测绘工程专业培养方案

专业名称与代码：测绘工程（081201）

专业培养目标：

本专业培养具有爱国情怀与高度社会责任感，具有优秀人文素养、深厚的数理基础、扎实的测绘专业能力，能在国家基础测绘、城市和工程建设、交通、航空航天、资源勘探与开发、自然资源调查与管理、环境保护、灾害监测与预警等诸多领域从事测绘工程设计、实施、管理等方面工作的测绘学科创新型技术人才。

培养目标分解如下：

目标1：具有良好的自然科学与人文科学素养，具备数学、计算机、外语、经济、管理等方面的应用基础，系统地掌握测绘工程专业基本理论、基础知识与技能，经过实践，具备工程师的基本素质；

目标2：具有高尚的职业道德和高度的社会责任感，熟悉并掌握国家测绘及相关法律、法规和规章；

目标3：具有继续学习能力，了解国际、国内测绘技术发展状况，具有较丰富的专业知识和技术工作经验，能够处理较复杂的技术问题；

目标4：具备能成为地质调查与勘探、地质灾害防治、能源交通等领域及其他行业测绘工作骨干的能力；

目标5：能熟练运用各种技术手段，完成测绘项目技术设计、咨询、评估及测绘成果质量检验管理；具有组织实施测绘项目的能力。

专业毕业要求：

1.**工程知识：**具有扎实的数学、计算机、自然科学、工程基础科学知识和测绘专业知识，以及基本的经济和管理知识，能够将其应用于测绘工程实践，并可用于解决测绘领域的复杂工程问题。

1-1 掌握数学、自然科学与工程基础类知识，能将其用于测绘工程问题的建模和求解。

1-2 具备测绘基准体系、地理空间信息采集与处理等专业知识，能将其用于解决相关复杂工程问题。

1-3 具备专业知识，能选择恰当的数学模型，用于描述复杂测绘工程问题，对模型进行推理和求解。

2.**问题分析：**具有发现问题、分析问题的能力，具有开拓创新的意识，能够通过文献检索、资料查询及现代信息技术获取的信息，对测绘领域中的复杂工程问题进行分析和研究。

2-1 能够将数学与自然科学的基本理论和知识运用到复杂测绘工程实践之中。

2-2 能从数学与自然科学的角度分析复杂测绘工程问题，并能给出解决方案。

2-3 能够应用文献检索与分析方法，寻求复杂测绘工程问题解决方案。

2-4 能够对复杂测绘工程问题解决方案进行研究、分析，论证解决方案的合理性。

3.**设计/开发解决方案：**能够针对复杂测绘工程问题设计出体现创新意识，并考虑人文、社会、安全、法律和环境等因素的解决方案，设计满足地质、交通、能源、国土规划等行业工程特定测绘需求的工作方案，并通过测试或实验分析其可行性。

3-1 能根据复杂测绘工程需求，制订方案设计目标。

3-2 能够根据方案设计目标，设计、开发满足特定工程需求的技术解决方案，并能体现创新意识。

3-3 在设计、开发的测绘技术解决方案中，能综合考虑社会、健康、安全、法律、文化以及环境等因素。

4.**研究：**能够基于科学原理并采用科学方法对测绘领域的复杂工程问题开展专业设计、实验、数据分析等研究工作，并通过信息综合得到合理有效的结论。具有从事科学研究和技术开发的初步能力。

4-1 能够运用科学原理对复杂测绘工程中的问题提出具有创新性的研究方案和技术路线。

4-2 能够基于专业理论对研究方案进行实验、可行性分析和精度评估。

4-3 能够基于科学方法，按照技术路线进行实验组织、数据获取和数据处理。

4-4 能够对实验数据进行分析与评价，得到合理有效的结论。具有从事科学研究和技术开发的初步能力。

5.**现代工具使用：**能够针对复杂测绘工程问题，开发、选择与使用恰当的技术、资源、现代工程工具和信息技术工具，开展分析和模拟研究，并总结分析其适用性与局限性。

5-1 能够针对复杂测绘工程，选择合适的现代测绘技术和测绘仪器。

5-2 能够使用现代测绘仪器和信息技术完成测绘数据采集、数据处理与精度分析。

5-3 能够将现代工具应用于复杂测绘工程问题的分析研究。

5-4 能选用恰当的技术、资源、信息技术工具，针对复杂测绘工程问题进行建模、仿真及模拟，并分析其适用性与局限性。

6.**工程与社会：**熟悉测绘法律法规、行业技术标准与规范、知识产权。能够基于工程相关背景知识进行合理分析，评价测绘工程实践和复杂工程问题解决方案对社会、健康、安全、法律以及文化等方面的影响，并理解应承担的责任。

6-1 基于工程相关背景知识，分析和评价测绘工程设计方案的合理性。

6-2 熟悉测绘工程专业的技术标准与规范、知识产权和法律法规。

6-3 能够分析测绘工程设计方案对社会的影响，评价测绘工程设计方案的合理性。

6-4 能够评价复杂测绘工程方案实施过程中对社会、健康、安全、法律及文化的影响，并理解应承担的责任。

7.**环境和可持续发展：**了解环境保护和社会可持续发展的相关政策与法律法规，能够理解和评价针对测绘复杂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 了解环境保护和社会可持续发展的相关政策与法律法规。

