering,      |
|   | understand the responsibilities | navigation and positioning the                |
|   | that should be borne            | comprehensive practice, graduation            |
|   |                                 | Calculation, GIS basic and application        |
|   |                                 | skills, etc.                                  |
|   |                                 | An introduction to Xi Jinping thought on      |
|   |                                 | Socialism with Chinese characteristics for    |
|   |                                 | a new era, an introduction to engineering     |
|   | 7.1 Know and understand the     | practice, composite training, an              |
|   | concept and connotation of      | introduction to Earth Science, an             |
| 7. Environment and                              | environmental protection and    | introduction to surveying, mapping and        |
| sustainable development :                       | sustainable development         | geographic information, urban remote          |
| Be able to understand and                       | sustamable development          | sensing (bilingual), natural resources        |
| evaluate the impact of                          |                                 | investigation and monitoring, basic           |
| _   |                                 | application skills of Gis, an introduction to |
| complex surveying and                           |                                 | urban planning, etc                           |
| mapping engineering practice on the environment | 7.2 From the perspective of     | Introduction to MAO Zedong Thought and        |
| and social sustainable                          | environmental protection and    | theoretical system of Socialism with          |
|   | sustainable development, we     | Chinese Characteristics, Situation and        |
| development.                                    | can think about the             | Policy, Introduction to smart City,           |
|   | sustainability of Surveying and | High-precision map collection practice,       |
|   | Mapping Engineering &           | physical geography and geomorphology          |
|   | Navigation engineering          | and remote sensing image interpretation       |
|   | practice, and evaluate the      | practice, graduation project, big data and    |
|   | damage and hidden danger that   | geographic information system, etc.           |

| Graduate Abilities  | Related Knowledge   | Course Supports   |
|---|---|---|
|   | may be caused to human and environment in the practice of Surveying and Mapping Engineering & Navigation engineering  | An outline of the history of China, an introduction to the basic principles of Marxism, an introduction to Xi Jinping's   |
| 8. Occupational norms: With humanities and social science literacy, social responsibility, can understand and abide by the professional ethics and norms of Surveying and | 8.1 Have correct values, understand the relationship between individuals and society, and understand China's national conditions  | thought on Socialism with Chinese characteristics for a new era, an introduction to Maoism and the theoretical system of socialism with Chinese characteristics, the situation and policies, sports (1-4), the "Four Histories" (the history of the party, the history of the New China, the history of reform and opening-up, and the history of Socialist Development), natural resources investigation and monitoring, military theory, military training, deep learning of remote sensing images and intelligent interpretation, etc. |
| mapping industry in the practice of Surveying and mapping, and fulfill the responsibility.  | 8.2 Understand the professional ethics and norms of the surveying and mapping industry of honesty, justice and integrity, and consciously abide by them in the practice of Surveying and Mapping Engineering & Navigationprojects | Ideological morality and rule of law, College students' career and development planning, introduction to surveying and mapping geographic Information, surveying and mapping management and laws and regulations, digital topographic surveying practice, engineering surveying comprehensive practice, navigation and positioning comprehensive practice, surveying and mapping skills competition training, etc.  |
|   | 8.3 Understand the social responsibility of Surveying and Mapping Engineering &   | An introduction to the basic principles of Marxism, an introduction to Xi Jinping's thought on Socialism with Chinese   |

| Graduate Abilities          | Related Knowledge               | Course Supports                               |  |  |  |  |
|-----------------------------|---------------------------------|---|--|--|--|--|
|                             | Navigation workers for public   | characteristics for a new era, an             |  |  |  |  |
|                             | safety, health, well-being and  | introduction to college students'mental       |  |  |  |  |
|                             | environmental protection, and   | health, an introduction to Earth Science,     |  |  |  |  |
|                             | be able to consciously perform  | deformation monitoring and disaster           |  |  |  |  |
|                             | their responsibilities in       | prediction, urban remote sensing              |  |  |  |  |
|                             | Surveying and Mapping           | (bilingual), physical geography and           |  |  |  |  |
|                             | Engineering & Navigation        | remote sensing image interpretation           |  |  |  |  |
|                             | engineering practice            | practice, graduation project, etc             |  |  |  |  |
|                             |                                 | College Students'career and development       |  |  |  |  |
|                             |                                 | planning, physical education (1-4),           |  |  |  |  |
|                             |                                 | introduction to civil engineering,            |  |  |  |  |
|                             | 9.1 Be able to communicate      | engineering drawing and mapping,              |  |  |  |  |
|                             | effectively with members of     | physical geography and remote sensing         |  |  |  |  |
| 9. Individuals and teams:   | architecture, civil engineering | image interpretation practice, engineering    |  |  |  |  |
| Be able to play the role of | and other disciplines           | survey comprehensive practice, real estate    |  |  |  |  |
| individual, team member     |                                 | survey and management practice,               |  |  |  |  |
| and leader in the team      |                                 | graduation design, etc                        |  |  |  |  |
| under the background of     |                                 | College Students Mental Health, military      |  |  |  |  |
| architecture, civil         | 9.2 Ability to work             | theory, digital terrain survey practice,      |  |  |  |  |
| engineering and other       | independently or cooperatively  | mapping practice, satellite navigation        |  |  |  |  |
| disciplines.                | in a team                       | positioning practice, laser radar             |  |  |  |  |
|                             |                                 | measurement technology practice.              |  |  |  |  |
|                             | 0.2.4139                        | Control measurement practice, navigation      |  |  |  |  |
|                             | 9.3 Ability to organize,        | and positioning comprehensive practice,       |  |  |  |  |
|                             | coordinate and direct the work  | surveying and mapping skills competition      |  |  |  |  |
|                             | of the team                     | training.                                     |  |  |  |  |
| 10. Communication: Be       | 10.1 Be able to accurately      | Basic navigation equipment, scientific and    |  |  |  |  |
| able to effectively         | express opinions, respond to    | technological literature retrieval, surveying |  |  |  |  |
| communicate and             | queries, and understand the     | and mapping management and laws and           |  |  |  |  |
| communicate with            | differences of communication    | regulations, engineering surveying            |  |  |  |  |
| surveying and mapping       | with Surveying and Mapping      | comprehensive practice, navigation and        |  |  |  |  |
| peers and the public on     | Engineering & Navigation        | positioning comprehensive practice, Lidar     |  |  |  |  |
| complex surveying and       | peers and the public in written | measurement technology practice,              |  |  |  |  |
| mapping engineering         | statements and statements on    | graduation design, scientific and             |  |  |  |  |
| problems, including writing | Surveying and Mapping           | technological paper writing (bilingual),      |  |  |  |  |
| surveying and mapping       | Engineering & Navigation        | marketing, etc.                               |  |  |  |  |

| Graduate Abilities  | Related Knowledge   | Course Supports  |
|---|---|--|
| technology design book  | technology design book and  |  |
| and surveying and mapping   | survey technology summary   |  |
| 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.                                  | 10.2 Understand the international development trends and research hotspots in the field of Surveying and Mapping Engineering & Navigation, and understand and respect the differences and diversity of different cultures  10.3 Have the ability of cross-cultural communication language and written expression, and be able to carry out basic communication and exchange on Surveying and Mapping Engineering & Navigation professional issues under the cross-cultural backgr | College English extension courses, introduction to mapping and geographic information, principles of geographic information system (bilingual), application of modern surveying and Mapping Technology, prospects of remote sensing applications, scientific paper writing (bilingual) and so on.  College English (1-2), College English Extension Courses, urban remote sensing (bilingual), scientific paper writing (bilingual) and so on. |
| 11. Project management: Understand and master the principles of engineering management and economic decision-making methods, and can be applied in surveying and mapping, architecture, civil engineering, environment and other disciplines. | ound  11.1 understand the cost structure of the whole process of surveying and mapping engineering and surveying products production, understand the engineering management and economic decision-making issues involved, and grasp the management and economic decision-making methods involved in engineering projects  11.2 application of   | Real estate surveying and management, surveying and mapping management and laws and regulations, navigation and positioning comprehensive practice, graduation design, marketing, etc.  Civil Engineering Conspectus, engineering  |
|   | engineering management and economic decision-making in  | civil Engineering Conspectus, engineering survey comprehensive practice, graduation project and so on.   |

| Graduate Abilities                                | Related Knowledge  | Course Supports  |
|---|--|--|
|   | the design and development                                 |  |
|   | of surveying and mapping                                   |  |
|   | schemes in multidisciplinary<br>environments such as civil |  |
|   | 12.1 Under the background of social development, we can    | College Students Career and Development Planning, digital terrain surveying,   |
|   | realize the necessity of self-learning and lifelong        | mapping skills contest training, mapping and geographic information technology |
| 12. Lifelong learning: Have the consciousness of  | learning   | frontier.  |
| self-learning and lifelong learning, and have the | 12.2 Have the ability of self-learning and adapting to     | Basic Principles of Marxism, college   |
| ability of continuous learning and adapting to    | development, including the ability to understand the       | English (1-2), sports (1-4), C language programming, application of modern     |
| development.                                      | Surveying and Mapping Engineering & Navigation             | surveying and Mapping Technology,<br>engineering surveying, photogrammetry     |
|   | technical problems, the ability                            | practice, graduation design, remote  |
|   | to summarize and the ability to ask questions.             | sensing application prospects, etc   |

X Table of Teaching Arrangement (appendix table)

# 表 1 测绘工程专业(智能导航实验班)指导性教学计划

| 程 | 课程属性                              | 课程名称  | 学分     | 总学时 | 讲课学时 | 实践学时 | 上机学时 | 课外学时 | 延续教学 | 开课<br>学期 | 教学单位      |
|---|-----------------------------------|---|--------|-----|------|------|------|------|------|----------|-----------|
|   |                                   | 思想道德与法治 Ideological Morality and<br>Rule of Law   | 3      | 48  | 48   |      |      |      |      | 1        | 马克思主义学院   |
|   |                                   | 中国近现代史纲要 The Outline of the<br>Modern Chinese History   | 3      | 48  | 32   |      |      | 16   |      | 2        | 马克思主义学院   |
|   |                                   | 习近平新时代中国特色社会主义思想概论<br>Introduction to Xi Jinping Thought on<br>Socialism with Chinese Characteristics<br>for a New Era  | 2      | 32  | 28   | 4    |      |      |      | 2        | 马克思主义学院   |
|   |                                   | 马克思主义基本原理★ Basic Principle of<br>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理论体系概<br>论★ Introduction to Mao Zedong Thoughts<br>and Theoretical System of Socialism with<br>Chinese Characteristics  | 5      | 80  | 64   |      |      | 16   |      | 4        | 马克思主义学院   |
|   |                                   | 形势与政策(1-4) Situation and<br>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<br>College Student Occupation Career and<br>Development Planning   | 1      | 16  | 16   |      |      |      |      | 1        | 学工部       |
| 通 |                                   | 大学生心理健康<br>The Mental health of College Students  | 1      | 16  | 16   |      |      |      |      | 2        | 学工部       |
| 识 |                                   | 大学英语(1-2) ★ English(1-2)  | 6      | 128 | 96   |      |      |      | 32   | 1-2      | 人文学院      |
| 数 |                                   | 大学英语拓展系列课程(1-4)<br>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)<br>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       |
| 果 |                                   | 计算思维导论<br>Introduction to Computational Thinking  | 1.5    | 56  | 24   |      |      | 32   |      | 1        | 电信学院      |
|   |                                   | "四史"(党史、新中国史、改革开放史、<br>社会主义发展史) History of the Communist<br>Party of China, History of New China,<br>History of Reform and Opening up and<br>History of Socialist Development | 0.5    | 8   | 8    |      |      |      |      | 1-7      | 马克思主义学院   |
| - |                                   | 小 计<br>************************************   | 36     | 696 | 596  | 4    |      | 64   | 32   | 1 0      | مد بدی جا |
|   |                                   | 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<br>2 | 32  | 包米:  | 5 小丛 |      | 当八   |      | 1-8      | 各院部       |
|   |                                   | 至少修读 4 类合i  | /Γ Ø 与 | 产力, |      |      |      |      |      |          |           |
|   | 任                                 | 工程实践类 1-8 学期任选  |        |     |      |      |      |      |      |          | 各院部       |
|   | 选                                 | 复合培养类 1-8 学期任选  |        |     |      |      |      |      |      | 各院部      |           |
| - | 跨类任选至少 2 学分<br>通识教育课合计至少修读 46 学分。 |   |        |     |      |      |      |      |      |          |           |
| j |                                   | 通识教育必修 36 学分(含"四史"(党史、新<br>用内任意学期完成,0. 5 学分),通识教育核心   |        |     |      |      |      |      |      |          |           |

