**2020级遥感科学与技术专业本科培养方案**

**一、专业基本信息**

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| --- | --- | --- | --- |
| 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，能够在城乡建设与规划、自然资源调查与监测、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和科学文化素养、工作责任心，能够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及注册测绘师的能力，成为遥感领域相关企事业单位的技术负责人或技术骨干。

**专业特色：**

本专业依托首都建设、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、面向城市管理的移动道路测量系统研发与应用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169.5学分，其中理论课程130.5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** |
| 通识教育课 | 必修 | 43.5 | 848 | 25.6 |
| 选修 | 2.0 | 32 | 1.2 |
| 大类基础课 | 必修 | 43 | 688 | 25.4 |
| 选修 | 1 | 16 | 0.6 |
| 专业核心课 | 必修 | 14 | 224 | 8.3 |
| 专业方向课 | 必修 | 6 | 96 | 3.5 |
| 任选 | 21 | 336 | 12.4 |
| 独立实践环节 | 必修 | 37 | 892 | 21.8 |
|  | 选修 | 2 | 40 | 1.2 |
| 总计 | | 169.5 | 3172 | 100 |

**八、教学进程表**

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

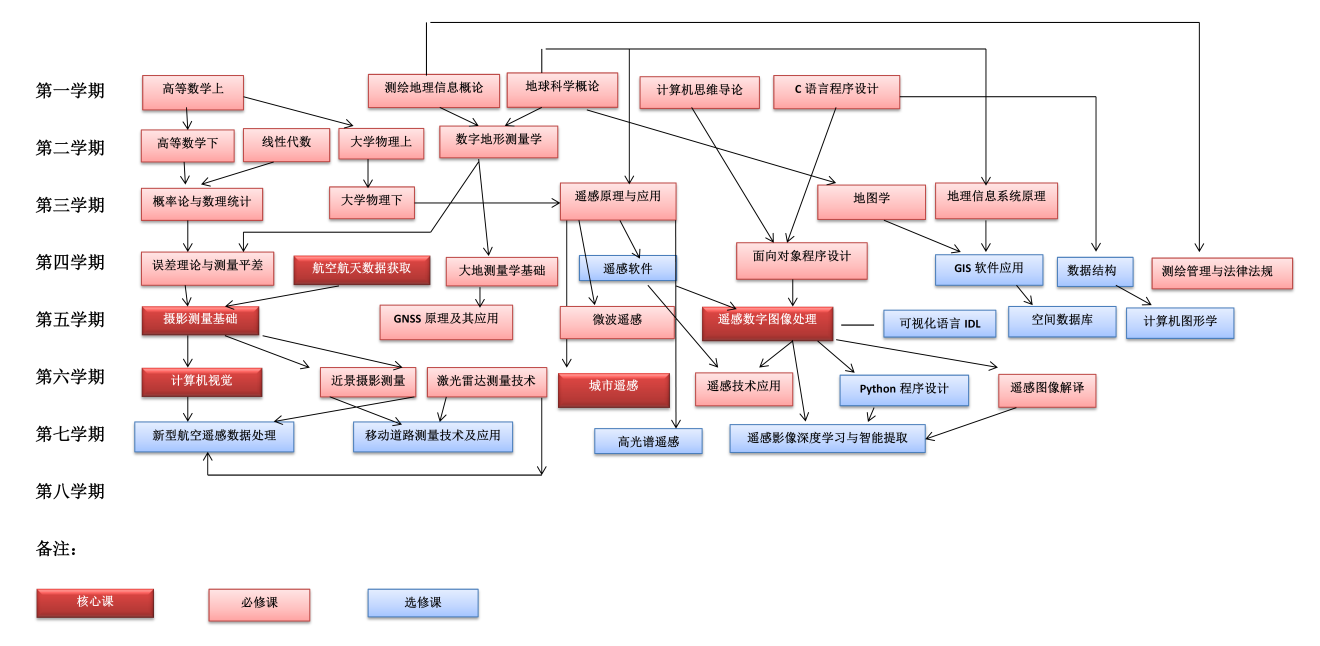
**九、毕业生应具备的知识能力及实现矩阵**

|  |  |  |
| --- | --- | --- |
| 毕业生应具备的知识能力 | 相关毕业要求指标点 | 实现途径（课程支撑，粗体为必修课） |
| 1. 工程知识: 能够应用数学、物理、计算机、地学科学、工程的基础和专业知识用于解决遥感领域复杂工程问题。 | 1.1能够将数学、物理、地学科学、工程的语言工具用于遥感工程问题的表述 | C语言程序设计、地图学、数据结构、工程制图与识图、高等数学A(1-2)、概率与数理统计B、线性代数、普通物理B(1-2)、工程制图与识图、CAD基础与应用、遥感原理与应用、遥感数字图像处理、地球科学概论、大地测量基础、计算机图形学等。 |
| 1.2能针对具体的遥感对象建立数学模型并求解 ，满足测绘的精度要求 | 高等数学A(1-2)、线性代数、概率与数理统计B、普通物理B(1-2)、数字地形测量学、地理信息系统原理（双语）、摄影测量学、大地测量学基础、误差理论与测量平差基础等。 |
| 1.3能够将遥感相关知识和数学模型方法用于推演、分析遥感专业复杂工程问题 | 高等数学A(1-2)、线性代数、遥感数字图像处理、工程制图与识图、GNSS原理及其应用、激光雷达测量技术与应用、微波遥感、计算机视觉等。 |
| 1.4能够将遥感相关知识和数学模型方法用于遥感专业复杂工程问题解决方案的比较与综合 | 概率与数理统计B、近景摄影测量、遥感技术应用、摄影测量学、摄影测量学实习、新技术实习、空间信息综合实习、毕业设计等。 |
| 2.问题分析: 能够应用数学、物理、计算机、地学科学和工程的基本原理，识别、表达、并通过文献研究分析复杂遥感工程问题，以获得有效结论。 | 2.1能够将数学、物理、计算机、地学科学和工程的基本理论运用到识别与判断遥感复杂工程问题的关键环节 | 地理信息系统原理（双语）、面向对象的程序设计、遥感数字图像处理、大地测量基础等。 |
| 2.2能够运用数学、物理、计算机、地学科学和工程的基本理论表达遥感复杂工程问题 | 计算思维导论、C语言程序设计、高等数学A(1-2)、概率与数理统计B、线性代数、普通物理B(1-2)、工程制图与识图、CAD基础与应用、地图学、摄影测量学等。 |
| 2.3能够认识到解决问题有多种方案可选择，会通过文献研究寻求可替代的解决方案 | 科技文献检索、大地测量学基础、遥感技术应用、城市遥感（双语）、摄影测量学、面向对象的程序设计等。 |
| 2.4能运用数学、物理、计算机、地学科学和工程的基本原理，借助文献研究，分析遥感复杂工程过程中的影响因素，获得有效结论 | 科技文献检索、GNSS原理及其应用、近景摄影测量、遥感原理等。 |