7-2 能够理解和评价针对测绘复杂工程问题的测绘工程实践对环境的影响。

7-3 能够理解和评价针对测绘复杂工程问题的测绘工程实践对社会可持续发展的影响

8.**职业规范：**具有良好的人文社会科学知识和素养，包括思想道德素质、政治素质、科学素质、人文素质、心理和身体素质，践行社会主义核心价值观。能够在测绘工程实践中理解并遵守职业道德和规范，履行责任。

8-1 具有良好的人文社会科学知识和素养。

8-2 理解测绘工作维护国家利益的重要作用，践行社会主义核心价值观，具有社会责任感。

8-3 理解并遵守测绘行业职业道德。

8-4 理解并遵守测绘行业执业规范。

9.**个人和团队：**能够在多学科背景下的团队中承担个体、团队成员以及负责人的角色。理解测绘及相关学科背景下团结协作的重要性，能够倾听并尊重他人的意见，具有一定的组织、协调能力与较强的团队协作意识。

9-1 具有团队精神，理解测绘与多学科背景下团结协作的重要性。

9-2 能够理解个人与团队的关系、个人在团队中的角色定位，胜任团队中不同的角色并承担相应职责。

9-3 能够倾听并尊重他人的意见，具有一定的组织、协调能力与较强的团队协作意识。

10.**沟通：**能够就复杂测绘工程问题与业界同行及社会公众进行有效沟通和交流，包括撰写报告和设计文档、陈述发言、清晰表达或回应指令。具有较强的英语综合运用能力，能熟练阅读本专业的英文技术文献。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 能够就复杂测绘工程撰写工程设计书、技术总结和陈述发言。

10-2 能够就复杂测绘工程问题，以多种方式与业界同行及社会公众进行沟通和交流。

10-3 具备外文信息获取、沟通与表达能力，能够在跨行业、跨文化背景下进行沟通与交流。

10-4 对测绘领域国际发展状况有基本的了解，并能准确表达自己的观点。

11.**项目管理：**具有较强的工程项目组织、管理与执行能力。理解并掌握工程管理原理与经济决策方法，并能够在地质、交通、能源、国土规划等多行业和学科下的测绘工程实践中应用。

11-1 理解测绘工程项目在工程中的地位和作用。

11-2 能够将测绘工程管理的原理和经济决策的方法应用于测绘工程项目。

11-3 能够在多学科环境中应用测绘工程管理与经济决策的技术和方法。

12.**终身学习：**具有自主学习和终身学习的意识，有不断学习和适应发展的能力。

12-1 能认识到不断探索和学习的必要性，具有自主学习和终身学习的意识。

12-2 能够选择适当的途径和方法不断学习。

12-3 了解测绘学科和相关技术与理论的重要进展和前沿动态，具有适应发展的能力。

毕业要求对培养目标的支撑

为了支持培养目标的达成，测绘工程专业人才培养方案对毕业生应具备的知识、能力和素质进行了清楚阐述，对照《工程教育专业认证标准》提出了 12 项具体毕业要求。测绘工程专业毕业要求支撑培养目标实现的矩阵图如表《毕业要求与培养目标的支撑关系表》所示。

毕业要求与培养目标的支撑关系表

序号	毕业要求	毕业要求分解	培养目标				
			目标1	目标 2	目标 3	目标 4	目标 5
1	毕业要求 1	1-1	√				
2		1-2	√				
3		1-3	√				
4	毕业要求 2	2-1	√				√
5		2-2	√		√	√	√
6		2-3			√		
7		2-4			√	√	
8	毕业要求 3	3-1				√	
9		3-2			√	√	
10		3-3	√	√			
11	毕业要求 4	4-1	√		√	√	
12		4-2	√			√	
13		4-3	√		√	√	
14		4-4			√	√	
15	毕业要求 5	5-1			√	√	
16		5-2	√		√	√	
17		5-3			√	√	
18		5-4			√	√	√
19	毕业要求 6	6-1				√	
20		6-2		√			√
21		6-3	√	√		√	
22		6-4	√	√		√	
23	毕业要求 7	7-1		√	√		

24		7-2		√	√		
25		7-3		√	√		
26	毕业要求 8	8-1	√	√			
27		8-2		√	√		
28		8-3		√			
29		8-4		√			
30	毕业要求 9	9-1	√	√			
31		9-2	√	√			√
32		9-3		√			√
33	毕业要求 10	10-1			√	√	√
34		10-2	√		√	√	√
35		10-3	√		√	√	
36		10-4			√		
37	毕业要求 11	11-1			√	√	
38		11-2	√	√		√	
39		11-3	√			√	√
40	毕业要求 12	12-1			√		
41		12-2			√		
42		12-3			√		