| 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<br>学期 | 教学单位     |  |
|------|------|--|------|-----|-------|------|------|------|------|----------|----------|--|
|      |      | 高等数学 A (1) ★<br>Advanced Mathematics A(1)                                | 5    | 92  | 80    |      |      |      | 12   | 1        | 理学院      |  |
|      |      | 高等数学 A (2) ★<br>Advanced Mathematics A(2)                                | 5    | 84  | 80    |      |      |      | 4    | 2        | 理学院      |  |
|      |      | 线性代数<br>Linear Algebra   | 2    | 40  | 32    |      |      |      | 8    | 2        | 理学院      |  |
|      |      | 概率论与数理统计 B<br>Theory of Probability and Statistics (B)                   | 3    | 48  | 44    |      |      |      | 4    | 3        | 理学院      |  |
|      |      | 普通物理 A (1) ★<br>College physics A(1)                                     | 3    | 56  | 52    |      |      | 4    |      | 2        | 理学院      |  |
|      |      | 普通物理 A (2) ★<br>College physics A(2)                                     | 3    | 56  | 52    |      |      | 4    |      | 3        | 理学院      |  |
|      |      | 物理实验(1-2)<br>Physics Experiment(1-2)                                     | 2    | 60  |       | 60   |      |      |      | 3-4      | 理学院      |  |
| 大    |      | C 语言程序设计 ★<br>C Language Programming                                     | 3    | 48  | 24    | 24   |      |      |      | 1        | 遥感科学与技术系 |  |
| 类    | 必    | 地球科学概论<br>Introduction to Earth Science                                  | 2    | 32  | 32    |      |      |      |      | 1        | 地理信息科学系  |  |
| 基础   | 修    | 测绘地理信息概论<br>Introduction to Geomatics                                    | 1    | 16  | 16    |      |      |      |      | 1        | 测绘学院     |  |
| 课    |      | CAD 基础与应用<br>CAD Basic and Application                                   | 2    | 32  | 16    | 16   |      |      |      | 1        | 测绘工程系    |  |
|      |      | 导航装备基础<br>Foundation of Navigation Equipment                             | 2.5  | 40  | 36    | 4    |      |      |      | 2        | 测绘工程系    |  |
|      |      | 数字地形测量学★<br>Digital Topographic Surveying                                | 4    | 64  | 52    | 12   |      |      |      | 2        | 测绘工程系    |  |
|      |      | 地图学 Cartography  | 2    | 32  | 30    | 2    |      |      |      | 3        | 地理信息科学系  |  |
|      |      | 地理信息系统原理(双语)★<br>Principle of Geographic Information<br>System           | 2    | 32  | 24    | 8    |      |      |      | 3        | 地理信息科学系  |  |
|      |      | 遥感原理与应用★<br>Principles of Remote Sensing and<br>Application              | 3    | 48  | 48    |      |      |      |      | 3        | 遥感科学与技术系 |  |
|      |      | 小 计  | 44.5 | 780 | 618   | 126  |      | 8    | 28   |          |          |  |
|      |      | 大类基础   | 课合计  | 十必修 | 44. 5 | 学分   |      |      |      |          |          |  |
|      |      | GNSS 原理及其应用★<br>Application and Principles of GNSS                       | 3    | 48  | 44    | 4    |      |      |      | 3        | 测绘工程系    |  |
| 专    |      | 误差理论与测量平差基础★<br>Fundamentals of Error Theory and<br>Surveying Adjustment | 3    | 48  | 48    |      |      |      |      | 4        | 测绘工程系    |  |
| 业    | 必    | 大地测量学基础★<br>Foundation of Geodesy  | 3    | 48  | 40    | 8    |      |      |      | 4        | 测绘工程系    |  |
| 核心课  | 修    | 摄影测量学★<br>Principles of Photogrammetry                                   | 2    | 32  | 32    |      |      |      |      | 5        | 遥感科学与技术系 |  |
|      |      | 工程测量学★<br>Engineering Surveying  | 3    | 48  | 40    | 8    |      |      |      | 6        | 测绘工程系    |  |
|      |      | 小计   | 14   | 224 | 204   | 20   |      |      |      |          |          |  |
|      |      | 专业核心课合计必修 14 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<br>学期 | 教学单位    |
|------|------|---|-----|-----|------|------|------|------|------|----------|---------|
|      |      | 嵌入式系统与程序设计<br>Embedded System and Programming                           | 3   | 48  | 40   |      | 8    |      |      | 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   |
|      |      | 变形监测与灾害预报<br>Deformation Monitoring and Disasters<br>Predicting         | 2   | 32  | 24   | 8    |      |      |      | 5        | 测绘工程系   |
|      | 必    | 高精度导航地图与位置服务<br>High-Precision Navigation Map and<br>Location Service   | 2   | 32  | 32   |      |      |      |      | 5        | 测绘工程系   |
|      | 修    | 组合导航原理<br>Principle of Integrated Navigation                            | 2   | 32  | 24   | 8    |      |      |      | 5        | 测绘工程系   |
|      |      | 测绘管理与法律法规 Surveying Management<br>and Laws                              | 1   | 16  | 16   |      |      |      |      | 6        | 测绘工程系   |
|      |      | 激光雷达测量技术与应用<br>Application and Technology of Laser Radar<br>Surveying   | 2   | 32  | 24   | 8    |      |      |      | 7        | 测绘工程系   |
|      |      | 小 计   | 14  | 224 | 184  | 32   | 8    |      |      |          |         |
|      |      | 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<br>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<br>Programming Design and Data Processing         | 2   | 32  | 20   | 12   |      |      |      | 5        | 测绘工程系   |
| 方    |      | 科技文献检索<br>Document Retrieval of Science and<br>Technology               | 1   | 16  | 16   |      |      | 8    |      | 5        | 图书馆     |
| 向    |      | 土木工程概论(限选)<br>Introduction to Civil Engineering                         | 3   | 48  | 48   |      |      |      |      | 5        | 土木学院    |
| 课    |      | 工程制图与识图 (限选) Engineering Drawing and Interpreting                       | 3   | 48  | 48   |      |      |      |      | 6        | 理学院     |
|      | 选    | 室内定位与智能导航(限选)<br>Indoor Positioning and Intelligent<br>Navigation       | 2   | 32  | 28   | 4    |      |      |      | 6        | 地理信息科学系 |
|      | 修    | 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)<br>Industrial Intelligent Positioning<br>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)<br>Scientific Paper writing                                  | 1   | 16  | 16   |      |      |      |      | 6        | 测绘工程系   |
|      |      | 智慧城市导论<br>Introduction to Smart City                                    | 1   | 16  | 16   |      |      |      |      | 6        | 地理信息科学系 |
|      |      | 自然资源调查监测(限选) Natural resources survey and monitoring                    | 1.5 | 24  | 16   | 8    |      |      |      | 7        | 地理信息科学系 |
|      |      | 不动产测量与管理 (限选)Real Estate<br>Surveying and Management                    | 2   | 32  | 28   | 4    |      |      |      | 7        | 测绘工程系   |
|      |      | 新型航空遥感数据处理技术 Modern aerial<br>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<br>学期 | 教学单位  |
|------|--|--|-------|------|------|------|------|-------|--------|----------|-------|
|      |  | 遥感影像深度学习与智能解译 Deep<br>learning and intelligent interpretation<br>of remote sensing image | 2     | 32   | 32   |      |      |       |        | 7        | 遥感工程系 |
|      | 测绘地理信息技术前沿<br>Advanced Technology of Surveying,<br>Mapping and GIS |  | 1     | 16   | 16   |      |      |       |        | 7        | 测绘学院  |
|      |  | 城市规划概论<br>Conspectus of Urban Planning   | 1.5   | 24   | 20   | 4    |      |       |        | 7        | 建筑学院  |
|      |  | 市场营销<br>Marketing Management   | 1.5   | 24   | 24   |      |      |       |        | 7        | 经管学院  |
|      |  | 小 计  | 34. 5 | 552  | 472  | 80   |      | 8     |        |          |       |
|      |  | 专业方向课合计 32.5 学分,   | 必修    | 14 学 | 分,有  | 任选至  | 三少修  | 读 18. | . 5 学: | 分        |       |

# 表 2 测绘工程专业(智能导航实验班)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<br>学期 | 开设 周次 | 教学单位            |
|------|--|----|------|------|----|----------|-------|-----------------|
|      | 军事理论<br>Military Theory<br>军训  | 2  | 36   |      |    | 1        | 1-3   | 武装部             |
|      | Military Training  | 2  | 112  |      |    |          |       |                 |
|      | 形势与政策(5-8)Situation and Policy(5-8)  |    | 32   |      |    | 5-8      | 分散    | 马克思主义学院、<br>各学院 |
|      | 导航装备基础实习 Foundation of Navigation<br>Equipment Pratice   | 1  | 20   | 20   |    | 2        | 17    | 测绘工程系           |
|      | 数字地形测量实习 Digital Topographic<br>Surveying Practice   | 3  | 60   | 60   |    | 2        | 18-20 | 测绘工程系           |
|      | 卫星导航定位实习 Practical Training for<br>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         |
| 课    | 导航定位嵌入式研发实习<br>Navigation and Positioning Embedded Research<br>and Development Practice        | 1  | 20   |      | 20 | 4        | 17    | 测绘工程系           |
| 山    | 遥感原理与应用实习Principles and<br>Applications of Remote Sensing Practice                             | 1  | 20   | 20   |    | 4        | 18    | 遥感科学与技术系        |
|      | 控制测量实习Practical Training for Control<br>Surveying  | 2  | 40   | 40   |    | 4        | 19-20 | 测绘工程系           |
|      | 高精度地图采集实习 High-precision Map<br>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<br>Natural Geography and Remote Sensing image<br>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<br>Engineering Surveying  | 4  | 80   | 80   |    | 6        | 17-20 | 测绘工程系           |
|      | 导航定位综合实习 Comprehensive Practice for<br>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<br>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<br>defense   | 8  | 160  | 160  |    | 8        | 1-16  | 测绘工程系           |
|      | 小 计  | 37 | 860  | 630  | 50 |          |       |                 |
| 课    | 科研团队创新训练-导航基础研发能力实训 Innovation Training Project of<br>创新实践及科研 Scientific Research Team         | 1  | 20   | 20   |    | 1-3      |       | 测绘学院            |
| 外    | 训练<br>科研团队创新训练-导航产品/系<br>统研制能力实训<br>Innovation Training Project of<br>Scientific Research Team | 1  | 20   | 20   |    | 4-5      |       | 测绘学院            |

| 课程属性 | 课程名称   | 学<br>分 | 折合学时 | 实验实践 | 上机 | 开课<br>学期 | 开设<br>周次 | 教学单位  |
|------|--|--------|------|------|----|----------|----------|-------|
|      | 科研团队创新训练-团队协作与创<br>新创业能力实训<br>Innovation Training Project of<br>Scientific Research Team           | 1      | 20   | 20   |    | 6-7      |          | 测绘学院  |
|      | 测绘技能大赛实训 Surveying<br>and Mapping Skills Practice<br>Contest                                       | 2      | 40   | 40   |    | 4        |          | 测绘工程系 |
|      | 学院测绘技能大赛 School of<br>Surveying and Mapping Skills<br>Contest                                      | 1      | 20   | 20   |    | 4        |          | 测绘学院  |
|      | 测绘科技论文写作大赛<br>College Students Paper Contest<br>of Surveying and Mapping Science<br>and Technology | 1      | 20   | 20   |    | 5        |          | 测绘学院  |
|      | 北斗创新创业大赛<br>Beidou Innovation and<br>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<br>赛 Navigation and Positioning<br>Terminal Embedded Programming<br>Contest         | 1      | 20   | 20   |    | 4        |          | 测绘工程系 |
|      | "北斗杯"全国青少年科技创新大<br>赛 Beidou Cup National Youth<br>Science and Technology<br>Innovation Contest     | 1      | 20   | 20   |    |          |          | 测绘工程系 |
|      | 小 计  | 10     | 200  | 200  |    |          |          |       |

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

# 2021 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 168 学分,其中,理论课程 132 学分,实践教学环节 36 学分。

#### 七、各类课程结构比例

| 课程类别                         | 课程属性 | 学分  | 学时   | 学分比例   |
|------------------------------|------|-----|------|--------|
| /玄 /ロ 松 大 /田                 | 必修   | 44  | 728  | 26.19% |
| 通识教育课                        | 选修   | 2   | 32   | 1.19%  |
| 1\\\ ++ \a\\\\\              | 必修   | 43  | 756  | 25.60% |
| 大类基础课                        | 选修   | 1   | 16   | 0.60%  |
| 专业核心课                        | 必修   | 16  | 256  | 9.52%  |
| ナル <b>ナ</b> ウ畑               | 必修   | 6   | 96   | 3.57%  |
| 专业方向课                        | 选修   | 20  | 320  | 11.90% |
| XΓ → ነታ μρ ⊥ኋ + <del>Γ</del> | 必修   | 34  | 780  | 20.24% |
| 独立实践环节                       | 选修   | 2   | 40   | 1.19%  |
| 总计                           |      | 168 | 3024 | 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 1′ | 7 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)  |
|--|---|--|
| 1.工程知识: 能够将数学、<br>自然科学、工程基础和专业<br>知识用于解决复杂地理空  | 1.1 能够将数学、自然科学、工程科学的语言工具用于地理空间信息工程问题的表述  1.2 能针对具体的地理空间对象建立数学模型并求解  | 计算思维导论、C语言与数据结构、CAD基础与应用、工程制图与识图、高等数学A(1-2)、概率论与数理统计B、普通物理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。高等数学A(1-2)、线性代数、数字地形测量学、地理信息系统原理(双语)、摄影测量基础、误差理论与测量平差基础、空间分析与建模、城市地理学CIM技术与应用、大数据与地理信息系统、人工智能在地理信息系统中的应用。 |
| 间信息工程问题。   | 1.3 能够将相关知识和<br>数学模型方法用于推<br>演、分析地理信息系统<br>专业复杂工程问题<br>1.4 能够将相关知识和<br>数学模型方法用于地<br>理信息工程专业复杂<br>工程问题解决方案的<br>比较与综合                 | 计算思维导论、CAD基础与应用、工程制<br>2 图与识图、线性代数、卫星导航定位技术、<br>激光雷达测量技术与应用、计算机图形学、<br>城市空间信息学、CIM技术与应用等。<br>C语言程序设计、数据结构、c#程序设计、<br>Java程序设计、Python程序设计、概率论<br>与数理统计B、三维地理信息技术、近景摄<br>影测量、数字地形测量实习、地图学实习、<br>摄影测量基础实习、空间信息综合实习、毕<br>业设计等。 |
| 2.问题分析: 能够应用数<br>学、自然科学和工程科学的<br>基本原理,识别、表达、并<br>通过文献研究分析复杂地<br>理信息工程问题,以获得有<br>效结论。 | 2.1 能够将数学、自然<br>科学与工程科学的基<br>本理论运用到识别、分<br>析与表达  2.2 能够基于相关科学<br>原理和数学模型方法<br>正确表达复杂地理空间信息工程问题  2.3 能够认识到解决问题有多种方案可选择,<br>会通过文献研究寻求 | 计算思维导论、C语言程序设计、高等数学 A(1-2)、概率论与数理统计 B、物理实验 (1-2)、线性代数、C#程序设计、地图学、地理信息系统原理(双语)、地球科学概论、空间分析与建模、摄影测量基础实习、空间分析与建模等。  CAD 基础与应用、数字地形测量学、误差 理论与测量平差基础、激光雷达测量技术与应用、三维地理信息技术、GIS 基础应用技能等。  C语言程序设计、数据结构、科技文献检索、摄影测量基础、地理信息系统原理实习、空 |

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

| 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)  |
|--|---|--|
|  | 4.4 能够对实验结果进<br>行信息综合与评判,取<br>得合理有效结论                               | 科技文献检索、地图学、科技论文写作(双语)、空间分析与建模、空间信息综合实习、<br>毕业设计等。<br>大学英语(1-2)、计算思维导论、卫星导  |
|  | 5.1 能够针对复杂地<br>理空间信息工程问题,<br>选择恰当的数据获取<br>方法与技术                     | 航与定位、C语言与数据结构、CAD基础与应用、C#程序设计、数字地形测量学、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: 能够针对复杂地理空间信息工程问题, 开发、选择与使用恰当的地理信息系统技术、资源、数据采集设备和信息技术,包括对复杂理空间信息工程问题的预测与模拟,并能够理解其局限性。 | 5.2 能够使用现代数据<br>采集设备和信息技术<br>软件完成地理信息系<br>统数据采集、数据处理<br>与精度分析       | 空间分析与建模、空间数据库、工程制图与识图、高等数学 A (1-2)、概率论与数理统计 B、数字地形测量学、遥感原理、地图学、摄影测量基础、卫星导航定位技术、误差理论与测量平差基础、遥感数字图像处理、数字地形测量实习、遥感原理实习、地理信息系统原理实习、空间信息综合实习、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<br>具,对复杂地理空间信<br>息工程问题、地理问题<br>进行预测与模拟,并理<br>解其局限性      | 概率论与数理统计 B、普通物理 (1-2)、<br>线性代数、科技文献检索、误差理论与测量<br>平差基础、大数据与地理信息系统、人工智<br>能在地理信息系统中的应用、摄影测量基础<br>实习、毕业设计、创新实践 (GIS 技能大赛、<br>测绘技能大赛、测绘科技论文大赛)等。                         |
| 6.工程与社会: 能够基于工程相关背景知识进行合理分析,评价地理空间信息工程实践和复杂地理空间信   | 6.1 熟悉地理信息系统<br>专业相关技术标准、法<br>律法规及管理规定,能<br>够基于工程相关背景<br>知识进行合理分析   | 思想道德与法治、数字地形测量学、遥感原理、空间分析与建模、城市地理学、卫星导航定位技术、数字地形测量实习、地理信息系统原理实习、工程实践类、毕业设计等。   |
| 息工程问题解决方案对社<br>会、健康、安全、法律以及<br>文化的影响,并理解应承担<br>的责任。  | 6.2 能够评价地理空间<br>信息工程实践和复杂<br>地理空间信息工程问<br>题、地理问题的解决方<br>案对社会、健康、安全、 | 中国近现代史纲要、马克思主义基本原理、<br>毛泽东思想和中国特色社会主义理论体系<br>概论、军事理论、工程测量学、城市空间信<br>息学、城市地理学、经典赏析与文化传承、<br>哲学逻辑与文明对话、科技革命与社会发  |