| 3. 设计/开发解决方案：能够设计针对复杂遥感、摄影测量、测绘工程问题的解决方案，设计满足遥感数据获取、处理、应用等方面需求的系统、生产流程，并能够在设计环节中体现创新意识，考虑社会、健康、安全、法律、文化以及环境等因素。 | 3.1能够根据测绘、遥感、地理信息工程用户的需求，设计技术方案，了解影响设计目标和技术方案的各种因素 | 地理信息系统原理（双语）、遥感数字图像处理、遥感软件、可视化语言IDl、计算机视觉、GIS软件使用、地理信息系统原理实习、遥感数字图像处理实习、空间信息综合实习等。 |
| 3.2能够开发满足遥感数据获取、处理、应用等方面需求的生产流程及算法 | 遥感软件、遥感技术应用、移动道路测量技术及应用 、GIS软件使用、GNSS原理及其应用、激光雷达测量技术与应用、航空航天数据获取实习、面向对象的程序设计、遥感数字图像处理实习等。 |
| 3.3能够在遥感工程解决方案设计中体现创新意识 | 遥感技术应用、移动道路测量技术及应用、智慧城市导论、遥感科学与技术创新实践及科研训练等。 |
| 3.4能够在遥感工程解决方案设计中考虑社会、健康、安全、法律、文化以及环境等因素 | 生态文明与未来城市、数字地形测量学、测绘地理信息概论、数字地形测量实习、毕业设计等。 |
| 4.研究：能够基于科学原理并采用科学方法对复杂遥感工程问题进行研究，包括现状调研、获取分析与解释数据、并通过信息综合得到合理有效的结论。 | 4.1能够运用科学原理及文献研究等方法对复杂遥感工程问题现状进行调研 | 地图学、地理信息系统原理（双语）、科技文献检索、航空航天数据获取、摄影测量学、近景摄影测量、微波遥感、遥感数字图像处理、遥感数字图像处理实习等。 |
| 4.2能够基于专业理论知识对研究方案进行设计、论证与预测 | GNSS原理及其应用、遥感原理与应用、遥感技术应用、遥感综合实习、空间信息综合实习、近景摄影测量等。 |
| 4.3能够采用科学方法实施数据采集与分析处理 | CAD基础与应用、误差理论与测量平差基础、激光雷达测量技术与应用、摄影测量基础、摄影测量学实习、航空航天数据获取。 |
| 4.4能够对实验结果进行信息综合与评判，取得合理有效结论 | 物理实验（1-2）、数字地形测量实习、地图学、激光雷达测量技术与应用、遥感图像解译、空间信息综合实习等。 |
| 5. 使用现代工具：能够针对复杂遥感工程问题，选择恰当的遥感、使用测绘技术与资源；现代测绘仪器和遥感处理软件，能够对复杂遥感工程问题的预测与模拟，并能够理解其局限性。 | 5.1能够针对复杂遥感工程问题，选择恰当的现代遥感技术与硬件、软件 | 现代测绘技术应用、数字地形测量学、GIS基础应用技能、摄影测量学实习、航空航天数据获取、地图学实习、遥感综合实习、（近景与激光雷达、移动测量、微波遥感）新技术实习、GIS软件开发大赛实训等。 |
| 5.2能够使用现代测绘仪器和信息技术软件完成 遥感 数据采集、数据处理与精度分析 | GIS基础应用技能、数字地形测量实习、遥感原理与应用实习、大地测量学基础、GNSS原理及其应用、误差理论与测量平差基础、航空航天数据获取、地理信息系统原理实习、空间信息综合实习、毕业设计等。 |
| 5.3能够使用现代工具，对复杂 遥感 工程问题进行预测与模拟，并理解其局限性 | 遥感软件、微波遥感、误差理论与测量平差基础、高光谱遥感、遥感综合实习、GIS软件设计与使用、新型航空遥感数据处理技术、新技术实习、深度学习与遥感智能解译等。 |
| 6. 工程与社会：能够基于工程相关背景知识进行合理分析，评价遥感工程实践和复杂工程问题解决方案对社会、健康、安全、法律以及文化的影响，并理解应承担的责任。 | 6.1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、思想道德修养与法律基础、数字地形测量学、遥感原理与应用、大地测量学基础、GNSS原理及其应用、测绘地理信息概论、遥感图像解译等。 |
| 6.2能够评价遥感测绘成果对社会、健康、法律以及文化、国家安全、领土完整的重要性，以及这些制约因素对项目实施的影响，并理解应承担的责任理解遥感工程实践应承担的责任 | 思想道德修养与法律基础、马克思主义基本原理概论、中国近现代史纲要、毛泽东思想和中国特色社会主义体系理论概论、习近平新时代中国特色社会主义思想概论、空间信息综合实习、军事理论、科技革命与社会发展、生态文明与未来城市、形势与政策（1-2）、遥感综合实习、毕业设计等。 |
| 7. 环境和可持续发展：能够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。 | 7.1知晓和理解环境保护和可持续发展的理念和内涵 | 毛泽东思想和中国特色社会主义体系理论概论、测绘地理信息概论、地球科学概论、自然资源调查与监测、形势与政策（1-2）、自然地理地貌与遥感解译实习等。 |