毕业要求实现及途径：

序号	毕 业 要 求	实现途径（教学过程）
1	1.具有扎实的数学、计算机、自然科学和工程科学知识，以及基本的经济和管理知识，能够将其应用于测绘工程实践，并可以用于解决测绘领域的复杂工程问题。（工程知识）	**①课程教学：**高等数学 A、线性代数 A、概率论与数理统计 A、大学物理 C、数据结构、计算机高级语言程序设计(C/C++)、计算机高级语言课程设计（C/C++）、数据结构课程设计 A、Linux 技术与测绘程序设计、地球科学概论、建筑制图、测绘法律法规与项目管理、GNSS 原理及其应用 A、测绘软件设计与开发、测绘数据处理、大地测量学基础、地图投影与算法实现、工程测量学 A、海洋测绘、文献检索与科技论文写作、误差理论与测量平差、数字地形测量学、工程测量学教学实习、激光雷达技术、精密工业测量、卫星导航算法与实现等课程。 **②课外学习：**参与挑战杯、全国大学生数学建模竞赛、美国大学生数学建模竞赛、全国大学生数学竞赛、湖北省大学生物理实验创新设计竞赛、全国大学生海洋知识竞赛等活动。
2	2.具有发现问题、分析问题的能力，具有开拓创新的意识，能够通过文献检索、资料查询及现代信息技术获取的信息，对测绘领域中的复杂工程问题进行分析和研究。（问题分析）	**①课程教学：**开设社会调查、文献检索与科技论文写作、学科前沿知识讲座、毕业设计（论文）、Linux 技术与测绘程序设计、变形监测与数据处理、测绘工程监理与招投标、测绘软件设计与开发、测绘数据处理、大地测量学基础、地图投影与算法实现、工程测量学 A、雷达干涉测量、摄影测量学、文献检索与科技论文写作、误差理论与测量平差、数字地形测量学、工程测量学教学实习、激光雷达技术、精密工业测量等课程。 **②课外学习：**鼓励学生参加计算机等级考试和软件工程师考试。

序号	毕 业 要 求	实现途径（教学过程）
3	3.能够针对复杂测绘工程问题设计出体现创新意识，并考虑人文、社会、安全、法律和环境等因素的解决方案，设计满足地质、交通、能源、国土规划等行业工程特定测绘需求的工作方案，并通过测试或实验分析其可行性。（设计/开发解决方案）	**①课程教学：**Linux 技术与测绘程序设计、变形监测与数据处理、不动产测量与管理、测绘工程监理与招投标、测绘软件设计与开发、测绘数据处理、地图投影与算法实现、工程测量学 A、摄影测量学、数字测图、文献检索与科技论文写作、误差理论与测量平差、摄影测量教学实习、GNSS 教学实习、大地测量教学实习、数字地形测量教学实习、精密工业测量、卫星导航算法与实现等课程 **②课外学习：**组织学生到学校的实习基地实习和参加企事业单位的生产实习，组织学生参加学科竞赛，邀请校内外专家来校做工程技术讲座和学科前沿讲座等。
4	4.能够基于科学原理并采用科学方法对测绘领域的复杂工程问题开展专业设计实验、数据分析等研究工作，并通过信息综合得到合理有效的结论。具有从事科学研究和技术开发的初步能力。（研究）	**①课程教学：**GNSS 原理及其应用 A、变形监测与数据处理、不动产测量与管理、测绘工程监理与招投标、测绘软件设计与开发、测绘数据处理、大地测量学基础、雷达干涉测量、摄影测量学、数字测图、文献检索与科技论文写作、误差理论与测量平差、数字地形测量学、摄影测量教学实习、激光雷达技术、精密工业测量、卫星导航算法与实现、毕业设计（论文）、学科前沿知识讲座和 3S 论坛等。 **②课外学习：**每年开展产学研活动、组织专业学生申报大学生创新创业项目、组织学生参加学科竞赛，举办学术报告和学科前沿讲座等。

序号	毕 业 要 求	实现途径（教学过程）
5	5.能够针对复杂测绘工程问题，开发、选择与使用恰当的技术、资源、现代工程工具和信息技术工具，开展分析和模拟研究，并总结分析其适用性与局限性。（现代工具使用）	①**课程教学：**Linux 技术与测绘程序设计、不动产测量与管理、测绘工程监理与招投标、大地测量学基础、海洋测绘、雷达干涉测量、摄影测量学、数字测图、误差理论与测量平差、专业英语阅读、数字地形测量学、摄影测量教学实习、GNSS 教学实习、大地测量教学实习、数字地形测量教学实习、工程测量学教学实习、激光雷达技术、精密工业测量、卫星导航算法与实现、遥感图像解译、遥感图像处理，毕业实习和毕业设计 GNSS 原理及其应用 A。 ②**课外学习：**组织学生参考各种学科竞赛如“挑战杯”，创新实验计划、测绘技能比赛，组织学生参加大学生科研项目、产学研等。
6	6.熟悉测绘法律法规、行业技术标准与规范、知识产权。能够基于工程相关背景知识进行合理分析，评价测绘工程实践和复杂工程问题解决方案对社会、健康、安全、法律以及文化等方面的影响，并理解应承担的责任。（工程与社会）	①**课程教学：**变形监测与数据处理、不动产测量与管理、测绘工程监理与招投标、数字测图、激光雷达技术、精密工业测量、卫星导航算法与实现、思想道德修养和法律基础、测绘法律法规与项目管理等课程。 ②**课外学习：**社会调查、参观企事业单位、参观三峡和隔河岩大坝等，校外专家讲座。
7	7.了解环境保护和社会可持续发展的相关政策与法律法规，能够理解和评价针对测绘复杂工程问题的测绘工程实践对环境、社会可持续发展的影响。（环境和可持续发展）	①**课程教学：**思想道德修养和法律基础、生态学概论、测绘管理与法律法规、测绘工程监理与招投标、地球科学概论、变形监测与数据处理、测绘学概论、工程测量学 A、海洋测绘、雷达干涉测量等课程。 ②**课外学习：**社会调查、组织学生参加环境保护宣传和公益活动、参观企事业单位，校外专家讲座。