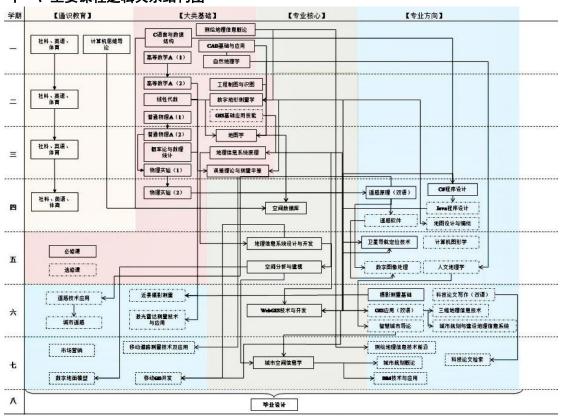
| 毕业生应具备的知识能力          | 相关知识领域                                | 实现途径 (课程支撑)                             |  |
|----------------------|---------------------------------------|---|--|
|                      | 法律以及文化的影响,                            | 展、建筑艺术与审美教育、生态文明与未来                     |  |
|                      | 以及这些制约因素对                             | 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、形势与政                     |  |
|                      | 念和内涵                                  | 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                          |   |  |
| 理解和评价针对复杂地理          | 可持续发展的角度认                             |   |  |
| 空间信息问题的地理空间          | 知地理空间信息工程                             | 나 나 사 사 다 나 사 사 사 사 사 사 사 사 사 사 사 사 사 사 |  |
| 信息工程实践对环境、社会         | 实践活动的可持续性,                            | 地球科学概论、智慧城市导论、城市地理学、                    |  |
| 可持续发展的影响。            | 以及评价测绘工程生                             | 城市空间信息学、大数据与地理信息系统、                     |  |
|                      | 产实践中可能对环境                             | 遥感原理、复合培养类、毕业设计等。                       |  |
|                      | 及社会造成的损害和                             |   |  |
|                      | 隐患                                    |   |  |
|                      | 8.1 具有人文社会科学                          | 思想道德与法治、中国近现代史纲要、马克                     |  |
|                      | 素养,树立正确的世界                            | 思主义基本原理、毛泽东思想和中国特色社                     |  |
|                      | 观、人生观和价值观                             | 会主义理论体系概论、军事理论、体育                       |  |
|                      | ///////////////////////////////////// | (1-4) 、军训等。                             |  |
|                      | 8.2 理解诚实公正、诚                          | 思想道德与法治、中国近现代史纲要、毛泽                     |  |
| <br>  8.职业规范: 具有人文社会 | 信守则的测绘行业职                             | 东思想和中国特色社会主义理论体系概论、                     |  |
| 科学素养、社会责任感,能         | 业道德和规范,并能在                            | 大学生职业生涯与发展规划、测绘地理信息                     |  |
| 够在地理空间信息工程实          | 地理空间信息工程实                             | 概论、地理信息系统设计与开发、WebGIS                   |  |
| 践中理解并遵守地理信息          | 地名   地名   地名   地名   地名   地名   地名   地名 | 概论、形势与政策(1-2)、数字地形测量                    |  |
| 系统行业职业道德和规范,         | 以下自己还可                                | 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                          |   |  |
|                      | 工程工作人员对公众                             |   |  |
|                      | 的安全、健康、福祉、                            | 马克思主义基本原理、大学生职业生涯与发                     |  |
|                      | 环境保护的社会责任,                            | 展规划、测绘地理信息概论、地球科学概论、                    |  |
|                      | 能够在地理空间信息                             | 毕业设计等。                                  |  |
|                      | 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)、                   |  |
| 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(测绘技能大赛、                    |  |
|                      |                                       |   |  |

| 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)   |
|---|--|---|
|   | 或合作开展工作  | 测绘科技论文大赛)、数字地形测量实习、<br>遥感原理实习、测绘技能大赛实训、GIS 软<br>件开发大赛实训等。               |
|   | 9.3 能够组织、协调和<br>指挥团队开展工作   | 中国近现代史纲要、军事理论、地图学实习、<br>地理信息系统原理实习、空间信息综合实<br>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 书、技术报告以及陈述  |   |
| 10.沟通:能够就复杂地理空间信息工程问题与地理信息同行及社会公众进行   | 发言中,就复杂地理空间信息工程问题与地理信息同行及社会公众进行有效沟通和交流                           | 地图学实习、地理信息系统设计与开发、WebGIS 概论、空间信息综合实习、毕业设计等。                             |
| 有效沟通和交流,包括撰写<br>报告和设计文稿、陈述发<br>言、清晰表达或回应指令,<br>并具备一定的国际视野,能<br>够在跨文化背景下进行沟<br>通和交流。 | 10.2 具备一定的国际<br>视野,了解测绘领域的<br>国际前沿发展趋势和<br>研究热点                  | 大学英语(1-2)、遥感原理、地理信息系统原理(双语)、空间信息综合实习、大学英语拓展系列课程(1-8)、GIS基础应用技能、遥感应用前景等。 |
|   | 10.3 具有跨文化交流<br>的语言和书面表达能<br>力,能够就地理空间信<br>息问题在跨文化背景<br>下进行沟通和交流 | 大学英语(1-2)、科技论文写作(双语)、<br>大学英语拓展系列课程(1-8)等。                              |
|   | 11.1 掌握工程项目中<br>涉及的管理与经济决<br>策方法                                 | 地理信息系统设计与开发、地理信息系统原<br>理(双语)、毕业设计等。                                     |
| 11.项目管理:理解并掌握<br>工程管理原理与经济决策<br>方法,并能在多学科环境中  | 11.2 了解地理信息系<br>统生产的成本构成,理<br>解其中涉及的工程管<br>理与经济决策问题              | 地理信息系统设计与开发、地理信息系统原<br>理(双语)毕业设计等。                                      |
| 应用。   | 11.3 能在多学科环境<br>下,在设计开发的过程<br>中,运用工程管理与经<br>济决策方法                | 空间信息综合实习、不动产测量与管理实<br>习、地理信息系统设计与开发、城市地理学、<br>毕业设计等。                    |
| 12. 终身学习: 具有自主学<br>习和终身学习的意识,有不<br>断学习和适应发展的能力。                                     | 12.1 具有自主学习和<br>终身学习的意识  | 思想道德与法治、大学生职业生涯与发展规划、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             |

| 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)           |
|-------------|--------------|----------------------|
|             |              | 法规、测绘地理信息技术前沿、大学英语拓  |
|             |              | 展系列课程(1-8)等。         |
|             |              | 马克思主义基本原理、毛泽东思想和中国特  |
|             |              | 色社会主义理论体系概论、测绘地理信息概  |
|             | 12.2 具有不断学习和 | 论、科技论文写作(双语)、智慧城市导论、 |
|             | 适应发展的能力      | 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



## 2021 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 168 including 132 credits of theoretical courses and 36 credits of practice teaching.

**VII Proportion of Course** 

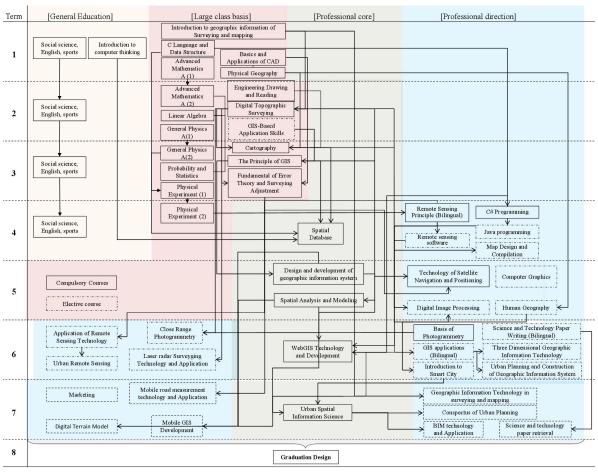
| Course Category       | Course Category Course Type |    | Class Hour | Proportion |
|-----------------------|-----------------------------|----|------------|------------|
| General Education     | Compulsory                  | 44 | 728        | 26.19%     |
|                       | Optional                    | 2  | 32         | 1.19%      |
| Big Academic Subjects | Compulsory                  | 43 | 756        | 25.60%     |
|                       | Optional                    | 1  | 16         | 0.60%      |
| Professional Core     | Compulsory                  | 16 | 256        | 9.52%      |

| Course Category        | Course Type | Credits | Class Hour | Proportion |
|------------------------|-------------|---------|------------|------------|
| D 0 1 1D1 1            | Compulsory  | 6       | 96         | 3.57%      |
| Professional Direction | Optional    | 20      | 320        | 11.90%     |
|                        | Compulsory  | 34      | 780        | 20.24%     |
| Practice               | Optional 2  |         | 40         | 1.19%      |
| Total                  |             | 168     | 3024       | 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<br>Graduation re | ign or Thesis 17 |

#### IX Table of Teaching Arrangement



## **X** Graduate Abilities and Matrices

| Graduate Abilities                             | Related Knowledge  | Course Supports                               |
|--|--|---|
|  |  | Introduction to Computational Thinking, C     |
|  |  | Language and Data Structure, CAD Basic and    |
|  | 1.1 Be able to use the language  | Application, Engineering Drawing and Read     |
|  | tools of mathematics, natural  | Drawing, Advanced Mathematics A (1-2),        |
|  | science and engineering  | Theory of Probability and Statistics (B),     |
|  | science to express geospatial  | College physics B(1), Physics                 |
|  | information engineering  | Experiment(1-2), Linear Algebra, Introduction |
|  | problems.  | to Civil Engineering, Cartography,            |
|  |  | Introduction to Geoscience, Computer          |
|  |  | Graphics, Remote Sensing Image Processing.    |
|  |  | Advanced Mathematics A (1-2), Linear          |
|  | 1.2 Be able to build and solve mathematical model for specific geospatial objects. | Algebra, Digital Topographic Surveying, The   |
|  |  | 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 problems with mathematics, |  | and Modeling, Urban geography, CIM            |
|  |  | Technology and Application, Big Data and      |
| natural science, engineering                   |  | Geographic Information System, Application    |
| foundation and professional                    |  | of Artificial Intelligence in GIS.            |
| knowledge.                                     |  | Introduction to Computational Thinking, CAD   |
|  | 1.3 Be able to apply relevant  | Basic and Application, Engineering Drawing    |
|  | knowledge and mathematical   | and Read Drawing, Linear Algebra, Satellite   |
|  | model method to deduce and   | Navigation and Positioning Technology, Laser  |
|  | analyze complex engineering  | Radar Surveying Technology and Application,   |
|  | problems of GIS Specialty  | Computer Graphics, Urban Spatial              |
|  | problems of GIS Specialty  | 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 theories of mathematics, natural science and engineering science to identification, analysis and expression. | Introduction to Computational Thinking, C      |
|                             |   | Language Programming, Advanced                 |
|                             |   | Mathematics A (1-2), Theory of Probability     |
|                             |   | and Statistics (B), Physics Experiment (1-2),  |
|                             |   | 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 the problem, and seek   | Document Retrieval of Science and              |
| to obtain the effective     |   | Technology, Photogrammetry Fundamental,        |
| conclusion.                 | alternative solutions through   | The Principle of Geographic Information        |
|                             | literature research   | System Practice, Spatial Information Practice, |
|                             | interaction research  | etc.   |
|                             | 2.4 Be able to use the basic  |  |
|                             | principles, with the help of  | College physics A (1-2), Document Retrieval    |
|                             | literature research, analyze the  | of Science and Technology, Satellite           |
|                             | influencing factors of the  | Navigation and Positioning Technology,         |
|                             | process, and obtain effective   | Undergraduate Design, etc.                     |
|                             | 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,                               |  | C Language Programming, Data Structure,        |
| and can embody the sense                               |  | CAD Basic and Application, Principles of       |
| of innovation in the design                            |  | Remote Sensing, The Principle of Geographic    |
| process, considering the                               |  | Information System (Bilingual Education),      |
| society, health, and safety,                           | 3.2 Be able to design and                      | Programming and Development of GIS,            |
| law, culture and                                       | develop production processes                   | Spatial Database, WebGIS Technology and        |
| environment factors.                                   | and systems to meet the needs                  | Development, Photogrammetry Fundamental,       |
|  | of specific Geospatial                         | Satellite Navigation and Positioning           |
|  | Information Engineering                        | Technology, Laser Radar Surveying              |
|  |  | Technology and Application, Map Design and     |
|  |  | Compilation, Cartography Practice, The         |
|  |  | Principle of Geographic Information System     |
|  |  | Practice, etc.                                 |
|  |  | Introduction to Geomatics, WebGIS              |
|  | 3.3 Be able to reflect                         | Technology and Development, Programming        |
|  | innovation awareness in                        | and Development of GIS, Digital Topographic    |
|  | geospatial information                         | Surveying, Big Data and Geographic             |
|  | engineering solution design,                   | Information System, Application of Artificial  |
|  | and consider social, health,                   | Intelligence in GIS, Innovative practice (GIS  |
|  | safety, legal, cultural and                    | Competition), Digital Topographic Surveying    |
|  | environmental factors                          | Practice, Innovation and Entrepreneurship,     |
|  |  | Undergraduate Design, etc.                     |
| 4 Study De able to study                               | 4.1 Be able to use scientific                  | Introduction to Geoscience, Cartography, The   |
| 4. Study: Be able to study 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,   |
|  | engineering problems and                       | Cartography Practice, etc.                     |
| analysis and interpretation                            | geographic problems                            | Canography Fractice, etc.                      |
| of data, and get a reasonable and effective conclusion | 4.2 Pa abla to design                          | Introduction to Computational Thinking, Big    |
| through the comprehensive                              | 4.2 Be able to design, demonstrate and predict | Data and Geographic Information System,        |
| information by using                                   | _  | Application of Artificial Intelligence in GIS, |
| scientific methods based on                            | research plans based on                        | Engineering Drawing and Read Drawing,          |
| scientific theory.                                     | professional theoretical knowledge             | Principles of Remote Sensing,                  |
| Scientific theory.                                     |  | Photogrammetry Fundamental, Satellite          |

| Graduate Abilities          | Related Knowledge              | Course Supports                              |
|-----------------------------|--------------------------------|--|
|                             |                                | Navigation and Positioning Technology,       |
|                             |                                | Spatial Information Practice, etc.           |
|                             |                                | C# Programming, C Language Programming,      |
|                             |                                | Data Structure, Spatial Database,            |
|                             | 4.3 Be able to use scientific  | Fundamentals of Error Theory and Surveying   |
|                             | methods to collect and analyze | Adjustment, Laser Radar Surveying            |
|                             | data.                          | Technology and Application, Remote Sensing   |
|                             |                                | Image Processing, Photogrammetry             |
|                             |                                | Fundamental Practice, etc.                   |
|                             | 445 11                         | Document Retrieval of Science and            |
|                             | 4.4 Be able to synthesize and  | Technology, Cartography, Academic Writing    |
|                             | evaluate the experimental      | (Bilingual Education), Spatial Analysis and  |
|                             | results and get reasonable and | Modeling, Spatial Information Practice,      |
|                             | effective conclusions.         | Undergraduate Design or Thesis, etc.         |
|                             |                                | College English (1-2), Introduction to       |
|                             |                                | Computational Thinking, Satellite Navigation |
|                             |                                | and Positioning Technology, C Language and   |
|                             |                                | Data Structure, CAD Basic and Application,   |
| 5. Using modern tools: be   | 5.1 Be able to select          | C# Programming, Digital Topographic          |
| able to develop, select and | appropriate data acquisition   | Surveying, Laser Radar Surveying Technology  |
| use appropriate GIS         | methods and technologies for   | and Application, Technology of 3D GIS,       |
| technology, resources, data | complex geospatial             | Computer Graphics, GIS-based Application     |
| collection equipment and    | information engineering        | Skills, Introduction to Smart City, Advanced |
| information technology for  | problem.                       | 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          |                                | Spatial Analysis and Modeling, Spatial       |
| information engineering     | 5.2 Be able to use modern data | Database, Engineering Drawing and Read       |
| problems, and understand    | acquisition equipment and      | Drawing, Advanced Mathematics A (1-2),       |
| their limitations.          | information technology         | Theory of Probability and Statistics (B),    |
|                             | software to complete GIS data  | Digital Topographic Surveying, Principles of |
|                             | acquisition, data processing   | Remote Sensing, Cartography,                 |
|                             | and accuracy analysis.         | 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.           |
|                              |                                 | Theory of Probability and Statistics (B),      |
|                              |                                 | College physics (1-2), Linear Algebra,         |
|                              |                                 | Document Retrieval of Science and              |
|                              | 5.3 Be able to use modern tools | Technology, Fundamentals of Error Theory       |
|                              | to predict and simulate         | and Surveying Adjustment, Big Data and         |
|                              | complex geospatial              | Geographic Information System, Application     |
|                              | information engineering         | of Artificial Intelligence in GIS,             |
|                              | problems and geographic         | Photogrammetry Fundamental Practice,           |
|                              | problems, and understand their  | Undergraduate Design or Thesis, Innovative     |
|                              | limitations.                    | 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:  |                                 | Thought Morals Accomplishment and Basic        |
| be able to conduct           | 6.1 Be familiar with relevant   | Law, Digital Topographic Surveying,            |
| reasonable analysis based    | technical standards, laws and   | Principles of Remote Sensing, Spatial Analysis |
| on the relevant background   | regulations and management      | and Modeling, Urban geography, Satellite       |
| knowledge of the project,    | regulations of GIS, and be able | Navigation and Positioning Technology,         |
| evaluate the impact of       | to make reasonable analysis     | Digital Topographic Surveying Practice, The    |
| geospatial information       | based on relevant engineering   | Principle of Geographic Information System     |
| engineering practice and     | background knowledge.           | 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 Thought and         |
| and culture, and understand  | practice and complex            | Theoretical System of Socialism with Chinese   |
| the responsibilities to be   | geospatial information          | Characteristics, Introduction to Mao Zedong    |