| 7.2能够从环境保护和可持续发展的角度认知遥感工程实践活动的可持续性，以及分析遥感工程生产实践中可能对环境及社会造成的损害和隐患 | 生态文明与未来城市、自然资源调查与监测、地球科学概论、智慧城市导论、形势与政策（1-2）、自然地理地貌与遥感解译实习等。 |
| 8. 职业规范：具有人文社会科学素养、社会责任感，能够在遥感工程实践中理解并遵守测绘、地理信息行业职业道德和规范，履行责任。 | 8.1具有人文社会科学素养和健康的体魄，树立正确的世界观、人生观和价值观 | 思想道德修养与法律基础、中国近现代史纲要、马克思主义基本原理概论、毛泽东思想和中国特色社会主义体系理论概论、习近平新时代中国特色社会主义思想概论、军事理论、体育（1-4）、军训、大学生职业生涯与发展规划、形势与政策（1-2）、经典赏析与文化传承、哲学视野与文明对话、科技革命与社会发展等。 |
| 8.2理解诚实公正、诚信守则的遥感行业职业道德和规范，并能在遥感 工程实践中自觉遵守 | 思想道德修养与法律基础、毛泽东思想和中国特色社会主义体系理论概论、大学生职业生涯与发展规划、测绘地理信息概论、测绘管理与法律法规、形势与政策（1-2）、数字地形测量实习、空间信息综合实习等。 |
| 8.3理解遥感工作人员对公众的安全、健康、福祉、环境保护的社会责任，能够在遥感工程实践中自觉履行责任 | 思想道德修养与法律基础、中国近现代史纲要、马克思主义基本原理概论、毛泽东思想和中国特色社会主义体系理论概论、大学生职业生涯与发展规划、测绘管理与法律法规、测绘地理信息概论、地球科学概论、自然地理地貌及遥感图像解译实习、城市遥感等。 |
| 9. 个人和团队：能够在多学科背景下的团队中承担个体、团队成员以及责任人的角色。 | 9.1能与测绘、地理信息、计算机、建筑历史与理论、地理等学科的成员有效沟通，合作共事 | 工程制图与识图、地球科学概论、计算机视觉、面向对象的程序设计、遥感图像解译等。 |
| 9.2能够在多学科背景下的团队中独立或合作开展工作 | 军事理论、军训、数字地形测量实习、遥感原理与应用实习、新技术实习、GIS软件开发大赛实训等。 |
| 9.3能够组织、协调和指挥团队开展工作 | 数字地形测量实习、地图学实习、地理信息系统原理实习、航空航天数据获取、空间信息综合实习、新技术实习、学院测绘技能大赛等。 |
| 10. 沟通：能够就复杂遥感工程问题与行及社会公众进行有效沟通和交流，包括撰写报告和设计文稿、陈述发言、清晰表达或回应指令，并具备一定的国际视野，能够在跨文化背景下进行沟通和交流。 | 10.1能够就遥感专业问题，以口头、文稿、图表等方式，准确表达自己的观点，回应质疑，理解与同行和社会公众交流的差异性。 | 地图学实习、城市遥感（双语）、科技论文写作（双语）、遥感数字图像处理实习、面向对象程序设计实习、遥感科学与技术创新实践及科研训练、毕业设计等。 |
| 10.2具备一定的国际视野，了解遥感领域的国际前沿发展趋势和研究热点，理解和尊重世界不同文化的差异性和多样性。 | 大学英语（1-2）、城市遥感（双语）、地理信息系统原理（双语）、新型航空遥感数据处理、遥感应用前景等。 |
| 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景下进行沟通和交流 | 大学英语（1-2）、口语、英语国家文化、专门用途英语、科技论文写作（双语）、城市遥感（双语）等。 |
| 11.项目管理：理解并掌握遥感工程项目或产品的设计和实施的全周期、全流程管理原理与经济决策方法，并能在多学科环境中应用。 | 11.1掌握工程项目中涉及的管理与经济决策方法 | 数字地形测量学实习、现代测绘技术应用、航空航天数据获取实习、（近景与激光雷达、移动测量、微波遥感）新技术实习等。 |
| 11.2了解遥感、测绘工程及产品全周期、全流程的成本构成，能在多学科环境下，理解其中涉及的工程管理与经济决策问题 | 现代测绘技术应用、测绘管理与法律法规、航空航天数据获取、遥感综合实习、毕业设计等。 |
| 11.3能在多学科环境下，在设计开发遥感工程解决方案的过程中，运用工程管理与经济决策方法。 | 遥感技术应用、 激光雷达测量技术与应用、现代测绘技术应用、遥感应用前景、（近景与激光雷达、移动测量、微波遥感）新技术实习 |
| 12. 终身学习：具有自主学习和终身学习遥感领域新知识的意识，有不断学习和适应遥感技术发展的能力。 | 12.1具有自主学习和终身学习的意识和能力，掌握必要的学习方法 | 大学生职业生涯与发展规划、计算机思维导论、科技革命与社会发展、测绘地理信息概论、测绘管理与法律法规、遥感应用前景等。 |
| 12.2具有理解和迁移知识、归纳总结和识别、综述遥感学科新发展的能力 | 大学生职业生涯与发展规划、智慧城市导论、遥感应用前景、新型航空遥感数据处理技术、测绘地理信息概论、遥感影像深度学习与智能解译、毕业设计、遥感科学与技术创新实践及科研训练等。 |