序号	毕 业 要 求	实现途径（教学过程）
8	8.具有良好的人文社会科学知识和素养，包括思想道德素质、政治素质、科学素质、人文素质、心理和身体素质，践行社会主义核心价值观。能够在测绘工程实践中理解并遵守职业道德和规范，履行责任。（职业规范）	**①课程教学：**思想道德修养和法律基础、变形监测与数据处理、不动产测量与管理、测绘工程监理与招投标、工程测量学 A、GNSS 教学实习、大地测量教学实习、数字地形测量教学实习、工程测量学教学实习、测绘法律法规与项目管理等课程。 **②课外学习：**组织学生参加各种测量实习、课程设计、毕业设计（论文）、社会实践、社会调查、大学生科技活动；号召学生参加学生社团、担任学生干部，“大学生青年艺术节”、“高雅艺术进校园”等主题教育活动，开展测绘仪器技能大赛、运动会、演讲比赛、风采展示、社区文化节等校园文化活动。
9	能够在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。理解测绘及相关学科背景下团结协作的重要性，能够倾听并尊重他人的意见，具有一定的组织、协调能力与较强的团队协作意识。（个人和团队）	**①课程教学：**Linux 技术与测绘程序设计、不动产测量与管理、测绘工程监理与招投标、大地测量学基础、海洋测绘、摄影测量学、数字测图、误差理论与测量平差、摄影测量教学实习、GNSS 教学实习、大地测量教学实习、数字地形测量教学实习等课程。 **②课外学习：**以团队形式组织学生参加各种测量实习、课程设计、社会实践、社会调查、大学生科技活动；号召学生参加学生社团、担任学生干部，开展测绘仪器技能大赛、运动会、社区文化节等校园文化活动。

序号	毕 业 要 求	实现途径（教学过程）
10	10.能够就复杂测绘工程问题与业界同行及社会公众进行有效沟通和交流，包括撰写报告和设计文档、陈述发言、清晰表达或回应指令。具有较强的英语综合运用能力，能熟练阅读本专业的英文技术文献。具备一定的国际视野，能够在跨文化背景下就行沟通和交流。（沟通交流）	①**课程教学：**开设大学英语Ⅰ-Ⅳ，第二外语选修、专业英语阅读、Linux 技术与测绘程序设计、变形监测与数据处理、测绘学概论、大地测量学基础、工程测量学 A、雷达干涉测量、文献检索与科技论文写作、摄影测量教学实习、GNSS 教学实习、大地测量教学实习、数字地形测量教学实习等课程。 ②**课外学习：**大学生英语竞赛、数学建模、设计大赛和演讲比赛、中西文化月、英语等级考试、计算机等级考试，推荐学生加入创新人才计划、李四光计划、将军计划，选派学生和教师到国外参加国际会议，邀请国外专家来校讲座。
11	11.具有较强的工程项目组织、管理与执行能力。理解并掌握工程管理原理与经济决策方法，并能够在地质、交通、能源、国土规划等多行业和学科下的测绘工程实践中应用。（项目管理）	①**课程教学：**测绘法律法规与项目管理、不动产测量与管理、测绘工程监理与招投标、海洋测绘、雷达干涉测量、误差理论与测量平差、等课程。 ②**课外学习：**组织学生利用假期参加各种测量生产实践、社会实践，每名毕业生均需完成毕业生产实习，邀请有项目管理经验的专家讲座。
12	12.具有自主学习和终身学习的意识，有不断学习和适应发展的能力。（终身学习）	①**课程教学：**不动产测量与管理、Linux 技术与测绘程序设计、变形监测与数据处理、测绘学概论、工程测量学 A、雷达干涉测量、摄影测量学、数字测图、文献检索与科技论文写作、专业英语阅读等课程。 ②**课外学习：**参观三峡和隔河岩大坝等单位，通过心理健康主题教育、安全教育等校园文化活动、学风建设、考风教育等活动提高学生的适应发展等能力，通过创新人才计划、李四光计划和海外游学培养方式为学生提供继续学习的机会。