| Graduate Abilities          | Related Knowledge                | Course Supports                                  |
|-----------------------------|----------------------------------|--|
| undertaken.                 | engineering problems,            | Thought and Theoretical System of Socialism      |
|                             | solutions to geographical        | with Chinese Characteristics, Military Theory,   |
|                             | problems on society, health,     | 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     |  |
| sustainable development:    | sustainability of geospatial     |  |
| Be able to understand and   | information engineering          |  |
| evaluate the influence of   | practice activities from the     | Introduction to Geoscience, Introduction to      |
| geospatial engineering      | perspective of environmental     | Smart City, Urban geography, Urban Spatial       |
| practice with complex       | protection and sustainable       | Information Science, Big Data and                |
| engineering problems for    | development, and evaluate the    | Geographic Information System, Principles of     |
| sustainable development of  | possible damage and hidden       | Remote Sensing, Compound Culture,                |
| environment and society.    | dangers to the environment and   | Undergraduate Design or Thesis.                  |
|                             | society in the production        |  |
|                             | practice of Surveying and        |  |
|                             | mapping engineering.             |  |
| 8. Occupational norms:      |                                  | Thought Morals Accomplishment and Basic          |
| Equip with the quality of   |                                  | Law, The Outline of the Modern Chinese           |
| humanistic social sciences, | 8.1 Equip with the quality of    | History, The Generality of Basic Principle of    |
| sense of social             | humanistic social sciences, set  | Marxism, Introduction to Mao Zedong              |
| responsibility, understand  | up correct world outlook,        | Thought and Theoretical System of Socialism      |
| and follow professional     | outlook on life and values.      | with Chinese Characteristics, Military Theory,   |
| ethics and criteria in      |                                  | Physical Education (1-4), Military Training,     |
| engineering, be             |                                  | 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 Thought   |  |  |  |  |  |  |
|                              | industry in terms of honesty,    | and Theoretical System of Socialism with  |  |  |  |  |  |  |
|                              | fairness and integrity, and      | Chinese Characteristics, 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        |   |  |  |  |  |  |  |
|                              | responsibility of geospatial     |   |  |  |  |  |  |  |
|                              | information engineering staff    | The Committee of Decis Drive in Last Marrians                                       |  |  |  |  |  |  |
|                              | for the safety, health,          | The Generality of Basic Principle of Marxism, College Student Occupation Career and |  |  |  |  |  |  |
|                              | well-being and environmental     | Development Planning, Introduction to   |  |  |  |  |  |  |
|                              | protection of the public, and be | Geomatics, Introduction to Geoscience,  |  |  |  |  |  |  |
|                              | able to consciously perform      | Undergraduate Design or Thesis, etc.  |  |  |  |  |  |  |
|                              | their responsibilities in        | Ondergraduate Design of Thesis, etc.  |  |  |  |  |  |  |
|                              | 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:    |                                  | Military Theory, Military Training, Innovative                                      |  |  |  |  |  |  |
| Be able to play an important |                                  | Practice (Surveying and Mapping Skills  |  |  |  |  |  |  |
| role of individual, team     |                                  | Contest, Surveying and Mapping Science and  |  |  |  |  |  |  |
| member and person in         | 9.2 Be able to work              | Technology Paper Contest), Digital  |  |  |  |  |  |  |
| charge in the team of        | independently or                 | Topographic Surveying Practice, Principles of                                       |  |  |  |  |  |  |
| multi-subject background.    | collaboratively in a team        | 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.   | Principle of Geographic Information System  |
|   |   | Practice, Spatial Information Practice, Laser   |
|   |   | Radar Surveying Technology and Application  |
|   |   | Practice, Undergraduate Design or Thesis, etc.  |
| 10. Communication: Be able to communicate effectively with industry peers in complex engineering, including   | 10.1 Be able to effectively communicate and exchange with geographic information peers and the public on complex geospatial information engineering issues in writing design books, technical reports and presentations.  | Cartography Practice, Programming and Development of GIS, WebGIS Technology 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 cross-cultural context. | 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.   | 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 management and economic decision-making methods in the process of design and development in a multidisciplinary environment. | Spatial Information Practice, Immovable Property Measurement and Management Practice, Programming and Development of GIS, Urban geography, Undergraduate Design or Thesis, etc.  |
| 12. Lifelong learning: Have  | 12.1 Have the awareness of autonomous learning and lifelong learning.  | Thought Morals Accomplishment and Basic Law, College Student Occupation Career and 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, Aping and GIS, College English training  (1-8), etc.   |
| the awareness of autonomous learning and lifelong learning and the ability to learn, and adapt to the development. | 12.2 Have the ability to learn, and adapt to the development.  | The Generality of Basic Principle of Marxism, Introduction to Mao Zedong Thought and Theoretical System of Socialism with Chinese Characteristics, Introduction to 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 | 实践学时 | 上机学时 | 课外学时 | 延续教学 | 开课<br>学期 | 教学单位    |
|------|------|---|-------|-----|------|------|------|------|------|----------|---------|
|      |      | 思想道德与法治 Ideological Morality and<br>Rule of Law   | 3     | 48  | 48   |      |      |      |      | 1        | 马克思主义学院 |
|      |      | 中国近现代史纲要 The Outline of the<br>Modern Chinese History   | 3     | 48  | 32   |      |      | 16   |      | 2        | 马克思主义学院 |
|      |      | 习近平新时代中国特色社会主义思想概论<br>Introduction to Xi Jinping Thought on<br>Socialism with Chinese Characteristics<br>for a New Era  | 2     | 32  | 28   | 4    |      |      |      | 2        | 马克思主义学院 |
|      |      | 马克思主义基本原理★<br>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理论体系概论★ Introduction to Mao Zedong Thoughts and Theoretical System of Socialism with Chinese Characteristics  | l 5   | 80  | 64   |      |      | 16   |      | 4        | 马克思主义学院 |
|      |      | 形势与政策(1-4)<br>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<br>College Student Occupation Career and<br>Development Planning   | 1     | 16  | 16   |      |      |      |      | 1        | 学工部     |
| 通    |      | 大学生心理健康<br>The Mental health of College Students  | 1     | 16  | 16   |      |      |      |      | 2        | 学工部     |
| 识    |      | 大学英语(1-2) ★ 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)<br>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)<br>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<br>Introduction to Computational Thinking  | 1.5   | 56  | 24   |      |      | 32   |      | 1        | 电信学院    |
|      |      | "四史"(党史、新中国史、改革开放史、<br>社会主义发展史) History of the Communist<br>Party of China, History of New China,<br>History of Reform and Opening up and<br>History of Socialist Development | 0.5   | 8   | 8    |      |      |      |      | 1-7      | 马克思主义学院 |
|      |      | 小 计   | 36    | 696 | 596  | 4    |      | 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 肖 | 岁分, |      |      |      |      |      |          |         |
|      |      | 工程实践类 1-8 学期任选  |       |     |      |      |      |      |      |          | 各院部     |
|      | 任修   |   |       |     |      |      |      |      |      |          | 各院部     |
|      |      | 跨   | 类任货   | 性至少 | 2 学  | 分    |      |      |      |          |         |
|      |      | 通识教育课台<br>通识教育必修 36 学分(含"四史"(党史、第<br>明内任意学期完成,0.5 学分),通识教育核心  | 新中国   | 史、  | 改革升  | 干放史  | 、社   |      |      |          |         |

# 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<br>学期 | 教学单位    |
|------|------|--|----|-----|--------|------|------|------|------|----------|---------|
|      |      | 高等数学A(1)★<br>Advanced Mathematics A(1)   | 5  | 92  | 80     |      |      |      | 12   | 1        | 理学院     |
|      |      | 高等数学A(2)★<br>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     |
|      |      | 概率论与数理统计 B Theory of<br>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     |
|      | 必    | C 语言程序设计★ C Language Programming   |    | 32  | 24     | 8    |      |      |      | 1        | 地理信息科学系 |
| 大    | 修    | 地球科学概论<br>Introduction to Geoscience   | 2  | 32  | 32     |      |      |      |      | 1        | 地理信息科学系 |
| 类    |      | 测绘地理信息概论<br>Introduction to Geomatics  | 1  | 16  | 16     |      |      |      |      | 1        | 测绘学院    |
| 基    |      | CAD 基础与应用<br>CAD Basic and Application   | 2  | 32  | 16     | 16   |      |      |      | 1        | 测绘工程系   |
| 础    |      | 数字地形测量学★<br>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)<br>The Principle of Geographic Information<br>System(Bilingual Education) | 3  | 48  | 40     | 8    |      |      |      | 3        | 地理信息科学系 |
|      |      | 遥感原理与应用<br>Principles of Remote Sensing  | 3  | 48  | 48     |      |      |      |      | 3        | 遥感工程系   |
|      |      | 合 计  | 43 | 756 | 608    | 112  |      | 8    | 28   |          |         |
|      | ١,μ. | GIS基础应用技能<br>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<br>Mapping Technology Application                        | 1  | 16  |        |      |      |      |      | 2        | 测绘工程系   |
|      | 修    | 遥感应用前景<br>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  | 3   | 48  | 32   | 16   |      |      |      | 4    | 地理信息科学系 |  |
|      |      | Spatial Database<br>误差理论与测量平差基础★<br>Fundamentals of Error Theory and Surveying<br>Adjustment | 2   | 32  | 32   |      |      |      |      | 4    | 测绘工程系   |  |
| 专    | יני. | 空间分析与建模<br>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<br>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<br>WebGIS Technology and Development  | 3   | 48  | 24   | 24   |      |      |      | 6    | 地理信息科学系 |  |
|      |      | 城市空间信息学<br>Urban Spatial Information Science   | 2   | 32  | 24   | 8    |      |      |      | 7    | 地理信息科学系 |  |
|      |      | 小计   | 16  | 256 | 176  | 80   |      |      |      |      |         |  |
|      |      | 专业核心课合计必修 16 学分  |     |     |      |      |      |      |      |      |         |  |
|      |      | C#程序设计<br>C# Programming   | 3   | 48  | 32   | 16   |      |      |      | 4    | 地理信息科学系 |  |
|      | 必    | GNSS 原理及其应用<br>The Application and Principles of GNSS  | 2   | 32  | 28   | 4    |      |      |      | 5    | 测绘工程系   |  |
|      | 修    | 测绘管理与法律法规<br>SurveyingManagement and Laws  | 1   | 16  |      |      |      |      |      | 6    | 测绘学院    |  |
|      |      | 小计   | 6   | 96  | 60   | 20   |      |      |      |      |         |  |
|      |      | 摄影测量学 Photogrammetry (限选)  | 3   | 48  | 44   | 4    |      |      |      | 5    | 遥感工程系   |  |
| +    |      | 人工智能在地理信息系统中的应用<br>Application of Artificial Intelligence<br>in GIS(限选)                      | 1.5 | 24  | 16   | 8    |      |      |      | 5    | 地理信息科学系 |  |
| 专    |      | 数据结构 Data Structure (限选)   | 2   | 32  | 24   | 8    |      |      |      | 5    | 地理信息科学系 |  |
| 业    |      | 遥感数字图像处理(限选)<br>Remote Sensing Image Processing  | 1.5 | 24  | 16   | 8    |      |      |      | 5    | 遥感工程系   |  |
| 方    |      | 计算机图形学 Computer Graphics (限选)  | 2   | 32  | 20   | 12   |      |      |      | 6    | 地理信息科学系 |  |
| 向课   | 选    | 工程制图与识图<br>Engineering Drawing and Read Drawing(限<br>选)                                      | 3   | 48  | 48   |      |      |      |      | 6    | 理学院     |  |
| 床    | 修    | 大数据与地理信息系统<br>Big Data and Geographic Information<br>System(限选)                              | 1.5 | 24  | 16   | 8    |      |      |      | 6    | 地理信息科学系 |  |
|      |      | CIM 技术与应用<br>CIM Technology and Application (限选)   | 1.5 | 24  | 16   | 8    |      |      |      | 7    | 地理信息科学系 |  |
|      |      | 城市地理学 Urban geography (限选)   | 2   | 32  | 32   |      |      |      |      | 7    | 地理信息科学系 |  |
|      |      | 地图设计与编绘<br>Map Design and Compilation  | 2   | 32  | 16   | 16   |      |      |      | 4    | 地理信息科学系 |  |
|      |      | Java 程序设计<br>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 |  |