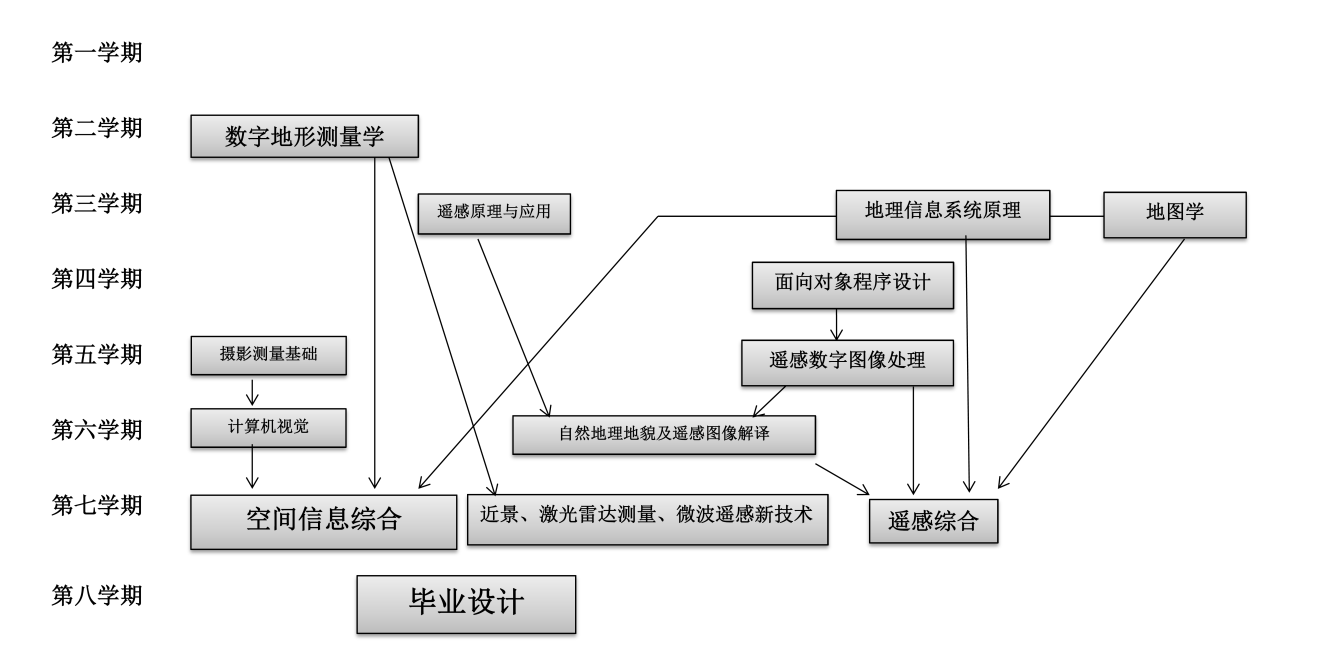
**十、指导性教学计划**（见附表）

**十一、主要课程、实践环节逻辑关系结构图**

1、主要课程



2、主要实践环节



备注：字体大小与实践环节时长对应

2020 Undergraduate Program for Specialty in Remote Sensing Science and Technology

**I. Specialty Name and Code**

|  |  |  |  |
| --- | --- | --- | --- |
| English Name | Remote Sensing Science and Technology | | |
| Code | 081202 | Disciplines | 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 and registered surveyor, 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, research and development and application of mobile road survey system for urban management. 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**

Science and Technology of Surveying and mapping

**IV. Major Courses**

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

**V. 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

**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 169.5, including 130.5 credits of theoretical courses and 39 credits of practice teaching.

**VII. Proportion of Courses**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Course** [**Category**](http://www.baidu.com/link?url=T-sTAae63xKETLJd_N7nNsFUo4ds7VX1E0PW1OwBIazAjp1vVAUKLUIUFYxDzfyxsSDXgWReQf8aH7q_CabOr9251wtvAH6OwY8dszrOr2u) | **Course Type** | **Credits** | **Class Hour** | **Proportion** |
| General Education | Compulsory | 43.5 | 848 | 25.6 |
| Optional | 2.0 | 32 | 1.2 |
| Big Academic Subjects | Compulsory | 43 | 688 | 25.4 |
| Optional | 1 | 16 | 0.6 |
| Professional Core | Compulsory | 14 | 224 | 8.3 |
| Professional Direction | Compulsory | 6 | 96 | 3.5 |
| Optional | 21 | 336 | 12.4 |
| Practice | Compulsory | 37 | 892 | 21.8 |
|  | Optional | 2 | 40 | 1.2 |
| total |  | 169.5 | 3172 | 100 |

**VIII. Table of Teaching Arrangement**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Semester | Teaching | Exam | Practice | Semester | Teaching | Exam | Practice |
| 1 | 4-19 | 20 | 1-3 | 2 | 1-16 | 17 | 18-20 |
| 3 | 1-15 | 16 | 17-20 | 4 | 1-16 | 17 | 18-20 |
| 5 | 1-16 | 17 | 18-20 | 6 | 1-15，18-19 | 20 | 16-17 |
| 7 | 6-14 | 15 | 1-5、16-20 | 8 | 1-16 weeks for graduation project / Internship, 17 week oral defense | | |