主干学科：

测绘科学与技术。

专业核心课程：

数字地形测量学、数字测图、误差理论与测量平差基础、大地测量学基础、摄影测量学、GNSS 原理及其应用 A、遥感原理与应用、地理信息系统原理、工程测量学 A、测绘软件设计与开发、地质灾害应急测绘。

主要专业实验：

1.测绘仪器使用：

水准仪、全站仪、测斜仪、GNSS 接收机、三维激光扫描仪、无人机航测平台等测绘仪器的使用。

2.测绘系统平台使用：

数字测图、GNSS、摄影测量、遥感、地理信息系统等测绘系统平台的使用。

3.测绘应用软件开发：

卫星导航算法与实现、地图投影与算法实现、测绘软件设计与开发。

主要实践性教学环节：

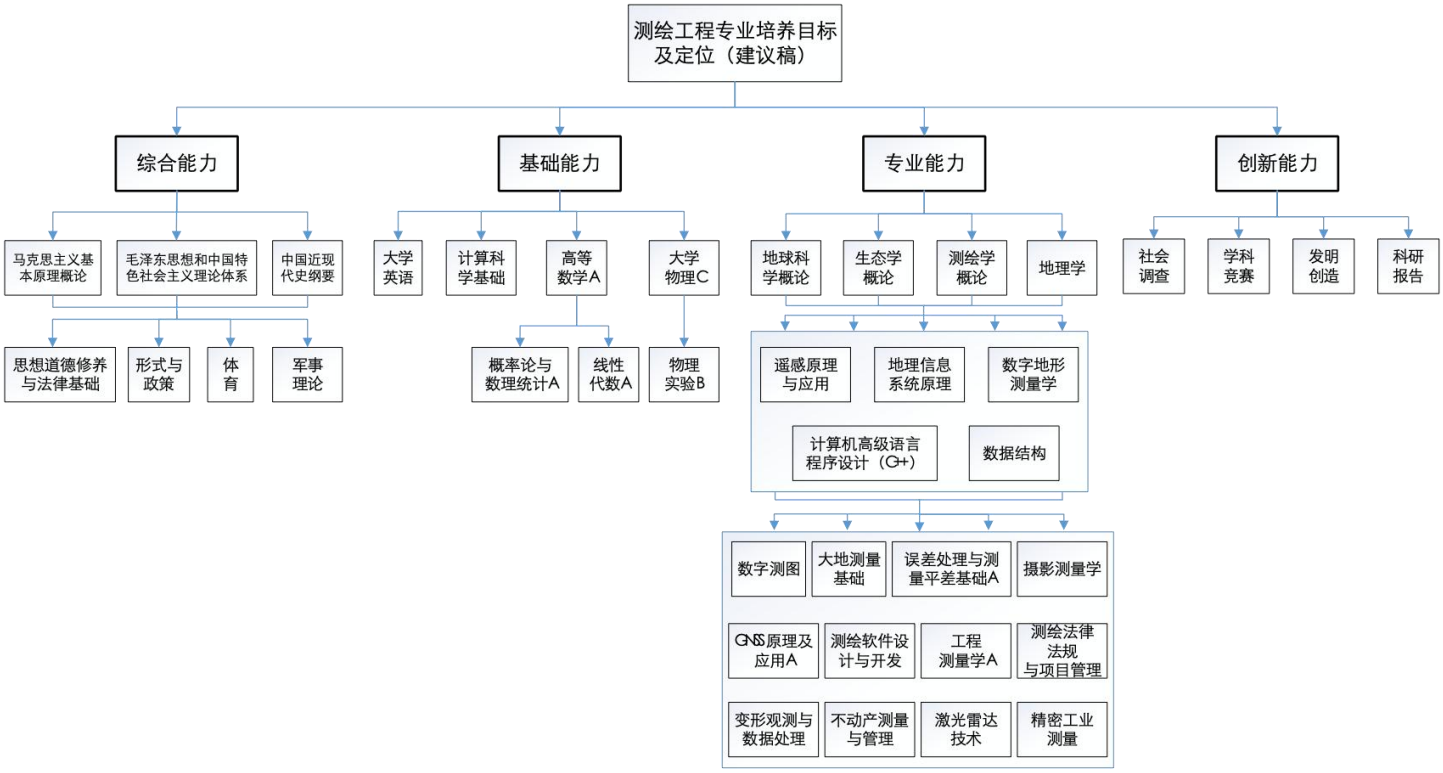
1. 计算机高级语言课程设计（C/C++）	3 周
2. 数据结构课程设计	3 周
3. 地理信息系统实习	2 周
4. 遥感原理与应用教学实习	2 周
5. 自然地理与地质学实习	2 周
6. 数字地形测量教学实习	3 周
7. 数字测图教学实习	6 周
8. 摄影测量教学实习	3 周
9. 大地测量教学实习	3 周
10. GNSS 教学实习	3 周
11. 工程测量教学实习	1 周
12. 测绘工程生产实践	4 周