| 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<br>学期 | 教学单位    |
|------|------|--|------|------|------|------|------|------|------|----------|---------|
|      |      | 遥感软件<br>Remote Sensing Software                                    | 2    | 32   | 16   | 16   |      |      |      | 5        | 遥感工程系   |
|      |      | Python 语言<br>Python language                                       | 2    | 32   | 24   | 8    |      |      |      | 4        | 地理信息科学系 |
|      |      | 科技论文写作(双语)<br>Academic Writing (Bilingual Education)               | 1    | 16   | 16   |      |      |      |      | 6        | 遥感工程系   |
|      |      | 科技文献检索 Document Retrieval of<br>Science and Technology             | 1    | 16   | 16   |      |      | 8    |      | 7        | 图书馆     |
|      |      | GIS 应用(双语)<br>GIS Applications (Bilingual Education)               | 1.5  | 24   | 16   | 8    |      |      |      | 6        | 地理信息科学系 |
|      |      | 三维地理信息技术 Technology of 3D GIS                                      | 2    | 32   | 16   | 16   |      |      |      | 6        | 地理信息科学系 |
|      |      | 遥感技术应用 Applications of Remote<br>Sensing Technology                | 2    | 32   | 16   | 16   |      |      |      | 6        | 遥感工程系   |
|      |      | 移动 GIS 开发 Mobile GIS Development                                   | 2    | 32   | 16   | 16   |      |      |      | 7        | 地理信息科学系 |
|      |      | 激光雷达测量技术与应用<br>Laser Radar Surveying Technology and<br>Application | 2    | 32   | 24   | 8    |      |      |      | 6        | 地理信息科学系 |
|      |      | 测绘地理信息技术前沿<br>Advanced Technology of Surveying,<br>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<br>Sensing(Bilingual Education)               | 2    | 32   | 24   | 8    |      |      |      | 6        | 遥感工程系   |
|      |      | 城市规划概论<br>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<br>Natural Resources Management                             | 1.5  | 24   |      |      |      |      |      | 7        | 测绘学院    |
|      |      | 小计   | 47.5 | 768  | 548  | 196  |      | 8    |      |          |         |
|      |      | 专业方向课合计 26 学   | :分,  | 必修 ( | 5 学分 | ,任   | 选 20 | 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<br>学期 | 开设 周次 | 教学单位            |
|------|--|----|------|------|----|----------|-------|-----------------|
|      | 军事理论<br>Military Theory  | 2  | 36   |      |    | 1        | 1-3   | 武装部             |
|      | 军训<br>Military Training  | 2  | 112  |      |    | 1        | 1-3   | 44 次 44         |
|      | 形势与政策(5-8)Situation and Policy(5-8)  | _  | 32   |      |    | 5-8      | 分散    | 马克思主义学院、<br>各学院 |
|      | 数字地形测量实习 Digital Topographic<br>Surveying Practice                                       | 3  | 60   | 60   |    | 2        | 18-20 | 测绘工程系           |
|      | 地图学实习<br>Cartography Practice  | 2  | 40   |      |    | 3        | 17-18 | 地理信息科学系         |
|      | 地理信息系统原理实习The Principle of<br>Geographic Information System Practice                     | 2  | 40   |      |    | 3        | 19-20 | 地理信息科学系         |
|      | C#程序实习<br>C# Programming Practice  | 2  | 40   |      |    | 4        | 18-19 | 地理信息科学系         |
| 课    | 空间数据库实习 Spatial Database Practice  | 2  | 40   |      |    | 4        | 20    | 地理信息科学系         |
| 内    | 遥感原理与应用实习Principles of Remote<br>Sensing Practice  | 1  | 20   |      |    | 4        | 17    | 遥感工程系           |
|      | 地理信息系统设计与开发实习 Programming and<br>Development of GIS Practice                             | 2  | 40   |      |    | 5        | 19-20 | 地理信息科学系         |
|      | 摄影测量基础实习<br>Photogrammetry Fundamental Practice  | 1  | 20   |      |    | 5        | 18    | 遥感工程系           |
|      | 空间分析与建模实习<br>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<br>Natural Geography and Remote Sensing image<br>interpretation Practice | 1  | 20   | 20   |    | 6        | 15    | 遥感工程系           |
|      | 空间信息综合实习<br>Spatial Information Practice   | 5  | 100  | 100  |    | 7        | 1-5   | 测绘学院            |
|      | 毕业设计或论文<br>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  | 学分 | 折合学时 | 实验实践 | 上机 | 开课<br>学期 | 开设周次 | 教学单位    |
|------|---------------|---|----|------|------|----|----------|------|---------|
|      |               | GIS 软件开发大赛实训 GIS<br>Software Development<br>Competition Practical Training    | 1  | 20   | 20   |    | 4        |      | 地理信息科学系 |
|      |               | 学院 GIS 选拔比赛 School GIS<br>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<br>National<br>University GIS Application<br>Skills Contest  | 1  | 20   | 20   |    |          |      | 地理信息科学系 |
|      | 创新实践<br>及科研训练 | 超图开发大赛 SuperMap<br>Development Competition                                    | 1  | 20   | 20   |    |          |      | 地理信息科学系 |
|      |               | 天地图开发大赛 Map World<br>Development Competition                                  | 1  | 20   | 20   |    |          |      | 地理信息科学系 |
| 课    |               | 则泰杯全国论文大赛 The<br>Mostrule Cup State Essay<br>Competition                      | 1  | 20   | 20   |    |          |      | 地理信息科学系 |
| 外    |               | Mapgis 开发大赛 Mapgis<br>Development Competition                                 | 1  | 20   | 20   |    |          |      | 地理信息科学系 |
|      |               | 测绘技能大赛实训 Surveying<br>and Mapping Skills Practice<br>Contest                  | 2  | 40   | 40   |    | 4        |      | 测绘工程系   |
|      |               | 学院测绘技能大赛 School of<br>Surveying and Mapping Skills<br>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<br>训练  | 2  | 40   | 40   |    | 6        |      | 遥感工程系   |
|      |               | 小 计   | 13 | 260  |      |    |          |      |         |

# 2021 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 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:

面向首都及周边城市群建设的需要,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,掌握遥感科学与技术专业知识,具有人文素质、职业道德和社会责任感,能够在城乡建设与规划、自然资源调查与监测、智慧城市建设与运营、建筑文化遗产保护、建/构筑物健康监测及城市基础测绘等领域从事地面、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、科学文化素养和工作责任心,能够自觉承担和履行社会责任, 能积极服务国家和社会。
- (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 工程问题并在多学科背景下担任团队成员和负责人的角色。
- (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、学校土木建筑类学科和学院测绘学科背景优势,在中、高分辨率地理要素提取与城市环境及设施监测、建筑遗产精细重构与虚拟修复等方面具有突出优势和特色。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"计算机实践能力"。第二,确保学生具有摄影测量遥感的生产实践能力。

# 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、遥感原理与应用实习、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 170 学分,其中理论课程 131 学分,实践教学环节 39 学分。

# 七、各类课程结构比例

| 课程类别                  | 课程属性 | 学分  | 学时   | 学分比例  |
|-----------------------|------|-----|------|-------|
| (호) 나사(숙)<br>H        | 必修   | 44  | 728  | 25.9% |
| 通识教育课                 | 选修   | 2   | 32   | 1.1%  |
| 1. 24. 廿九 7用          | 必修   | 43  | 756  | 25.3% |
| 大类基础课                 | 选修   | 1   | 16   | 0.6%  |
| 专业核心课                 | 必修   | 14  | 224  | 8.2%  |
| <i>+</i> . II. → → \H | 必修   | 6   | 96   | 3.5%  |
| 专业方向课                 | 任选   | 21  | 336  | 12.4% |
| ᄽᄼᄼᆄᇄᄱᅶᅷ              | 必修   | 37  | 840  | 21.8% |
| 独立实践环节                | 选修   | 2   | 40   | 1.2%  |
| 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      | 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                              | 相关毕业要求指标点   | 实现途径 (课程支撑)  |
|--|---|--|
|  | 1.1 能够将数学、物理、<br>地学科学、工程的语言工<br>具用于遥感工程问题的<br>表述                  | 高等数学 A(1-2)、概率论与数理统计 B、普通物理 B(1-2)、遥感原理与应用、遥感数字图像处理等。                        |
| 1. 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     | 1.2 能针对具体的遥感对<br>象建立数学模型并求<br>解 ,满足测绘的精度要求                        | 高等数学 A(1-2)、线性代数、普通物理 B(1-2)、摄影测量学、大地测量学基础、误差理论与测量平差基础等。                     |
| 知识用于解决遥感领域复杂工程问题。                        | 1.3 能够将遥感相关知识<br>和数学模型方法用于推<br>演、分析遥感专业复杂工<br>程问题                 | 线性代数、遥感数字图像处理、地理信息<br>系统原理(双语)、GNSS 原理及其应用、<br>计算机视觉等。                       |
|  | 1.4 能够将遥感相关知识<br>和数学模型方法用于遥<br>感专业复杂工程问题解<br>决方案的比较与综合            | 概率论与数理统计 B、数据结构、遥感技术应用、摄影测量学、数字地形测量学实习等。                                     |
|  | 2.1 能够将数学、物理、<br>计算机、地学科学和工程<br>的基本理论运用到识别<br>判断遥感复杂工程问题<br>的关键环节 | 计算思维导论、高等数学 A(1-2)、概率论与数理统计 B 普通物理 B(1-2) CAD 基础与应用、地图学、面向对象的程序设计、遥感数字图像处理等。 |
| 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,      | 2.2 能够运用数学、物理、<br>计算机、地学科学和工程<br>的基本理论分析与表达<br>遥感复杂工程问题           | 遥感技术应用、城市遥感(双语)、面向<br>对象的程序设计等。  |
| 识别、表达、并通过文献<br>研究分析复杂遥感工程问<br>题,以获得有效结论。 | 2.3 能够认识到解决问题<br>有多种方案可选<br>择,会通过文献研究寻求<br>可替代的解决方案               | 科技文献检索、GNSS 原理及其应用、摄<br>影测量学、遥感原理与应用、毕业设计等。                                  |
|  | 2.4 能运用数学、物理、<br>计算机、地学科学和工程<br>的基本原理,借助文献研<br>究,分析遥感复杂工程过        | 概率论与数理统计、遥感原理与应用、地理信息系统原理实习、毕业设计等。   |

| 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)   |
|--|---|---|
|  | 程中的影响因素,获得有<br>效结论  |   |
| 3. 设计/开发解决方案:能<br>够设计针对复杂遥感、摄                            | 3.1 能够根据测绘、遥感、<br>地理信息工程用户的需<br>求,设计技术方案,了解<br>影响设计目标和技术方<br>案的各种因素 | C语言程序设计、遥感数字图像处理、遥感软件、可视化语言 IDI、GIS 软件使用、遥感数字图像处理实习、空间信息综合实习等。          |
| 影测量、测绘工程问题的<br>解决方案,设计满足遥感<br>数据获取、处理、应用等<br>方面需求的系统、生产流 | 3.2 能够开发满足遥感数<br>据获取、处理、应用等方<br>面需求的生产流程及算<br>法                     | GNSS 原理及其应用、激光雷达测量技术<br>与应用、地理信息系统原理实习、面向对<br>象的程序设计实习、遥感数字图像处理实<br>习等。 |
| 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                       | 3.3 能够在遥感工程解决<br>方案设计中体现创新意<br>识                                    | 遥感技术应用、计算机视觉实习、毕业设<br>计等。   |
| 以及环境等因素。   | 3.4 能够在遥感工程解决<br>方案设计中考虑社会、健<br>康、安全、法律、文化以<br>及环境等因素               | 航空航天数据获取、遥感图像解译、思想<br>道德与法治   |
| 4.研究: 能够基于科学原  | 4.1能够运用科学原理及<br>文献研究等方法对复杂<br>遥感工程问题现状进行<br>调研                      | 遥感原理与应用、摄影测量学、遥感数字<br>图像处理等。  |
| 理并采用科学方法对复杂<br>遥感工程问题进行研究,<br>包括现状调研、获取分析                | 4.2能够基于专业理论知<br>识对研究方案进行设计、<br>论证与预测                                | GNSS 原理及其应用、遥感原理与应用实习、地理信息系统原理(双语)等。                                    |
| 与解释数据、并通过信息<br>综合得到合理有效的结<br>论。                          | 4.3能够采用科学方法实<br>施数据采集与分析处理  | 激光雷达测量技术与应用、航空航天数据<br>获取、空间信息综合实习等。                                     |
|  | 4.4能够对实验结果进行<br>信息综合与评判,取得合<br>理有效结论                                | 近景摄影测量、数字地形测量实习、地图学实习等。   |
| 5. 使用现代工具: 能够针对复杂遥感工程问题,开<br>发、选择与使用恰当的遥                 | 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、软件并                                 | 微波遥感、摄影测量学实习、遥感综合实<br>习、(近景与激光雷达、移动测量、微波<br>遥感)新技术实习等。                  |

| 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)  |
|--|--|--|
| 感、测绘技术与资源;现<br>代测绘仪器和遥感处理软                                       | 理解其局限性   |  |
| 件,能够对复杂遥感工程<br>问题的预测与模拟,并能<br>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  | 微波遥感、误差理论与测量平差基础、航<br>空航天数据获取、遥感原理与应用实习等。                  |
|  | 5.3 能够使用现代工具,<br>对复杂 遥感 工程问题<br>进行预测与模拟,并理解<br>其局限性  | 误差理论与测量平差基础、计算机视觉、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   | 6.1 熟悉遥感专业相关技术标准、法律法规及管理规定,并能够理解其对项目实施的影响  | 测绘管理与法律法规、思想道德与法治、数字地形测量学、遥感原理与应用等。                        |
| 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<br>果对社会、健康、法律以<br>及文化、国家安全、领土<br>完整的重要性,以及这些<br>制约因素对项目实施的<br>影响,并理解应承担的责<br>任理解遥感工程实践应<br>承担的责任 | 空间信息综合实习、遥感综合实习、毕业设计等。                                     |
| 7. 环接和可体体外层、邻  | 7.1 知晓和理解环境保护<br>和可持续发展的理念和<br>内涵  | 习近平新时代中国特色社会主义思想概<br>论、测绘地理信息概论、地球科学概论、<br>自然地理地貌与遥感解译实习等。 |
| 7. 环境和可持续发展: 能够发现和分析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。             | 7.2 能够从环境保护和可<br>持续发展的角度认知遥<br>感 工程实践活动的可持<br>续性,以及分析遥感 工<br>程生产实践中可能对环<br>境及社会造成的损害和<br>隐患                    | 地球科学概论、自然地理地貌与遥感解译实习、毕业设计等。                                |
| 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<br>养 和健康的体魄,树立   | 思想道德与法治、习近平新时代中国特色<br>社会主义思想概论、马克思主义基本原理、                  |

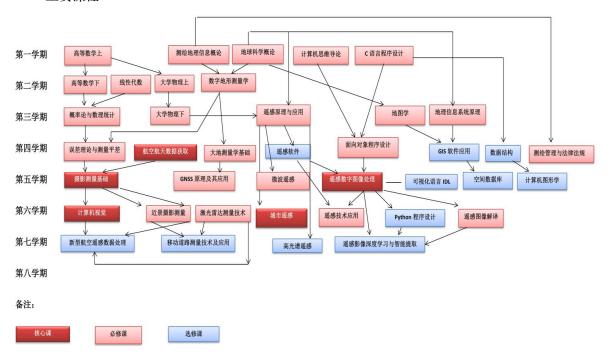
| 毕业生应具备的知识能力   | 相关毕业要求指标点  | 实现途径 (课程支撑)  |
|---|--|--|
| 能够在遥感工程实践中理<br>解并遵守测绘、地理信息                              | 正确的世界观、人生观和<br>价值观   | 体育 (1-4) 等。  |
| 行业职业道德和规范,履<br>行责任。                                     | 8.2 理解诚实公正、诚信<br>守则的遥感行业职业道<br>德和规范,并能在遥感<br>工程实践中自觉遵守                   | 大学生职业生涯与发展规划、形势与政策<br>(1-2) 遥感综合实习等。               |
|   | 8.3 理解遥感工作人员对<br>公众的安全、健康、福祉、<br>环境保护的社会责任,能<br>够在遥感工程实践中自<br>觉履行责任      | 大学生心理健康、数字地形测量学、自然地理地貌及遥感图像解译实习等。                  |
| 9. 个人和团队: 能够在多<br>学科背景下的团队中承担                           | 9.1 能与测绘、地理信息、<br>计算机、建筑历史与理<br>论、地理等学科的成员有<br>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、自然地理地 貌及遥感图像解译实习等。 |
| 个体、团队成员以及责任<br>人的角色。                                    | 9.2 能够在团队中独立或<br>合作开展工作  | 近景摄影测量、数字地形测量实习、新技<br>术实习等。                        |
|   | 9.3 能够组织、协调和指<br>挥团队开展工作   | 军训、面向对象程序设计、空间信息综合<br>实习、学院测绘技能大赛等。                |
| 10. 沟通: 能够就复杂遥<br>感工程问题与行及社会公<br>众进行有效沟通和交流,            | 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。             | 城市遥感(双语)、科技论文写作(双语)、<br>空间信息综合实习、遥感综合实习等。          |
| 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<br>野,了解遥感领域的国际<br>前沿发展趋势和研究热<br>点,理解和尊重世界不同<br>文化的差异性和多样性。 | 大学英语(1-2)、测绘地理信息概论、地理信息系统原理(双语)、遥感综合实习等。           |
|   | 10.3 具有跨文化交流的语言和书面表达能力,能够就遥感问题在跨文化背                                      | 大学英语(1-2)、科技论文写作(双语)、<br>城市遥感(双语)、毕业设计等。           |

| 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)  |
|---|---|--|
|   | 景下进行沟通和交流   |  |
|   | 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、测绘管理与法律法规、(近景与激光雷达、移动测量、微波<br>遥感)新技术实习等。       |
| 11.项目管理:理解并掌握<br>遥感工程项目或产品的设<br>计和实施的全周期、全流<br>程管理原理与经济决策方<br>法,并能在多学科环境中 | 11.2 了解遥感、测绘工程<br>及产品全周期、全流程的<br>成本构成,能在多学科环<br>境下,理解其中涉及的工<br>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。               |
| 应用。   | 11.3 能在多学科环境下,<br>在设计开发遥感工程解<br>决方案的过程中,运用工<br>程管理与经济决策方法。                | 遥感技术应用、现代测绘技术应用、(近景与激光雷达、移动测量、微波遥感)新技术实习、测绘管理与法律法规等。     |
| 12. 终身学习: 具有自主<br>学习和终身学习遥感领域<br>新知识的意识, 有不断学                             | 12.1 具有自主学习和终身<br>学习的意识,掌握必要的<br>学习方法                                     | 大学生职业生涯与发展规划、计算机思维<br>导论、科技革命与社会发展、数字地形测<br>量学、遥感应用前景等。  |
| 到和话的思虑,有不断字<br>习和适应遥感技术发展的<br>能力。   | 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  | 大学英语(1-2)、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)