I**V.** **Graduate Abilities and Matrices**

|  |  |  |
| --- | --- | --- |
| **Graduate Abilities** | **Related Knowledge** | **Course Supports** |
| 1. Engineering knowledge: be able to apply the basic and professional knowledge of mathematics, physics, computer, geosciences and engineering to solve complex engineering problems in remote sensing field. | 1.1 be able to use the language tools of mathematics, physics, geosciences and engineering to express remote sensing engineering problems | C language programming, cartography, data structure, engineering drawing and map recognition, advanced mathematics a (1-2), probability and Mathematical Statistics B, linear algebra, General Physics B (1-2), engineering drawing and map recognition, CAD basis and application, remote sensing principle and application, remote sensing digital image processing, introduction to earth science, foundation of geodesy, computer graphics, etc. |
| 1.2 be able to build mathematical model for specific remote sensing objects | Probability and Mathematical Statistics B, principles of geographic information system (Bilingual), photogrammetry, geodesy, error theory and survey adjustment, remote sensing digital image processing, etc. |
| 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, lidar measurement technology and application, microwave remote sensing, computer vision, etc. |
| 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 | Physical experiment (1-2), close range photogrammetry, remote sensing technology application, photogrammetry, photogrammetry internship, graduation project, etc. |
| 2. Problem analysis: be able to apply the basic principles of mathematics, physics, computer, geosciences and engineering to identify, express and analyze complex remote sensing engineering problems through literature research, so as to obtain effective conclusions. | 2.1 be able to apply the basic theories of mathematics, physics, computer, geosciences and engineering to the identification, judgment, analysis and expression of remote sensing complex engineering problems | Introduction to computational thinking, C language programming, probability and Mathematical Statistics B, linear algebra, object-oriented programming, new aerial remote sensing data processing, etc. |
| 2.2 be able to recognize that there are many solutions to the problem, and will seek alternative solutions through literature research | Scientific and technological literature retrieval, geodetic basis, remote sensing technology application, urban remote sensing (Bilingual), photogrammetry, remote sensing comprehensive practice, etc. |
| 2.3 be able to recognize that there are many solutions to the problem, and will seek alternative solutions through literature research | Scientific and technological literature retrieval, geodetic basis, remote sensing technology application, urban remote sensing (Bilingual), photogrammetry, object-oriented programming, etc. |
| 2.4 be able to use the basic principles of mathematics, physics, computer, geosciences and engineering, and with the help of literature research, analyze the influencing factors in the process of remote sensing complex engineering, and obtain effective conclusions | Scientific and technological literature retrieval, GNSS principle and its application, close range photogrammetry, remote sensing principle, etc. |
| 3. Design / development solutions: be able to design solutions for complex remote sensing, photogrammetry, surveying and mapping engineering problems, design systems and production processes that meet the requirements of remote sensing data acquisition, processing, application, etc., and embody the sense of innovation in the design process, and consider the factors of society, health, safety, law, culture and environment. | 3.1 be able to design technical schemes according to the needs of users of Surveying and mapping, remote sensing and geographic information engineering, and understand various factors affecting design objectives and technical schemes | Principles of geographic information system (Bilingual), remote sensing digital image processing, remote sensing software, computer vision, GIS software use, GIS theory practice, remote sensing digital image processing practice, spatial information comprehensive practice, etc. |
| 3.2 be able to develop production processes and algorithms that meet the requirements of remote sensing data acquisition, processing and application | Remote sensing software, remote sensing technology application, GIS software use, object-oriented programming, remote sensing digital image processing practice. |
| 3.3 be able to embody innovation consciousness in remote sensing engineering solution design | Remote sensing technology application, mobile road measurement technology and application, introduction to smart city, remote sensing science and technology innovation practice and scientific research training. |
| 3.4 be able to consider social, health, safety, legal, cultural and environmental factors in the design of remote sensing engineering solutions | Ecological civilization and future city, digital topographic survey, introduction to surveying and mapping geographic information, digital topographic survey practice, graduation project, etc. |
| 4. Research: be able to study complex remote sensing engineering problems based on scientific principles and scientific methods, including current situation investigation, obtaining analysis and interpretation data, and obtaining reasonable and effective conclusions through information synthesis. | 4.1 be able to use scientific principles and literature research methods to investigate the current situation of complex remote sensing engineering problems | Remote sensing principle and application, aerospace data acquisition, photogrammetry, close range photogrammetry, microwave remote sensing, remote sensing digital image processing, etc. |
| 4.2 be able to design, demonstrate and predict the research scheme based on professional theoretical knowledge | GNSS principle and its application, remote sensing technology application, remote sensing comprehensive practice, spatial information comprehensive practice, close range photogrammetry, etc. |
| 4.3 be able to use scientific methods to implement data collection and analysis | CAD basis and application, digital topographic survey, error theory and survey adjustment basis, lidar survey technology and application, photogrammetry practice, aerospace data acquisition. |
| 4.4 be able to synthesize and evaluate the experimental results and obtain reasonable and effective conclusions | Physical experiment (1-2), GNSS principle and its application, lidar measurement technology and application, digital topographic survey practice, remote sensing image interpretation. |
| 5. Using modern tools: be able to develop, select and use appropriate remote sensing and surveying technology and resources for complex remote sensing engineering problems; modern surveying and mapping instruments and remote sensing processing software can predict and simulate complex remote sensing engineering problems, and understand their limitations. | 5.1 be able to select appropriate modern remote sensing technology, hardware and software for complex remote sensing engineering problems | Modern surveying and mapping technology application, GIS basic application skills, photogrammetry practice, aerospace data acquisition, remote sensing comprehensive practice, (close range and lidar, mobile measurement, microwave remote sensing) new technology practice, GIS software development competition training. |
| 5.2 be able to use modern surveying and mapping instruments and information technology software to complete remote sensing data acquisition, data processing and accuracy analysis | Cartography, GIS basic application skills, digital topographic survey practice, aerospace data acquisition, GIS principle practice, spatial information comprehensive practice, graduation project, etc. |
| 5.3 be able to use modern tools to predict and simulate complex remote sensing engineering problems, and understand their limitations | Remote sensing software, microwave remote sensing, hyperspectral remote sensing, GIS software design and use, new aerial remote sensing data processing technology. |
| 6. Engineering and society: be able to conduct reasonable analysis based on engineering related background knowledge, evaluate the 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. | 6.1 be familiar with relevant technical standards, laws and regulations and management regulations of remote sensing, and be able to understand the impact on project implementation | Surveying and mapping management and laws and regulations, ideological and moral cultivation and legal basis, engineering drawing and map recognition, cartography, introduction to surveying and mapping geographic information, remote sensing image interpretation, etc. |