毕业学分要求：172。

学制与学位：四年，工学学士。

本专业学生可以辅修的其他专业：土木工程、地图制图学与地理信息工程、导航工程、土地资源管理、空间信息与数字技术。

相近专业：遥感科学与技术、地理国情监测。


测绘工程专业培养目标及定位（建议稿）
综合能力
基础能力
专业能力
创新能力
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理论体系
中国近现代史纲要
思想道德修养与法律基础
形式与政策
体育
军事理论
大学英语
计算科学基础
高等数学A
大学物理C
概率论与数理统计A
线性代数A
物理实验B
地球科学概论
生态学概论
测绘学概论
地理学
遥感原理与应用
地理信息系统原理
数字地形测量学
计算机高级语言程序设计（C+）
数据结构
数字测图
大地测量基础
误差处理与测量平差基础A
摄影测量学
GNSS原理及应用A
测绘软件设计与开发
工程测量学A
测绘法律法规与项目管理
变形观测与数据处理
不动产测量与管理
激光雷达技术
精密工业测量
社会调查
学科竞赛
发明创造
科研报告

Program for Surveying and Mapping Engineering

Specialty and Code: Surveying and Mapping Engineering (081201)

Education Objective:

The objective of this program is to cultivate innovative technical talents of surveying and mapping, who have patriotic feelings and a high sense of social responsibility, excellent humanistic quality, profound mathematical foundation and solid professional skill in surveying and mapping, and capability of working in surveying and mapping engineering design, implementation, management, etc. They can work in areas such as national fundamental surveying and mapping, city and engineering construction, transportation, aerospace, resource exploration and development, natural resources investigation and management, environmental protection, disaster monitoring and early warning, etc.

The cultivation objectives are decomposed as follows:

Objective 1: The graduates should have a solid natural science and humanities literacy, with mathematics, computer, foreign language, economics, management and other aspects of application, master the basic theory, basic knowledge and skills of surveying and mapping engineering skillfully. And after practice, they should have the basic qualities of engineers;

Objective 2: The graduates should have a noble professional ethic and strong sense of social responsibility, be familiar with and master the related laws, regulations and rules of national surveying and mapping;

Objective 3: The graduates should have the ability of continuous learning, understand the development of international and domestic surveying and mapping technologies, have abundant professional knowledge and technical work experience, and be able to handle complicated technical problems;

Objective 4: The graduates should have the ability to become a backbone of surveying and mapping in geological surveys and exploration, prevention of geological disaster, energy transportation, and other industries;

Objective 5: Five years after graduation, graduates can skillfully use various technical methods to complete the technical design, consultation, evaluation and quality inspection management of surveying and mapping projects; and have the ability to organize surveying and mapping projects.

Graduation Requirements:

1. Engineering Knowledge: The graduates should have solid knowledge of mathematics, computers, natural sciences, and engineering science, as well as fundamental economic and

management knowledge. They should also have the capability to apply their knowledge to surveying engineering practice and solve complex engineering problems in the field of surveying and mapping.

1-1 The graduates should have basic knowledge of mathematics, natural sciences, and engineering science, and can apply their knowledge to solve complex engineering problems.

1-2 The graduates should have professional knowledge of surveying and mapping basic system, geospatial information collection and processing, and can apply their knowledge to solve related complex engineering problems.

1-3 The graduates should have professional knowledge and can choose appropriate mathematical models to describe, inference and solve complex surveying and mapping engineering problems.

2. Problem Analysis: The graduates should have the capability of finding and analyzing problems, and awareness of innovation. They should also be capable of analyzing and studying the complex engineering problems in the field of surveying and mapping with information that obtained by literature search, data query, and modern information technology.

2-1 The graduates should have the capability to apply the basic theory and knowledge of mathematics and natural science to the practice of complex surveying and mapping engineering.

2-2 The graduates should have the capability to analyze complex surveying and mapping engineering problems from the perspective of mathematics and natural science, and can give solutions.

2-3 The graduates should have the capability to apply literature retrieval and analysis methods to find solutions to complex surveying and mapping engineering problems.

2-4 The graduates should have the capability to study and analyze the solutions to complex surveying and mapping engineering problems, and demonstrate the rationality of the solutions.

3. Design/Develop Solutions: The graduates should have the capability to design solutions that embody innovation and consider humanities, society, security, law and environmental factors for complex surveying and mapping engineering problems. They should also be capable of designing work plans that meet the specific surveying and mapping demands of industries such as geology, transportation, energy, and territorial planning, and analyzing their feasibility by testing or experiments.

3-1 The graduates should have the capability to formulate the design objectives according to the needs of complex surveying and mapping projects.

3-2 The graduates should have the capability to design and develop technical solutions to meet specific engineering needs according to the design objectives of the scheme, and then

embody innovative consciousness.

3-3 In the design and development of mapping technology solutions, social, health, safety, legal, cultural and environmental factors can be considered comprehensively.

4. Research: The graduates should have the capability to carry out professional experiment design, data analysis and other research works on complex engineering problems in the field of surveying and mapping based on scientific principles and scientific method, and obtain reasonable and effective conclusions through information synthesis s. They should also have the initial ability to engage in scientific research and technological development.

4-1 The graduates should have the capability to use scientific principles to propose innovative research programs and technical routes for complex surveying and mapping projects.