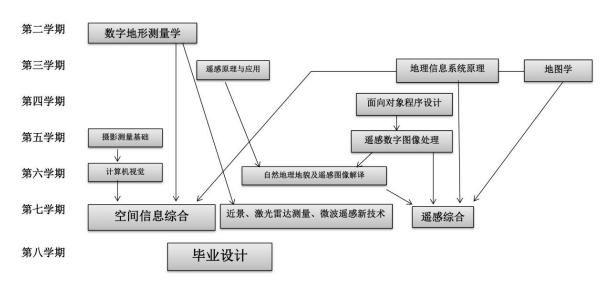
# 十一、主要课程、实践环节逻辑关系结构图

# 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

# 2021 Undergraduate Program for Specialty

# in Remote Sensing Science and Technology

## I Specialty Name and Code

| English Name        | Remot   | e Sensing Scien | ce 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 the capital and the country's urban and rural construction, train qualified builders and reliable successors of the socialist cause with all-round development of morality, intelligence, physique, beauty and labor, and be able to engage in ground, aviation and aerospace in the fields of land and resources survey, National basic surveying and mapping, urban and rural construction and planning, natural resources monitoring, environmental protection, cultural heritage protection, disaster early warning and emergency response, etc Remote sensing information collection and processing, analysis, application development and project management of senior professional backbone personnel.

After five years of work and study after graduation, we can achieve the following goals:

- (1) With good ideological and moral cultivation and scientific and cultural literacy, strong sense of responsibility, dedication, good professional ethics, can undertake and perform social responsibility, can actively serve the country and society.
- (2) Competent in photogrammetry and remote sensing production, design and development, planning and management, as well as related research and education.
  - (3) Have a good sense of international vision and ability to solve complex engineering problems.
- (4) It has the ability of lifelong learning and following the development of new technology in remote sensing field, mastering the use method of modern tools and software, and has competitive potential.
- (5) With the ability of Surveying and mapping geographic information industry engineer, become the technical director or technical backbone of relevant enterprises and institutions in the field of remote sensing. Professional features: Relying on the background advantages of capital construction and civil architecture discipline of the University and surveying and mapping discipline of the college, this major has outstanding advantages and characteristics in the aspects of medium and high resolution geographical elements extraction and urban environment and facilities monitoring, fine reconstruction and virtual restoration of architectural heritage. Pay attention to the penetration and construction of photogrammetry and remote sensing system course. First, we should pay attention to "original ability" and "computer practice ability" in every teaching link. Second, to ensure that students have the production practice ability of photogrammetry and remote sensing.

# **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 170, including 131 credits of theoretical courses and 39 credits of practice teaching.

VI Proportion of Course

| Course Category        | Course Type | Credits | Class Hour | Proportion |
|------------------------|-------------|---------|------------|------------|
| G IFI                  | Compulsory  | 44      | 728        | 25.9%      |
| General Education      | Optional    | 2       | 32         | 1.1%       |
| B: 4 1 : 61:           | Compulsory  | 43      | 756        | 25.3%      |
| Big Academic Subjects  | Optional    | 1       | 16         | 0.6%       |
| Professional Core      | Compulsory  | 14      | 224        | 8.2%       |
| D ( ' 1D' ('           | Compulsory  | 6       | 96         | 3.5%       |
| Professional Direction | Optional    | 21      | 336        | 12.4%      |
| Practice               | Compulsory  | 37      | 840        | 21.8%      |
|                        | Optional    | 2       | 40         | 1.2%       |
| total                  |             | 170     | 3068       | 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 <b>,</b><br>18-19 | 20            | 16-17    |
| 7        | 6-14     | 15   | 1-5、16-20 | 8        |                        | ks for gradua | 1 0      |

# **VIII Graduate Abilities and Matrices**

| VIII Graduate Abii   | ities and Matrices  |   |
|--|---|---|
| Graduate Abilities   | Related Knowledge   | Course Supports   |
|  | 1.1 be able to use the language tools of mathematics, physics   | Advanced Mathematics A (1-2), probability and Mathematical Statistics B, linear   |
|  | and geosciences for the expression of remote sensing engineering problems:  | algebra, General Physics B (1-2), remote sensing principle and application, remote sensing digital image processing, etc.   |
| 1. Engineering knowledge: Engineering  | 1.2 be able to build<br>mathematical model for<br>specific remote sensing objects   | Advanced Mathematics A (1-2), linear algebra, General Physics B (1-2), photogrammetry, Fundamentals of geodesy, error theory and survey adjustment, etc.                |
| knowledge: be able to<br>apply the basic and<br>professional<br>knowledge of<br>mathematics, physics<br>and Geosciences to | 1.3 be able to apply the relevant knowledge and mathematical model methods to deduce and analyze the complex engineering problems of remote sensing                   | Linear algebra, remote sensing digital image processing, geographic information system principle (Bilingual), GNSS principle and its application, computer vision, etc. |
| solve complex engineering problems.  | 1.4 be able to apply relevant knowledge and mathematical model methods to the comparison and synthesis of solutions to complex engineering problems of remote sensing | Probability and Mathematical Statistics B, data structure, application of remote sensing technology, photogrammetry, digital topographic survey practice, etc.          |
| 2. Problem analysis: be able to apply the basic principles of mathematics, physics   | 2.1 be able to apply the basic theories of mathematics, physics and Geosciences to identification, analysis and   | Introduction to computational thinking, advanced mathematics a (1-2), probability and Mathematical Statistics B, General Physics B (1-2) CAD foundation and             |

| Graduate Abilities   | Related Knowledge   | Course Supports  |
|--|---|--|
| and Geosciences to identify, express and analyze complex   | expression.   | application, cartography, object-oriented programming, remote sensing digital image processing, etc.   |
| remote sensing engineering problems through literature research, so as to obtain effective conclusions.  | 2.2 be able to correctly express complex remote sensing engineering problems based on relevant scientific principles and mathematical model methods   | Application of remote sensing technology, urban remote sensing (Bilingual), object-oriented programming, etc.  |
|  | 2.3 be able to recognize that there are many options for solving problems, and be able to find alternative solutions through literature research  2.4 be able to use the basic  | Scientific and technological literature retrieval, close range photogrammetry, remote sensing technology application, new technology practice, graduation design, scientific research training, etc.                                       |
|  | principles of mathematics, physics, computer, geoscience and engineering, analyze the influencing factors in the process of remote sensing complex engineering with the help of literature research, and obtain effective conclusions   | Probability theory and mathematical statistics, remote sensing principle and application, geographic information system principle practice, graduation project, etc.   |
| 3. Design/Develop solutions: be able to design solutions for complex remote sensing and photogrammetric surveying and mapping engineering problems, design systems and | 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. | C language programming, remote sensing digital image processing, remote sensing software, visualization Language IDL, GIS software use, remote sensing digital image processing practice, spatial information comprehensive practice, etc. |
| production processes<br>that meet specific<br>needs, embody  | 3.2 be able to design and develop production processes  | GNSS principle and its application, lidar measurement technology and application,  |

| Graduate Abilities      | Related Knowledge               | Course Supports                               |
|-------------------------|---------------------------------|---|
| innovation awareness    | and systems that meet specific  | GIS principle practice, object-oriented       |
| in the design process,  | remote sensing needs            | programming practice, remote sensing          |
| and consider social,    |                                 | digital image processing practice, etc.       |
| health, safety, legal,  | 3.3 be able to embody the       |   |
| cultural and            | innovative consciousness in     |   |
| environmental factors.  | the design of remote sensing    | Remote sensing technology application,        |
|                         | engineering solutions, and      | computer vision practice, graduation project, |
|                         | consider the social, health,    | etc.  |
|                         | safety, legal, cultural and     |   |
|                         | environmental factors.          |   |
|                         | 3.4 be able to consider social, |   |
|                         | health, safety, legal, cultural | Aerospace data acquisition, remote sensing    |
|                         | and environmental factors in    | image interpretation, ideological and moral   |
|                         | the design of remote sensing    | cultivation and legal basis                   |
|                         | engineering solutions           |   |
|                         | 4.1 be able to use scientific   |   |
|                         | principles to put forward       | Remote sensing principle and application,     |
| 4. Research: be able to | research plans for complex      | photogrammetry, remote sensing digital        |
| research complex        | remote sensing engineering      | image processing, etc.                        |
| remote sensing          | problems                        |   |
| engineering problems    | 4.2 be able to design,          | CNICC principle and its continuous and        |
| based on scientific     | demonstrate and predict the     | GNSS principle and its application, remote    |
| principles and          | research scheme based on        | sensing principle and application practice,   |
| scientific methods,     | professional theoretical        | geographic information system principle       |
| including designing     | knowledge                       | (Bilingual), etc.                             |
| experiments,            | 4.3 be able to use scientific   | Lidar measurement technology and              |
| analyzing and           | methods to implement data       | application, aerospace data acquisition,      |
| interpreting data, and  | collection, analysis and        | comprehensive practice of spatial             |
| getting reasonable and  | processing                      | information, etc.                             |
| effective conclusions   | 4.4 be able to carry out        |   |
| through information     | information synthesis and       | Close range photogrammetry, digital           |
| integration.            | evaluation on the experimental  | topographic survey practice, cartography      |
|                         | results, and obtain reasonable  | practice, etc.                                |
|                         | and effective conclusions       |   |
| 5. Using modern tools:  | 5.1 be able to select           | Microwave remote sensing,                     |
| be able to develop,     | appropriate modern remote       | photogrammetry practice, comprehensive        |

| Graduate Abilities  | Related Knowledge   | Course Supports  |
|---|---|--|
| select and use  | sensing technology and  | remote sensing practice, (close range and  |
| appropriate remote  | hardware, software  | lidar, mobile measurement, microwave   |
| sensing, mapping  |   | remote sensing) new technology practice,   |
| technology, resources,  |   | etc.   |
| modern mapping  | 5.2 be able to use modern   |  |
| instruments and   | surveying and mapping   | Migrovaya romota cancing arror theory and  |
| remote sensing  | instruments and information   | Microwave remote sensing, error theory and   |
| processing software   | technology software to  | measurement adjustment basis, aerospace  |
| for complex remote  | complete remote sensing data  | data acquisition, remote sensing principle   |
| sensing engineering   | collection, data processing and   | and application practice, etc.   |
| problems, including   | accuracy analysis   |  |
| prediction and Simulation of complex remote sensing engineering problems, and understand their limitations.   | 5.3 be able to use modern tools to predict and simulate complex remote sensing engineering problems, and understand their limitations   | Error theory and measurement adjustment basis, computer vision, new technology practice, deep learning and intelligent interpretation of remote sensing, etc.                            |
| 6. Society and engineering: be able to conduct reasonable analysis based on relevant background knowledge of the project, evaluate the  | 6.1 be familiar with relevant technical standards, laws and regulations and management regulations of remote sensing specialty, and be able to conduct reasonable analysis based on relevant background knowledge of the project  | Surveying and mapping management and laws and regulations, ideological and moral cultivation and legal basis, digital topographic survey, remote sensing principle and application, etc. |
| impact of remote sensing engineering practice and complex engineering problem solutions on society, health, safety, law and culture, and understand the responsibilities to be undertaken | 6.2 be able to evaluate the social, health, safety, legal and cultural impact of remote sensing engineering practice and complex mapping engineering solutions, and the impact of these constraints on project implementation, and understand the responsibilities to be undertaken | Comprehensive practice of spatial information, comprehensive practice of remote sensing, graduation project, etc.  |

| Graduate Abilities       | Related Knowledge               | Course Supports                              |  |  |  |  |  |
|--------------------------|---------------------------------|--|--|--|--|--|--|
|                          |                                 | Xi Jinping's introduction to China's         |  |  |  |  |  |
|                          | 7.1 know and understand the     | socialism thought in the new era,            |  |  |  |  |  |
|                          | concept and connotation of      | introduction to surveying and mapping        |  |  |  |  |  |
| 7.Environment and        | environmental protection and    | geographic information, outline of Earth     |  |  |  |  |  |
| sustainable              | sustainable development         | Science, natural geography and remote        |  |  |  |  |  |
| development : be able    |                                 | sensing interpretation practice.             |  |  |  |  |  |
| to discovery and         | 7.2 be able to recognize the    |  |  |  |  |  |  |
| analysis the impact of   | sustainability of remote        |  |  |  |  |  |  |
| Surveying and            | sensing engineering practice    |  |  |  |  |  |  |
| mapping engineering      | activities from the perspective |  |  |  |  |  |  |
| practice on the          | of environmental protection     | Introduction to geoscience, practice of      |  |  |  |  |  |
| sustainable              | and sustainable development,    | natural geography, geomorphology and         |  |  |  |  |  |
| development of           | as well as analyze the          | remote sensing interpretation, graduation    |  |  |  |  |  |
| environment and          | possible damages and hidden     | project, etc.                                |  |  |  |  |  |
| society                  | dangers to the environment      |  |  |  |  |  |  |
|                          | and society caused by the       |  |  |  |  |  |  |
|                          | production practice of remote   |  |  |  |  |  |  |
|                          | sensing engineering             |  |  |  |  |  |  |
|                          | 8.1 have the quality of         |  |  |  |  |  |  |
| 8. Occupational          | Humanities and Social           | Ideological and moral cultivation and legal  |  |  |  |  |  |
| norms: have the          | Sciences, establish correct     | basis, Xi Jinping's new China's principle of |  |  |  |  |  |
| quality of Humanities    | world outlook, outlook on life  | socialism, general principles of Marx        |  |  |  |  |  |
| and Social Sciences      | and values,                     | doctrine, sports (1-4), etc.                 |  |  |  |  |  |
| and a sense of social    | 8.2 understand the professional |  |  |  |  |  |  |
| responsibility, be able  | ethics and norms of the remote  |  |  |  |  |  |  |
| to understand and        | sensing industry in terms of    | College Students' career and development     |  |  |  |  |  |
| abide by the             | honesty, justice and integrity, | planning, situation and policy (1-2) remote  |  |  |  |  |  |
| professional ethics and  | and consciously abide by the    | sensing comprehensive practice, etc.         |  |  |  |  |  |
| norms of Surveying       | ideological and moral           |  |  |  |  |  |  |
| and mapping and          | cultivation and legal basis     |  |  |  |  |  |  |
| geographic               | 8.3 understand the social       |  |  |  |  |  |  |
| information industry     | responsibility of remote        | College Students' mental health, digital     |  |  |  |  |  |
| in the practice of       | sensing workers for the safety, | topographic survey, physical geography and   |  |  |  |  |  |
| remote sensing           | health, well-being and          | geomorphology, remote sensing image          |  |  |  |  |  |
| engineering, and fulfill | environmental protection of     | interpretation practice, etc.                |  |  |  |  |  |
| their responsibilities.  | the public, and be able to      |  |  |  |  |  |  |