| 6.2 be able to evaluate the importance of remote sensing surveying and mapping results to society, health, law and culture, national security and territorial integrity, as well as the impact of these constraints on the implementation of the project, and understand the responsibilities to be borne by the remote sensing engineering practice | The basic principles of Marxism, military theory, scientific and technological revolution and social development, Outline of Xi Jinping's new China's socialist ideology, ecological civilization and future city, remote sensing comprehensive practice, graduation project, etc. |
| 7. Environment and sustainable development: be able to discover and analyse the impact of Surveying and mapping engineering practice for complex remote sensing engineering problems on environmental and social sustainable development. | 7.1 know and understand the concept and connotation of environmental protection and sustainable development | Mao Zedong Thought and the theory of socialist system with Chinese characteristics, introduction to surveying and mapping geographic information, introduction to earth science, situation and policy (1-2), physical geography and geomorphology and remote sensing interpretation practice. |
| 7.2 be able to recognize the sustainability of remote sensing engineering practice activities from the perspective of environmental protection and sustainable development, and analyse the possible damage and hidden danger to the environment and society in the production practice of remote sensing engineering | Ecological civilization and future city, surveying and mapping management and laws and regulations, introduction to earth science, introduction to smart city, practice of natural geography and geomorphology and remote sensing interpretation, cartography practice, etc. |
| 8. Professional norms: have humanities and social science literacy, sense of social responsibility, be able to understand and abide by the professional ethics and norms of Surveying and mapping and geographic information industry in the practice of remote sensing engineering, and fulfill the responsibilities. | 8.1 have humanities and social science literacy and healthy physique, and establish correct world outlook, outlook on life and values | Ideological and moral cultivation and legal basis, outline of modern Chinese history, introduction to basic principles of Marxism, introduction to Mao Zedong Thought and socialist system with Chinese characteristics, Outline of Xi Jinping's new China's socialist ideology, military theory, physical education (1-4), military training, classic appreciation and cultural inheritance, philosophical vision and civilization dialogue, scientific and technological revolution and social development. |
| 8.2 understand the professional ethics and norms of the remote sensing industry of honesty, justice and integrity, and consciously abide by them in the practice of remote sensing engineering | College Students' career and development planning, introduction to surveying and mapping geographic information, situation and policy (1-2), digital topographic survey practice, remote sensing comprehensive practice, remote sensing principle practice, etc. |
| 8.3 understand the social responsibility of remote sensing staff for public safety, health, well-being and environmental protection, and be able to consciously perform their responsibilities in remote sensing engineering practice | College Students' career and development planning, introduction to surveying and mapping geographic information, physical geography, remote sensing principle practice, physical geography and geomorphology and remote sensing image interpretation practice, urban remote sensing, etc. |
| 9. Individual and team: be able to play the roles of individual, team member and responsible person in a team with multi-disciplinary background. | 9.1 be able to effectively communicate and cooperate with members of Surveying and mapping, geographic information, computer and other disciplines | Engineering drawing and map recognition, introduction to earth science, computer vision, object-oriented programming, remote sensing image interpretation, etc. |
| 9.2 be able to work independently or cooperatively in a team | Cartography practice, GIS principle practice, remote sensing digital image processing practice, new technology practice, Zetai cup national paper competition, GIS software development competition training. |
| 9.3 be able to organize, coordinate and direct the work of the team | Military training, digital topographic survey practice, digital topographic survey practice, aerospace data acquisition, spatial information comprehensive practice, new technology practice, college surveying and mapping skills competition, etc. |
| 10. Communication: be able to effectively communicate and communicate with the industry and the public on complex remote sensing engineering issues, including writing reports and design manuscripts, making statements, clearly expressing or responding to instructions, and having a certain international vision, and being able to communicate and communicate in a cross-cultural context. | 10.1 be able to accurately express their own views, respond to queries, and understand the differences in communication with peers and the public on remote sensing professional issues in oral, manuscript, chart and other ways. | Urban remote sensing (Bilingual), scientific paper writing (Bilingual), cartography practice, remote sensing digital image processing practice, object-oriented programming practice, remote sensing science and technology innovation practice and scientific research training. |
| 10.2 have a certain international perspective, understand the international cutting-edge development trends and research hotspots in the field of remote sensing, and understand and respect the differences and diversity of different cultures in the world. | College English (1-2), scientific paper writing (Bilingual), urban remote sensing (Bilingual), GIS principles (Bilingual), new aerial remote sensing data processing, etc. |
| 10.3 have the language and written expression ability of cross-cultural communication, and be able to communicate and exchange on remote sensing issues in the cross-cultural context | College English (1-2), spoken English, English national culture, esp, scientific paper writing (Bilingual), urban remote sensing (Bilingual), etc. |
| 11. Project management: understand and master the whole cycle and whole process management principles and economic decision-making methods for the design and implementation of remote sensing engineering projects or products, and be able to apply them in a multidisciplinary environment. | 11.1 master the management and economic decision-making methods involved in the project | Digital topographic survey, modern surveying and mapping technology application, aerospace data acquisition practice, (close range and lidar, mobile measurement, microwave remote sensing) new technology practice. |
| 11.2 understand the cost composition of remote sensing, surveying and mapping engineering and products in the whole cycle and whole process, and understand the engineering management and economic decision-making problems involved in the multi-disciplinary environment | Application of modern surveying and mapping technology, aerospace data acquisition practice, remote sensing comprehensive practice, spatial information comprehensive practice, graduation project, etc. |
| 11.3 be able to apply engineering management and economic decision-making methods in the design and development of remote sensing engineering solutions in a multidisciplinary environment. | Remote sensing technology application, lidar measurement technology and application, modern surveying and mapping technology application, remote sensing application prospect, (close range and lidar, mobile measurement, microwave remote sensing) new technology practice |
| 12. Lifelong learning: have the awareness of self-learning and lifelong learning of new knowledge in remote sensing field, and have the ability to continuously learn and adapt to the development of remote sensing technology. | 12.1 have the awareness of self-learning and lifelong learning, and master the necessary learning methods | College Students' career and development planning, introduction to computational thinking, scientific and technological revolution and social development, remote sensing application prospect, modern surveying and mapping technology application, etc. |
| 12.2 have the ability to understand and transfer knowledge, identify and summarize the new development of remote sensing | Introduction to smart city, remote sensing application prospect, new aerial remote sensing data processing technology, remote sensing image deep learning and intelligent interpretation, graduation project, remote sensing science and technology innovation practice and scientific research training. |