4-2 The graduates are expected to have the capability to conduct experiments, feasibility analysis and precision evaluation of research programs based on professional theories.

4-3 The graduates should have the capability to conduct experimental organization, data acquisition and data processing according to technical routes based on scientific methods.

4-4 The graduates should have the capability to analyze and evaluate the experimental data, obtaining reasonable and effective conclusions. They are expected to have the preliminary ability to engage in scientific research and technological development.

5. Usage of Modern Tools: The graduates should have the capability to carry out analysis and simulation studies by developing, choosing and using appropriate technologies, resources, modern engineering tools and information technology tools for complex engineering problems of surveying and mapping, and, and summarize their applicability and limitations.

5-1 The graduates should have the capability to select suitable modern surveying and mapping technology and surveying and mapping instruments for complex surveying and mapping engineering.

5-2 The graduates should have the capability to use modern surveying and mapping instruments and information technology to complete surveying and mapping data collection, data processing and precision analysis.

5-3 The graduates should have the capability to apply modern tools to the analysis and research of complex surveying and mapping engineering problems.

5-4 The graduates should have the capability to choose appropriate technology, resource and information technology tools, conduct modeling, emulation and simulation for complex surveying and mapping engineering problems, and analyze their applicability and limitations.

6. Engineering and Society: The graduates should be familiar with surveying and mapping laws and regulations, industry technical standards and norms, and intellectual property rights. They should also have the capability to conduct reasonable analysis based on

engineering-related background knowledge, evaluate the impact of surveying engineering practice and complex engineering problem solutions on society, health, safety, law and cultural aspects, and understand the responsibilities.

6-1 The graduates should have the capability to analyze and evaluate the reasonability of surveying and mapping engineering design scheme based on relevant engineering background knowledge.

6-2 The graduates are expected to be familiar with technical standards and specifications, intellectual property rights, as well as laws and regulations of surveying and mapping engineering major.

6-3 The graduates should have the capability to analyze the impact of surveying and mapping engineering design scheme on society, and evaluate the reasonability of surveying and mapping engineering design scheme.

6-4 The graduates are expected to have the capability to evaluate the impacts of the implementation of complex mapping engineering programs on society, health, safety, legislation and culture, and understand the responsibilities to be assumed.

7. Environment and Sustainable Development: The graduates should understand the relevant policies, laws and regulations regarding environmental protection and social sustainable development and have the capability to understand and evaluate the impact of surveying and mapping engineering practices of surveying and mapping complex engineering problems on the environmental and social sustainable development.

7-1. The graduates should understand the relevant policies, laws and regulations regarding environmental protection and social sustainable development

7-2. The graduates should have the capability to understand and evaluate the impact of surveying and mapping engineering practices of surveying and mapping complex engineering problems on the environmental.

7-3. The graduates should have the capability to understand and evaluate the impact of surveying and mapping engineering practices of surveying and mapping complex engineering problems on the social sustainable development.

8. Professional Norm: The graduates should have good accomplishment and knowledge of humanities and social sciences, including ideological and moral quality, political quality, scientific quality, humanistic quality, psychological and physical quality, and practice Socialist Core Values. They should also be capable to understand and compliance the professional ethics and norms and fulfill the responsibilities.

8-1. The graduates should have good accomplishment and knowledge of humanities and social sciences.

8-2. The graduates should understand the important role of surveying and mapping work in safeguarding national interests, practice Socialist Core Values, and have high sense of

social responsibility.

8-3. The graduates should understand and comply the professional ethics and norms.

8-4. The graduates should understand and comply practice norms in surveying and mapping industry.

9. Individuals and Teams: The graduates should have capability to assume the roles of individual, team member and responsible individual in a multidisciplinary team, understand the importance of solidarity and cooperation in the context of Surveying and Mapping Engineering and relative disciplines, and listen and respect the opinions of others. They should also have the teamwork awareness and the capabilities of organizing and coordinating.

9-1. The graduates should have team spirit and understand the importance of solidarity and cooperation in the context of surveying and mapping engineering and relative disciplines.

9-2. The graduates should understand the relationship between the individual and the team and the role of the individual in the team and be capable of taking on different roles and responsibilities in the team.

9-3. They should listen and respect the opinions of others and have the teamwork awareness and the capabilities of organizing and coordinating.

10. Communication: The graduates should have the capabilities to effectively communicate with industry peers and the public on complex surveying engineering issues, including writing reports and designing documents, presenting statements, articulating or responding to instructions, use English comprehensively, and skilled in reading English technical literature of Surveying and Mapping Engineering. They should also have the international perspective and the capabilities of communicating under cross-cultural background.

10-1. The graduates should have the capabilities to writing project design, technical summary, and presenting statements on complex surveying and mapping engineering issues.

10-2. The graduates should have the capabilities to effectively communicate with industry peers and the public in various ways on complex Surveying and Mapping engineering issues.

10-3 The graduates should have the abilities of acquiring foreign language information, communication and presentation skills, they are able to communicate in a cross-industry, cross-cultural context.

10-4 The graduates should have a basic understanding of the international development of the field of surveying, and they can accurately express their views.