| Graduate Abilities      | Related Knowledge                | Course Supports   |  |  |  |  |  |
|-------------------------|----------------------------------|---|--|--|--|--|--|
|                         | consciously perform their        |   |  |  |  |  |  |
|                         | responsibilities in the practice |   |  |  |  |  |  |
|                         | of remote sensing engineering    |   |  |  |  |  |  |
|                         | 9.1 be able to effectively       |   |  |  |  |  |  |
|                         | communicate with members of      | Engineering drawing and map recognition,  |  |  |  |  |  |
|                         | Surveying and mapping,           | introduction to geoscience, computer vision,                                      |  |  |  |  |  |
| 9.Individuals and       | geographic information,          | object-oriented programming, practice of  |  |  |  |  |  |
| teams: be able to       | computer and other               | natural geography and geomorphology and   |  |  |  |  |  |
| assume the roles of     | disciplines, and work together   | remote sensing image interpretation, etc.   |  |  |  |  |  |
| individual, team        | with them                        |   |  |  |  |  |  |
| member and              | 9.2 be able to work              | Close range photogrammetry, digital   |  |  |  |  |  |
| responsible person in a | independently or cooperatively   | topographic survey practice, new  |  |  |  |  |  |
| multi-disciplinary      | in the team                      | technology practice, etc.   |  |  |  |  |  |
| team.                   | 9.3 be able to organize,         | Military training, object-oriented  |  |  |  |  |  |
|                         | coordinate and command the       | programming, comprehensive practice of spatial information, college surveying and |  |  |  |  |  |
|                         | team to carry out the work       |   |  |  |  |  |  |
|                         |                                  | mapping skills competition, etc.  |  |  |  |  |  |
| 10. Communication:      | 10.1 be able to effectively      |   |  |  |  |  |  |
| be able to effectively  | communicate and exchange         | Urban remote sensing (Bilingual), scientific                                      |  |  |  |  |  |
| communicate and         | with peers and the public on     | paper writing (Bilingual), comprehensive  |  |  |  |  |  |
| exchange with the       | complex remote sensing           | practice of spatial information,  |  |  |  |  |  |
| bank and the public on  | engineering issues during the    | comprehensive practice of remote sensing,   |  |  |  |  |  |
| complex remote          | writing of design books,         | etc.  |  |  |  |  |  |
| sensing engineering     | technical reports and            |   |  |  |  |  |  |
| issues, including       | presentations                    |   |  |  |  |  |  |
| writing reports and     | 10.2 have a certain              | College English (1-2), introduction to  |  |  |  |  |  |
| design papers, making   | international vision and         | surveying and mapping geographic  |  |  |  |  |  |
| statements, clearly     | understand the international     | information, principles of geographic   |  |  |  |  |  |
| expressing or           | cutting-edge development         | information system (Bilingual),   |  |  |  |  |  |
| responding to           | trend and research hotspot in    | comprehensive practice of remote sensing,   |  |  |  |  |  |
| instructions, and have  | the field of remote sensing      | etc.  |  |  |  |  |  |
| a certain international | 10.3 have the ability of         |   |  |  |  |  |  |
| vision, and be able to  | cross-cultural communication     | College English (1-2), scientific paper   |  |  |  |  |  |
| communicate and         | in language and written          | writing (Bilingual), urban remote sensing   |  |  |  |  |  |
| exchange in a           | expression, be able to           | (Bilingual), graduation project, etc.   |  |  |  |  |  |
| cross-cultural context  | communicate and exchange on      |   |  |  |  |  |  |

| Graduate Abilities   | Related Knowledge   | Course Supports  |  |  |  |  |
|--|---|--|--|--|--|--|
|  | remote sensing issues in cross-cultural context   |  |  |  |  |  |
| 11. Project management:  | 11.1 master the management and economic decision-making methods involved in engineering projects  | Digital topographic survey practice,<br>surveying and mapping management and<br>laws and regulations, (close range and lidar,<br>mobile measurement, microwave remote<br>sensing) new technology practice, etc.  |  |  |  |  |
| understand and master engineering management principles and economic decision-making | 11.2 understand the cost composition of remote sensing and mapping production, and understand the engineering management and economic decision-making issues involved in it                         | Modern surveying and mapping technology application, surveying and mapping management and laws and regulations, aerospace data acquisition, remote sensing comprehensive practice, graduation project, etc.  |  |  |  |  |
| methods, and be able to apply them in a multidisciplinary environment.               | 11.3 be able to use engineering management and economic decision-making methods in the process of designing and developing remote sensing engineering solutions in a multidisciplinary environment. | Remote sensing technology application, modern surveying and mapping technology application, (close range and lidar, mobile measurement, microwave remote sensing) new technology practice, surveying and mapping management, laws and regulations, 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 computer thinking, scientific and technological revolution and social development, digital topographic survey, remote sensing application prospect, 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.   | College English (1-2), introduction to surveying and mapping geographic information, in-depth learning and intelligent interpretation of remote sensing images, graduation design, innovative practice of Remote Sensing Science and technology, 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        | 实践学时       | 上机学时 | 课外学时     | 延续教学 | 开课<br>学期 | 教学单位    |
|-------------|------|---|------|-------------|-------------|------------|------|----------|------|----------|---------|
|             |      | 思想道德与法治 Ideological Morality and<br>Rule of Law   | 3    | 48          | 48          |            |      |          |      | 1        | 马克思主义学院 |
|             |      | 中国近现代史纲要 The Outline of the<br>Modern Chinese History   | 3    | 48          | 32          |            |      | 16       |      | 2        | 马克思主义学院 |
|             |      | 习近平新时代中国特色社会主义思想概论<br>Introduction to Xi Jinping Thought on<br>Socialism with Chinese Characteristics for<br>a New Era  | 2    | 32          | 28          | 4          |      |          |      | 2        | 马克思主义学院 |
|             |      | 马克思主义基本原理★<br>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理论体系概<br>论★ Introduction to Mao Zedong Thoughts<br>and Theoretical System of Socialism with<br>Chinese Characteristics                                      | 5    | 80          | 64          |            |      | 16       |      | 4        | 马克思主义学院 |
|             |      | 形势与政策(1-4) Situation and<br>Policy(1-4)   | 2    | 32          | 32          |            |      |          |      | 1-4      | 马克思主义学院 |
|             | 必    | 大学生职业生涯与发展规划<br>College Student Occupation Career and<br>Development Planning   | 1    | 16          | 16          |            |      |          |      | 1        | 学工部     |
|             | 修    | 大学生心理健康<br>The Mental health of College Students  | 1    | 16          | 16          |            |      |          |      | 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    |
| ·<br>识<br>教 |      | 大学英语拓展系列课程(1-4)<br>College English Training(1-4)  | 2    | 32          | 32          |            |      |          |      | 3        | 人文学院    |
| 育果          |      | 大学英语拓展系列课程(5-8)<br>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     |
|             |      | 计算思维导论<br>Introduction to Computational Thinking  | 1.5  | 56          | 24          |            |      | 32       |      | 1        | 电信学院    |
|             |      | "四史"(党史、新中国史、改革开放史、社会主义发展史) History of the Communist<br>Party of China, History of New China,<br>History of Reform and Opening up and<br>History of Socialist Development | 0.5  | 8           | 8           |            |      |          |      | 1-7      | 马克思主义学院 |
|             |      | 小 计   | 36   | 696         | 596         | 4          |      | 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          |             |            |      | <u> </u> |      | 1-8      | 各院部     |
| -           |      | 修读4类合计5   | 8 学分 | ),每         |             |            |      |          |      |          | A       |
|             | 任    | 工程实践类   |      |             |             | -8 学       |      |          |      |          | 各院部     |
|             | 选    | 1 1-8 字期任策  |      |             |             |            |      |          |      | 各院部      |         |
|             |      |   | 计至   | 少修i<br>l史、i | 卖 46<br>改革尹 | 学分。<br>F放史 |      |          |      |          |         |

| 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) ★<br>Advanced Mathematics A(1)                          | 5  | 92  | 80   |      |      |          | 12       | 1    | 理学院             |  |
|       |      | 高等数学 A (2) ★   | 5  | 84  | 80   |      |      |          | 4        | 2    | 理学院             |  |
|       |      | Advanced Mathematics A(2)  |    |     | 20   |      |      |          |          |      |                 |  |
|       |      | 线性代数 Linear Algebra<br>概率论与数理统计 B                                  | 2  | 40  | 32   |      |      |          | 8        | 2    | 理学院             |  |
|       |      | M华尼与数连统订员 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<br>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<br>Introduction to Geomatics                              | 1  | 16  | 16   |      |      |          |          | 1    | 测绘学院            |  |
| 基     |      | CAD 基础与应用<br>CAD Basic and Application                             | 2  | 32  | 16   | 16   |      |          |          | 1    | 测绘工程系           |  |
|       |      | 数字地形测量学★ Digital Topographic<br>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         |  |
| VIII. |      | 地理信息系统原理(双语) The Principle of<br>Geographic Information System     | 3  | 48  | 40   | 8    |      |          |          | 3    | 地理信息科学系         |  |
| 课     |      | 遥感原理与应用★ Principles of Remote<br>Sensing                           | 3  | 48  | 48   |      |      |          |          | 3    | 遥感科学与技术系        |  |
|       |      | 小计   | 43 | 756 | 608  | 112  |      | 8        | 28       |      |                 |  |
|       |      | 现代测绘技术应用 Application of Modern<br>Surveying and Mapping Technology | 1  | 16  | 16   |      |      |          |          | 2    | 测绘工程系           |  |
|       | 选    | GIS 基础应用技能<br>GIS base Application Skill                           | 1  | 16  | 8    | 8    |      |          |          | 2    | 地理信息科学系         |  |
|       | 修    | 遥感应用前景<br>Remote Sensing Application Prospect                      | 1  | 16  | 16   |      |      |          |          | 3    | 遥感科学与技术系        |  |
|       |      | 小 计  | 3  | 48  | 40   | 8    |      |          |          |      |                 |  |
|       |      | 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<br>Aerospace data acquisition                             | 2  | 32  | 28   | 4    |      |          |          | 4    | 遥感科学与技术系        |  |
| 专     |      | 城市遥感(双语) Urban Remote Sensing                                      | 3  | 48  | 40   | 8    |      |          |          | 6    | 遥感科学与技术系        |  |
| 业     | 必    | 摄影测量学 Photogrammetry   | 3  | 48  | 44   | 4    |      |          |          | 5    | 遥感科学与技术系        |  |
| 核     | 修    | 遥感数字图像处理<br>Digital Image Processing                               | 3  | 48  | 40   | 8    |      |          |          | 5    | 遥感科学与技术系        |  |
| 心     |      | 计算机视觉 Computer vision  | 3  | 48  | 40   | 8    |      |          |          | 6    | 遥感科学与技术系        |  |
| 课     |      | 小计   | 14 | 224 | 192  | 32   |      |          |          |      | <b>地心们于一汉小尔</b> |  |
|       |      |  |    |     | l    |      | l    | <u> </u> | <u> </u> | I    | I               |  |