表1 遥感科学与技术专业指导性教学计划

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **课**  **程**  **类**  **别** | **课**  **程**  **属**  **性** | **课程名称** | **学**  **分** | **总**  **学**  **时** | **讲**  **课**  **学**  **时** | **实**  **验**  **学**  **时** | **上**  **机**  **学**  **时** | **课**  **外**  **学**  **时** | **延**  **续**  **学**  **时** | **开课**  **学期** | **教学单位** |
| 通  识  教  育  课 | 必修 | 思想道德修养与法律基础 Thought Morals Accomplishment and Basic Law | 3 | 48 | 32 |  |  | 16 |  | 1 | 马克思主义学院 |
| 中国近现代史纲要 The Outline of the Modern Chinese History | 3 | 48 | 32 |  |  | 16 |  | 2 | 马克思主义学院 |
| 习近平新时代中国特色社会主义思想概论Introduction to Xi Jinping Thought on Socialism with Chinese Characteristics for new era | 2 | 32 | 28 | 4 |  |  |  | 2 | 马克思主义学院 |
| 马克思主义基本原理概论★ The Generality of Basic Principle of Marxism | 3 | 48 | 32 |  |  | 16 |  | 3 | 马克思主义学院 |
| 毛泽东思想和中国特色社会主义体系理论概论★ Introduction to Mao Zedong Thoughts and Theoretical System of the Chinese characteristic socialism | 5 | 80 | 64 |  |  | 16 |  | 4 | 马克思主义学院 |
| 形势与政策  Situation and Policy | 2 | 32 | 16 |  |  | 16 |  | 1-4 | 马克思主义学院 |
| 形势与政策  Situation and Policy | 0 | 32 |  |  |  | 32 |  | 5-8 | 马克思主义学院 |
| 大学生职业生涯与发展规划  College Student Occupation Career and Development Planning | 1 | 16 | 16 |  |  |  |  | 1/2 | 学工部 |
| 大学英语(1-2) ★ English(1-2) | 6 | 128 | 96 |  |  |  | 32 | 1-2 | 文法学院 |
| 口语  oral English training | 2 | 32 | 32 |  |  |  |  | 3 | 文法学院 |
| 大学英语四级强化  CET-4 reinforcement | 2 | 32 | 32 |  |  |  |  | 3 | 文法学院 |
| 大学英语六级提高  CET-6 improvement | 2 | 32 | 32 |  |  |  |  | 3 | 文法学院 |
| 英语报刊选读  Selected English Newspaper Reading | 2 | 32 | 32 |  |  |  |  | 3 | 文法学院 |
| 英语国家文化  English national culture | 2 | 32 | 32 |  |  |  |  | 4 | 文法学院 |
| 英美文学名篇赏析  Appreciation of famous English and American Literature | 2 | 32 | 32 |  |  |  |  | 4 | 文法学院 |
| 专门用途英语  Special English | 2 | 32 | 32 |  |  |  |  | 4 | 文法学院 |
| 升学英语考试  Entrance English test | 2 | 32 | 32 |  |  |  |  | 4 | 文法学院 |
| 体育(1-4)  Physical Education(1-4) | 4 | 120 | 120 |  |  |  |  | 1-4 | 体育部 |
| 计算思维导论  introduction to computational thinking | 1.5 | 56 | 24 |  |  | 32 |  | 1/2 | 电信学院 |
| 小 计 | 35.5 | 720 | 588 | 4 |  | 96 | 32 |  |  |
| 建筑艺术与城市设计 | 2 | 32 |  |  |  |  |  | 1-8 | 各院部 |
| 哲学视野与人文素养 | 2 | 32 |  |  |  |  |  | 1-8 | 各院部 |
| 创新创业与社会发展 | 2 | 32 |  |  |  |  |  | 1-8 | 各院部 |
| 生态文明与智慧科技 | 2 | 32 |  |  |  |  |  | 1-8 | 各院部 |
| 修读4类合计8学分，每类至少修读2学分 | | | | | | | | | |
| 工程实践类 | 1-8学期任选 | | | | | | | | 各院部 |
| 复合培养类 | 1-8学期任选 | | | | | | | | 各院部 |
| 跨类任选至少2学分 | | | | | | | | | | |
| **通识教育课合计至少修读45.5学分，其中通识教育必修35.5学分（其中口语、大学英语四级强化、大学英语六级提高、英语报刊选读必选2学分，英语国家文化、英美文学名篇赏析、专门用途英语、升学英语考试必选2学分），通识教育核心8学分，通识教育任选2学分** | | | | | | | | | | |