| ### Programming ### Wikawikawikawikawikawikawikawikawikawikaw  | 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     |          |
|--|------|------|---|-------|-----|------|------|------|------|------|----------|----------|
| <ul> <li>並 送差壁论与測量平差基础 Fundamentals of Error Theory and Surveying Adjustment (を )</li></ul>  |      |      |   | 2     | 32  | 32   |      |      |      |      | 4        | 遥感科学与技术系 |
| ### Management and Laws  |      | 必    | 误差理论与测量平差基础 Fundamentals of             | 3     | 48  | 48   |      |      |      |      | 4        | 测绘工程系    |
| 小 计   6   96   96   0   0  |      | 修    | 测绘管理与法律法规 Surveying                     | 1     | 16  | 16   |      |      |      |      | 6        | 测绘工程系    |
| 透感技术应用(研讨式教学)(限选)  |      |      |   | G     | 06  | 0.6  |      |      |      |      |          |          |
| Applications of Remote Sensing in different fields (seminar) 激光能达测量技术与应用(限选)Laser radar Surveying Technology GNSS 原理及其应用(限选)GNSS principle and application 近景摄影测量(限选)Close Range 2 32 28 4 5 测绘工程系 产品观量学基础Geodesy Fundamental 2 32 24 8 4 3 3 3 3 3 3 3 5 3 3 3 3 3 5 3 3 3 3 3  |      |      |   | 0     | 90  | 90   | 0    |      |      |      |          |          |
| Padar Surveying Technology   |      |      | Applications of Remote Sensing in       | 2     | 32  | 16   | 16   |      |      |      | 6        | 遥感科学与技术系 |
| and application 近景摄影測量(限选)Close Range 2 32 26 6 6 遥感科学与技〉 微波遥感(限选)Microwave Remote Sensing 2 32 32 大地测量学基础 Geodesy Fundamental 2 32 24 8 4 3 32 近感科学与技〉 大地测量学基础 Geodesy Fundamental 2 32 24 8 4 3 32 远感科学与技〉 大地测量学基础 Geodesy Fundamental 2 32 24 8 4 3 32 远感科学与技〉 大地测量学基础 Geodesy Fundamental 2 32 24 8 4 3 32 远感科学与技〉 工程制图与识图(限选) Engineering 3 48 48 6 理学院  prawing and Interpreting 2 32 32 7 遥感科学与技〉 数据结构(限选) Engineering 3 48 48 6 理学院  prawing and Interpreting 2 32 32 5 地理信息科学 数据结构(限选) Data structure 2 32 32 32 4 地理信息科学 移动道路测量技术及应用 Technology and Application of Mobile Mapping System 1 1 16 8 8 7 地理信息科学 高光谱遥感切yperspectral remote sensing 2 32 32 5 地理信息科学 所关键遥感切yperspectral remote sensing 2 32 24 8 6 遥感科学与技〉 科技文献检索 document retrieval of science and technology 1 16 16 8 5 图书馆  建感影像深度学习与智能解译 Deep learning and intelligent interpretation of remote sensing image 2 32 16 16 4 递感科学与技〉 GIS 软件使用 GIS Software 2 32 16 16 4 递感科学与技〉 可视化语言 IDL The Language IDL 2 32 16 16 4 递感科学与技〉 自然教育学母技计 Python 程序设计 Python Programming 2 32 16 16 6 递感科学与技〉 Python 程序设计 Python Programming 2 32 16 16 6 6 递感科学与技〉 Monitoring 大数据与地型信息系统 1.5 24 16 8 7 地理信息科学 Monitoring 大数据与地型信息系统 1.5 24 16 8 7 地理信息科学 |      |      |   | 2     | 32  | 24   | 8    |      |      |      | 6        | 遥感科学与技术系 |
| Photogrammetry     微波遥感 (限选) Microwave Remote Sensing 2 32 32 5 遥感科学与技力大规测量学基础 Geodesy Fundamental 2 32 24 8 4 测绘工程系 遥感图像解译(限选) Remote sensing image interpretation 新型航空遥感数据处理技术 Modern aerial remote sensing data processing technology 工程制图与识图 (限选) Engineering Drawing and Interpreting 2 32 32 7 遥感科学与技力 数据结构 (限选) Data structure 2 32 32 32 5 地理信息科学 移动道路测量技术及应用 Technology and Application of Mobile Mapping System 计算机图形学 (限选) Computer Graphics 2 32 32 5 地理信息科学 高光谱遥感 Hyperspectral remote sensing 2 32 24 8 6 遥感科学与技力科技文献检索 document retrieval of science and technology   |      |      |   | 2     | 32  | 28   | 4    |      |      |      | 5        | 测绘工程系    |
| 支地测量学基础 Geodesy Fundamental         2         32         24         8         4         测绘工程系 遥感图像解译(限选) Remote sensing image interpretation           新型航空遥感数据处理技术 Modern aerial remote sensing data processing technology 工程制图与识图 (限选) Engineering Drawing and Interpreting         2         32         32         7         遥感科学与技力 遥感科学与技力 遥感科学与技力 遥感科学与技力 强感 经 经 经 经 经 经 经 经 经 经 经 经 经 经 经 经 经 经   |      |      | Photogrammetry                          |       | 32  | 26   | 6    |      |      |      | 6        | 遥感科学与技术系 |
| <ul> <li>選應图像解译(限选) Remote sensing image interpretation 新型航空運感数据处理技术 Modern aerial remote sensing data processing technology 工程制图与识图 (限选) Engineering 2 32 32 7 遥感科学与技力 2 2 32 32 7 遥感科学与技力 2 2 32 32 7 2 2 32 32 7 2 2 32 32 32 32 32 32 32 32 32 32 32 32</li></ul>  |      |      | 微波遥感 (限选) Microwave Remote Sensing      | 2     | 32  | 32   |      |      |      |      | 5        | 遥感科学与技术系 |
| 1.5   24   24   24   24   24   24   24   2   |      |      | 大地测量学基础 Geodesy Fundamental             | 2     | 32  | 24   | 8    |      |      |      | 4        | 测绘工程系    |
| ### remote sensing data processing technology T程制图与识图(限选) Engineering Drawing and Interpreting 空间数据库 Spatial Database 2 32 32 32 5 地理信息科学 数据结构(限选)Data structure 2 32 32 32 4 地理信息科学 移动道路测量技术及应用 Technology and Application of Mobile Mapping System 计算机图形学(限选)Computer Graphics 2 32 32 5 地理信息科学 高光谱遥感Hyperspectral remote sensing 2 32 24 8 6 遥感科学与技术科技文献检索 document retrieval of science and technology 1 16 16 8 5 图书馆 图形馆 图形学(限选)Remote Sensing Software 2 32 32 6 地理信息科学 经 证 证 证 证 证 1 16 16 6 地理信息科学 图 证 1 16 16 6 16 16 16 16 16 16 16 16 16 16   | 专    |      |   | 1.5   | 24  | 24   |      |      |      |      | 6        | 遥感科学与技术系 |
| 方       Drawing and Interpreting       3 48 48       6 埋字院         空间数据库 Spatial Database       2 32 32       5 地理信息科学         数据结构 (限选) Data structure       2 32 32       4 地理信息科学         移动道路测量技术及应用 Technology and 计算机图形学 (限选) Computer Graphics       1 16 8 8       7 地理信息科学         高光谱遥感 Hyperspectral remote sensing 2 32 24 8       6 遥感科学与技术科技文献检索 document retrieval of science and technology       1 16 16       8 5       图书馆         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 遥感科学与技术 通常科学与技术 通常科学与技术 通常教育 (限选) Remote Sensing Software GIS 软件使用 GIS Software QIS 数件使用 GIS Software QIS 数据与地理信息科学与技术 QIS 软件使用 Geographic Conditions QIS 数据与地理信息系统       2 32 16 16       4 地理信息科学与技术 QIS 和学与技术 QIS 数据与地理信息系统  | 业    |      |   | 2     | 32  | 32   |      |      |      |      | 7        | 遥感科学与技术系 |
| 空间数据库 Spatial Database       2 32 32       5 地理信息科学数据结构(限选)Data structure       2 32 32       4 地理信息科学移动道路测量技术及应用 Technology and Poplication of Mobile Mapping System 计算机图形学(限选)Computer Graphics 2 32 32  | 方    |      |   | 3     | 48  | 48   |      |      |      |      | 6        | 理学院      |
| 透   数据结构(限选) Data structure   2   32   32   32   4   地理信息科学   移动道路测量技术及应用 Technology and   1   16   8   8   7   地理信息科学   |      |      |   | 2     | 32  | 32   |      |      |      |      | 5        | 地理信息科学系  |
| 移动道路测量技术及应用 Technology and Application of Mobile Mapping System 计算机图形学(限选)Computer Graphics 2 32 32 5 地理信息科学高光谱遥感 Hyperspectral remote sensing 2 32 24 8 6 遥感科学与技艺科技文献检索 document retrieval of science and technology 1 16 16 8 5 图书馆 遥感影像深度学习与智能解译 Deep learning and intelligent interpretation 2 32 32 7 遥感科学与技艺的 remote sensing image 智慧城市导论 Introduction to smart city 1 16 16 6 地理信息科学 遥感软件(限选)Remote Sensing Software 2 32 16 16 4 遥感科学与技艺 GIS 软件使用 GIS Software 2 32 16 16 4 地理信息科学可视化语言 IDL The Language IDL 2 32 16 16 5 遥感科学与技艺 Python 程序设计 Python Programming 2 32 16 16 6 遥感科学与技艺 自然资源管理 Geographic Conditions Monitoring 大数据与地理信息系统 1.5 24 16 8 7 地理信息科学 大数据与地理信息系统   | 向    | 选    |   | 2     | 32  | 32   |      |      |      |      | 4        | 地理信息科学系  |
| 计算机图形学(限选)Computer Graphics 2 32 32 5 地理信息科学高光谱遥感 Hyperspectral remote sensing 2 32 24 8 6 遥感科学与技艺科技文献检索 document retrieval of science and technology 1 16 16 8 5 图书馆  | 课    | 修    |   | 1     | 16  | 8    | 8    |      |      |      | 7        | 地理信息科学系  |
| 高光谱遥感 Hyperspectral remote sensing 2 32 24 8 6 遥感科学与技术科技文献检索 document retrieval of science and technology 1 16 16 8 5 图书馆 图书馆 遥感影像深度学习与智能解译 Deep learning and intelligent interpretation of remote sensing image 智慧城市导论 Introduction to smart city 1 16 16 6 地理信息科学遥感软件(限选)Remote Sensing Software 2 32 16 16 4 遥感科学与技术可视化语言 IDL The Language IDL 2 32 16 16 4 地理信息科学可视化语言 IDL The Language IDL 2 32 16 16 6 遥感科学与技术内状态,是一个工程的工程的工程的工程的工程的工程的工程的工程的工程的工程的工程的工程的工程的工  |      | 12   |   | 2     | 32  | 32   |      |      |      |      | 5        | 地理信息科学系  |
| 科技文献检索 document retrieval of science and technology  遥感影像深度学习与智能解译 Deep learning and intelligent interpretation of remote sensing image  智慧城市导论 Introduction to smart city 1 16 16 6 地理信息科学 遥感软件(限选) Remote Sensing Software 2 32 16 16 4 遥感科学与技习 GIS 软件使用 GIS Software 2 32 16 16 4 地理信息科学可视化语言 IDL The Language IDL 2 32 16 16 5 遥感科学与技习 自然资源管理 Geographic Conditions Monitoring 大数据与地理信息系统 1.5 24 16 8 6 地理信息科学   |      |      |   |       |     |      | 8    |      |      |      | <u> </u> | 遥感科学与技术系 |
| learning and intelligent interpretation of remote sensing image  智慧城市导论 Introduction to smart city 1 16 16 6 地理信息科学 遥感软件 (限选) Remote Sensing Software 2 32 16 16 4 遥感科学与技艺 GIS 软件使用 GIS Software 2 32 16 16 4 地理信息科学 可视化语言 IDL The Language IDL 2 32 16 16 5 遥感科学与技艺 Python 程序设计 Python Programming 2 32 16 16 6 遥感科学与技艺 自然资源管理 Geographic Conditions Monitoring 大数据与地理信息系统  |      |      | 科技文献检索 document retrieval of            |       |     |      | _    |      | 8    |      |          |          |
| 遥感软件 (限选) Remote Sensing Software       2       32       16       16       4       遥感科学与技力         GIS 软件使用 GIS Software       2       32       16       16       4       地理信息科学         可视化语言 IDL The Language IDL       2       32       16       16       5       遥感科学与技力         Python 程序设计 Python Programming 自然资源管理 Geographic Conditions Monitoring       1.5       24       16       8       7       地理信息科学         大数据与地理信息系统       1.5       24       16       8       6       地理信息科学   |      |      | learning and intelligent interpretation | 2     | 32  | 32   |      |      |      |      | 7        | 遥感科学与技术系 |
| GIS 软件使用 GIS Software       2       32       16       16       4       地理信息科学可视化语言 IDL The Language IDL       2       32       16       16       5       遥感科学与技术程序设计 Python Programming 自然资源管理 Geographic Conditions Monitoring       2       32       16       16       6       遥感科学与技术程序设计 Python Programming 自然资源管理 Geographic Conditions Monitoring       1.5       24       16       8       7       地理信息科学 中理信息科学 中理信息科学 中理信息科学 中国企业 中国企业 中国企业 中国企业 中国企业 中国企业 中国企业 中国企业  |      |      | 智慧城市导论 Introduction to smart city       | 1     | 16  | 16   |      |      |      |      | 6        | 地理信息科学系  |
| 可视化语言 IDL The Language IDL       2       32       16       16       5       遥感科学与技术         Python 程序设计 Python Programming 自然资源管理 Geographic Conditions Monitoring 大数据与地理信息系统       1.5       24       16       8       7       地理信息科学   |      |      | 遥感软件(限选)Remote Sensing Software         | 2     | 32  | 16   | 16   |      |      |      | 4        | 遥感科学与技术系 |
| Python 程序设计 Python Programming 自然资源管理 Geographic Conditions Monitoring 大数据与地理信息系统       2 32 16 16 6 遥感科学与技术         1.5 24 16 8       7 地理信息科学  |      |      | GIS 软件使用 GIS Software                   | 2     | 32  | 16   | 16   |      |      |      | 4        | 地理信息科学系  |
| 自然资源管理 Geographic Conditions       1.5       24       16       8       7       地理信息科学         大数据与地理信息系统       1.5       24       16       8       6       地理信息科学  |      |      | 可视化语言 IDL The Language IDL              | 2     | 32  | 16   | 16   |      |      |      | 5        | 遥感科学与技术系 |
| Monitoring     1.5     24     16     8     7     地理信息科学       大数据与地理信息系统     1.5     24     16     8     6     地理信息科学  |      |      | Python 程序设计 Python Programming          | 2     | 32  | 16   | 16   |      |      |      | 6        | 遥感科学与技术系 |
| 大数据与地理信息系统   |      |      | 自然资源管理 Geographic Conditions            | 1. 5  | 24  | 16   | 8    |      |      |      | 7        | 地理信息科学系  |
| Big data and GIS   |      |      | 大数据与地理信息系统                              | 1.5   | 24  | 16   | 8    |      |      |      | 6        | 地理信息科学系  |
| 小 计 42.5 680 542 138 8   |      |      | 小计                                      | 42. 5 | 680 | 542  | 138  |      | 8    |      |          |          |
| 专业方向课合计 27 学分, 必修 6 学分, 选修 21 学分   |      |      | 专业方向课合计 27 勞                            | 2分,   | 必修  | 6 学久 | ,选   | 修 2  | 2 学分 |      |          |          |

表 2 遥感科学与技术专业指导性教学计划(实践环节)

| 课         | <b>₹</b> 4   | 2   | רי ב      | 折   | 实     | <u> </u> |          |          |                 |
|-----------|--|---|-----------|-----|-------|----------|----------|----------|-----------------|
| 4程属性      |  | 课程名称  | 学<br>分    | 合学时 | - 验实践 | 上机       | 开课 学期    | 开设<br>周次 | <br>  教学単位<br>  |
| <u> "</u> | 军事理论<br>Military T<br>军训<br>Military T   | 2   | 36<br>112 |     |       | 1        | 1-3      | 武装部      |                 |
|           | 形势与政策  |   | _         | 32  |       |          | 5-8      | 分散       | 马克思主义学院、<br>各学院 |
|           | 数字地形测<br>Surveying   | 量实习Digital Topographic<br>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<br>Practice  | 实习Photogrammetry Fundamental                                  | 1         | 20  | 20    |          | 5        | 18       | 遥感科学与技术系        |
|           |  | 统原理实习 The Principle of<br>Information System Practice         | 2         | 40  | 40    |          | 3        | 19-20    | 地理信息科学系         |
| \m        | 遥感数字图<br>Practice  | 像处理实习 Digital Image Processing                                | 2         | 40  | 40    |          | 5        | 19-20    | 遥感科学与技术系        |
| 课<br>内    | 计算机视觉  | 实习 Computer vision practice                                   | 1         | 20  | 20    |          | 6        | 17       | 遥感科学与技术系        |
|           | 空间信息综合实习 Spatial Information<br>Practice   |   |           | 100 | 100   |          | 7        | 1-5      | 测绘学院            |
|           | 遥感综合实习 Remote Sensing Comprehensive<br>Practice                                    |   |           | 60  | 60    |          | 7        | 18-20    | 遥感科学与技术系        |
|           | 遥感原理与应用实习 Principles and<br>Applications of Remote Sensing Practice                |   |           | 20  | 20    |          | 4        | 18       | 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 |   |           | 20  | 20    |          | 6        | 16       | 遥感科学与技术系        |
|           |  | (近景与激光雷达、移动测量、微波遥感)新技术<br>实习 New technology Practice          |           |     | 40    |          | 7        | 16-17    | 遥感科学与技术系        |
|           | 面向对象程序设计实习 Object oriented programming Practice                                    |   |           | 40  | 40    |          | 4        | 19-20    | 遥感科学与技术系        |
|           | 毕业设计 Undergraduate Design or Thesis  |   |           | 160 | 160   |          | 8        | 1-16     | 遥感科学与技术系        |
|           |  | 小 计   | 37        | 840 | 660   |          |          |          |                 |
|           |  | 遥感科学与技术创新实践及科研训练  | 2         | 40  | 40    |          |          |          | 遥感科学与技术系        |
|           |  | 全国论文大赛 National Paper<br>Contest                              | 1         | 20  | 20    |          |          |          | 遥感科学与技术系        |
|           | 创新实践及  | GIS 软件开发大赛实训 GIS Software<br>Development Practice             | 1         | 20  | 20    |          |          |          | 地理信息科学系         |
| 课<br>外    | 科研训练   | 学院测绘技能大赛 School of<br>Surveying and Mapping Skills<br>Contest | 1         | 20  | 20    |          |          |          | 测绘工程系           |
|           |  | 测绘技能大赛实训  | 2         | 40  | 40    |          |          |          | 测绘工程系           |
|           |  | 科技论文写作 (双语)   | 1         | 16  | 0     |          | 6        |          | 遥感科学与技术系        |
|           |  | 小 计   | 8         | 156 | 140   |          |          |          |                 |
|           | 实践环节   | ·<br>百合计 39 学分,其中课内 37 学分,语                                   | 具外 2      | 学分  | (创    | 新实践      | <br>线及科研 | 训练必修     | 2 学分)           |