| **课**  **程**  **类**  **别** | **课**  **程**  **属**  **性** | **课程名称** | **学**  **分** | **总**  **学**  **时** | **讲**  **课**  **学**  **时** | **实**  **验**  **学**  **时** | **上**  **机**  **学**  **时** | **课**  **外**  **学**  **时** | **延**  **续**  **教**  **学** | **开课**  **学期** | **教学单位** |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 大  类  基  础  课 | 必  修 | 高等数学A（1）★  Advanced Mathematics A(1) | 5 | 92 | 80 |  |  |  | 12 | 1 | 理学院 |
| 高等数学A（2）★  Advanced Mathematics A(2) | 5 | 84 | 80 |  |  |  | 4 | 2 | 理学院 |
| 线性代数  Linear Algebra | 2 | 40 | 32 |  |  |  | 8 | 2 | 理学院 |
| 概率与数理统计B  Theory of Probability and Statistics (B) | 3 | 48 | 44 |  |  |  | 4 | 3 | 理学院 |
| 普通物理A（1）★  College physics A(1) | 3 | 56 | 52 |  |  | 4 |  | 2 | 理学院 |
| 普通物理A（2）★  College physics A(2) | 3 | 56 | 52 |  |  | 4 |  | 3 | 理学院 |
| 物理实验（1-2）  Physics Experiment(1-2) | 2 | 60 |  | 60 |  |  |  | 3-4 | 理学院 |
| C语言程序设计 C Programming Language | 2 | 32 | 24 | 8 |  |  |  | 1 | 地理信息科学系 |
| 地球科学概论Introduction to Earth Science | 2 | 32 | 32 |  |  |  |  | 1 | 地理信息科学系 |
| 测绘地理信息概论 Introduction to 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 |
| 数字地形测量学★ Digital Topographic Surveying | 4 | 64 | 52 | 12 |  |  |  | 2 | 测绘工程系 |
| 地图学Cartography | 3 | 48 | 40 | 8 |  |  |  | 3 | 地理信息科学系 |
| 地理信息系统原理(双语) The Principle of Geographic Information System | 3 | 48 | 40 | 8 |  |  |  | 3 | 地理信息科学系 |
| 遥感原理与应用★ Principles of Remote Sensing | 3 | 48 | 48 |  |  |  |  | 3 | 遥感工程系 |
| **小 计** | **43** | **756** | **608** | **112** |  | **8** | **28** |  |  |
| 选  修 | 现代测绘技术应用  Application of Modern Surveying and Mapping Technology | 1 | 16 | 16 |  |  |  |  | 2 | 测绘工程系 |
| GIS基础应用技能GIS base Application Skill | 1 | 16 | 8 | 8 |  |  |  | 2 | 地理信息科学系 |
| 遥感应用前景Remote Sensing Application Prospect | 1 | 16 | 16 |  |  |  |  | 3 | 遥感工程系 |
| **小 计** | **3** | **48** | **40** | **8** |  |  |  |  |  |
| **大类学科基础课合计 44学分，必修43 学分，选修1学分** | | | | | | | | | | |
| 专  业  核  心  课 | 必  修 | 航空航天数据获取Aerospace data acquisition | 2 | 32 | 28 | 4 |  |  |  | 4 | 遥感工程系 |
| 城市遥感（双语）Urban Remote Sensing | 3 | 48 | 40 | 8 |  |  |  | 6 | 遥感工程系 |
| 摄影测量学Photogrammetry | 3 | 48 | 44 | 4 |  |  |  | 5 | 遥感工程系 |
| 遥感数字图像处理Digital Image Processing | 3 | 48 | 40 | 8 |  |  |  | 5 | 遥感工程系 |
| 计算机视觉Computer vision | 3 | 48 | 40 | 8 |  |  |  | 6 | 遥感工程系 |
| **小计** | **14** | **224** | **192** | **32** |  |  |  |  |  |
|  | **专业核心课合计必修14学分** | | | | | | | | | | |
| 专  业  方  向  课 | 必  修 | 面向对象程序设计 object oriented programming | 2 | 32 | 32 |  |  |  |  | 4 | 遥感工程系 |
| 误差理论与测量平差基础 Fundamentals of Error Theory and Surveying Adjustment | 3 | 48 | 48 |  |  |  |  | 4 | 测绘工程系 |
| 测绘管理与法律法规Surveying  Management and Laws | 1 | 16 | 16 |  |  |  |  | 6 | 测绘工程系 |
| **小 计** | **6** | **96** | 96 | 0 |  |  |  |  |  |
| 任  选 | 遥感技术应用(研讨式教学)（限选）Applications of Remote Sensing in different fields（seminar） | 2 | 32 | 16 | 16 |  |  |  | 6 | 遥感工程系 |
| 激光雷达测量技术与应用（限选）Laser radar Surveying Technology | 2 | 32 | 24 | 8 |  |  |  | 6 | 遥感工程系 |
| GNSS原理及其应用（限选）GNSS principle and application | 2 | 32 | 28 | 4 |  |  |  | 5 | 测绘工程系 |
| 近景摄影测量（限选）Close Range Photogrammetry | 2 | 32 | 26 | 6 |  |  |  | 6 | 遥感工程系 |
| 微波遥感（限选）Microwave Remote Sensing | 2 | 32 | 32 |  |  |  |  | 5 | 遥感工程系 |
| 大地测量学基础Geodesy Fundamental | 2 | 32 | 24 | 8 |  |  |  | 4 | 测绘工程系 |
| 遥感图像解译（限选） Remote sensing image interpretation | 1.5 | 24 | 24 |  |  |  |  | 6 | 遥感工程系 |
| 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 |
| 工程制图与识图（限选） Engineering Drawing and Interpreting | 3 | 48 | 48 |  |  |  |  | 6 | 理学院 |
| 空间数据库  Spatial Database | 2 | 32 |  |  |  |  |  | 5 | 地理信息科学系 |
| 数据结构 Data structure | 2 | 32 |  |  |  |  |  | 4 | 遥感工程系 |
| 移动道路测量技术及应用Technology and Application of Mobile Mapping System | 1 | 16 | 8 | 8 |  |  |  | 7 | 地理信息科学系 |
| 计算机图形学（限选）Computer Graphics | 2 | 32 |  |  |  |  |  | 5 | 地理信息科学系 |
| 高光谱遥感Hyperspectral remote sensing | 2 | 32 | 24 | 8 |  |  |  | 6 | 遥感工程系 |
| 科技论文写作（双语）Academic Writing (Billinguish) | 1 | 16 | 16 |  |  |  |  | 6 | 遥感工程系 |
| 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 | 遥感工程系 |
| 智慧城市导论（限选）Introduction to smart city | 1 | 16 | 16 |  |  |  |  | 6 | 地理信息科学系 |
| 遥感软件（限选）Remote Sensing Software | 2 | 32 | 16 | 16 |  |  |  | 4 | 遥感工程系 |
| GIS软件使用 GIS Software | 2 | 32 | 16 | 16 |  |  |  | 4 | 地理信息科学系 |
| 可视化语言IDL The Language IDL | 2 | 32 | 16 | 16 |  |  |  | 5 | 遥感工程系 |
| Python程序设计 Python Programming | 2 | 32 | 16 | 16 |  |  |  | 6 | 遥感工程系 |
| 自然资源调查与监测 Geographic Conditions Monitoring | 1.5 | 24 | 16 | 8 |  |  |  | 7 | 地理信息科学系 |
| 大数据与地理信息系统 Big data and GIS | 1.5 | 24 | 16 | 8 |  |  |  | 6 | 地理信息科学系 |
| **小 计** | **42.5** | **680** | **542** | **138** |  |  |  |  |  |
| **专业方向课合计27 学分，必修6学分，任选 21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**  **程**  **属**  **性** | **课程名称** | | **学**  **分** | **折**  **合**  **学**  **时** | **实**  **验**  **实**  **践** | **上**  **机** | **开课**  **学期** | **开设**  **周次** | **教学单位** |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 课  内 | 军事理论  Military Theory | | 2 | 32 |  |  | 1 | 1-3 | 武装部 |
| 军训  Military Training | | 2 | 40 |  |  |
| 数字地形测量实习Digital Topographic Surveying Practice | | 3 | 60 | 60 |  | 2 | 18-20 | 测绘工程系 |
| 地图学实习Cartography Practice | | 2 | 40 | 40 |  | 3 | 17-18 | 地理信息科学系 |
| 摄影测量学实习Photogrammetry Fundamental Practice | | 1 | 20 | 20 |  | 5 | 18 | 遥感工程系 |
| 地理信息系统原理实习The Principle of Geographic Information System Practice | | 2 | 40 | 40 |  | 3 | 19-20 | 地理信息科学系 |
| 遥感数字图像处理实习Digital Image Processing Practice | | 2 | 40 | 40 |  | 5 | 19-20 | 遥感工程系 |
| 计算机视觉实习Computer vision practice | | 1 | 20 | 20 |  | 6 | 17 | 遥感工程系 |
| 空间信息综合实习 Spatial Information Practice | | 5 | 100 | 100 |  | 7 | 1-5 | 测绘学院 |
| 遥感综合实习Remote Sensing Comprehensive  Practice | | 3 | 60 | 60 |  | 7 | 18-20 | 遥感工程系 |
| 遥感原理与应用实习Principles and Applications of Remote Sensing Practice | | 1 | 20 | 20 |  | 4 | 18 | 遥感工程系 |
| 自然地理地貌及遥感图像解译实习Natural geography and remote sensing image interpretation Practice | | 1 | 20 | 20 |  | 6 | 16 | 遥感工程系 |
| （近景与激光雷达、移动测量、微波遥感）新技术实习New technology Practice | | 2 | 40 | 40 |  | 7 | 16-17 | 遥感工程系 |
| 面向对象程序设计实习Object oriented programming Practice | | 2 | 40 | 40 |  | 4 | 19-20 | 遥感工程系 |
| 毕业设计Undergraduate Design or Thesis | | 8 | 320 | 320 |  | 8 | 1-16 | 遥感工程系 |
| **小 计** | | **37** | **892** | **820** |  |  |  |  |
| 课  外 |  | |  |  |  |  |  |  |  |
| 创新实践及科研训练 | 遥感科学与技术创新实践及科研训练 | 2 | 40 | 40 |  |  |  | 遥感工程系 |
| 全国论文大赛 National Paper Contest | 1 | 20 | 20 |  |  |  | 遥感工程系 |
| GIS软件开发大赛实训 GIS Software Development Practice | 1 | 20 | 20 |  |  |  | 地理信息科学系 |
| 学院测绘技能大赛 School of Surveying and Mapping Skills Contest | 1 | 20 | 20 |  |  |  | 测绘工程系 |
| 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** |  |  |  |  |
| **实践环节合计39 学分，其中课内37 学分，课外 2 学分（创新实践及科研训练必修2学分）** | | | | | | | | | |