11. Project Management: The graduates should have strong capabilities of engineering project organizing， managing and executing, and understand and master the principles of engineering management and the methods of economic decision-making, and the capabilities

of applying it in surveying and mapping engineering practices in many industries and disciplines such as geology, transportation, energy, and territorial planning.

11-1 The graduates should understand the status and role of surveying and mapping engineering projects in engineering.

11-2 The graduates should have the ability to apply the principle of surveying and mapping engineering management and the method of economic decision-making in surveying and mapping engineering projects.

11-3 The graduates should have the ability to apply the techniques and methods of surveying engineering management and economic decision-making in a multidisciplinary environment.

12. Lifelong Learning：The graduates should have the awareness of autonomic and Lifelong learning and have the capabilities to continuous learning and adapt to the development.

12-1 The graduates should recognize the necessity for continuous exploration and learning, and have the awareness of autonomic and lifelong learning.

12-2 The graduates should have the ability to choose the appropriate approach and method to keep learning.

12-3 The graduates should understand the important developments and current trends of surveying and mapping disciplines and related technologies and theories, and have the ability to adapt to development.

Support of graduation requirements to education objectives

In order to support the achievement of the education objectives, the surveying and mapping engineering program clearly expounds the required knowledge, ability and quality for graduates, and puts forward 12 specific graduation requirements in accordance with the "Engineering Education Professional Certification Standards". The matrix diagram of the graduation requirements of the surveying and mapping engineering supporting the realization of major education objectives, as shown in the table “Support Relationship Table between Graduation Requirements and Education Objectives”.

Support Relationship Table between Graduation Requirements and Education Objectives

Serial Number	Graduation Requirements	Decomposition of Graduation Requirements	Education Objectives				
			Objective 1	Objective 2	Objective 3	Objective 4	Objective 5
1	Graduation Requirements1	1-1	√				
2		1-2	√				
3		1-3	√				
4	Graduation Requirements2	2-1	√				√
5		2-2	√		√	√	√
6		2-3			√		
7		2-4			√	√	
8	Graduation Requirements3	3-1				√	
9		3-2			√	√	
10		3-3	√	√			
11	Graduation Requirements4	4-1	√		√	√	
12		4-2	√			√	
13		4-3	√		√	√	
14		4-4			√	√	
15	Graduation Requirements5	5-1			√	√	
16		5-2	√		√	√	
17		5-3			√	√	
18		5-4			√	√	√
19	Graduation Requirements6	6-1				√	
20		6-2		√			√
21		6-3	√	√		√	
22		6-4	√	√		√	
23	Graduation Requirements7	7-1		√	√		
24		7-2		√	√		
25		7-3		√	√		
26	Graduation Requirements8	8-1	√	√			
27		8-2		√	√		

28		8-3		√			
29		8-4		√			
30	Graduation Requirements9	9-1	√	√			
31		9-2	√	√			√
32		9-3		√			√
33	Graduation Requirements10	10-1			√	√	√
34		10-2	√		√	√	√
35		10-3	√		√	√	
36		10-4			√		
37	Graduation Requirements11	11-1			√	√	
38		11-2	√	√		√	
39		11-3	√			√	√
40	Graduation Requirements12	12-1			√		
41		12-2			√		
42		12-3			√		

Graduation Requirements and Ways to Achieve:

No.	Graduation requirements	Ways to achieve（Teaching process）
1	1. The graduates should have solid knowledge of mathematics, computers, natural sciences, and engineering science, as well as fundamental economic and management knowledge. They should also have the capability to apply their knowledge to surveying engineering practice and solve complex engineering problems in the field of surveying and mapping. (Engineering Knowledge)	① **Curriculum Teaching:** Advanced Mathematics A, Linear Algebra A, Probability and Statics A, College Physics C, Data Structure and Database, High-level Programming Language (C/C++), Projects of Data Structure A, Linux Technology and Geodetic Programming Design, Introduction to Earth Sciences, Architecture Drawing, Geomatics Laws and Regulations & Project Management, Surveying Project Supervision and Bidding, GNSS Principles and Applications A, Software Design and Development of Geomatics, Data Processing of Geomatics, Fundamentals of Geodesy, Mapping Projection and Its Algorithm Implementation, Engineering Surveying A, Marine Surveying and Charting, Information Retrieval and Academic Writing, Error Theory and Foundation of Surveying Adjustment A, Digital Surveying, Engineering Surveying

No.	Graduation requirements	Ways to achieve（Teaching process）
		Teaching Practice, Laser Radar Technology, Precision Industrial Surveying, Satellite Navigation Algorithm and Implementation, etc. **② Out-of-class Learning:** Organize students to participate in the "The Challenge Cup", the Contemporary Undergraduate Mathematical Contest in Modeling, Mathematical Contest in Modeling /Interdisciplinary Contest in Modeling, the Chinese Mathematics Competitions, the Undergraduate Physics Experiment Innovation Design Contest of Hubei Province, and the Contemporary Undergraduate Ocean Knowledge Contest, etc.
2	2. The graduates should have the capability of finding and analyzing problems, and awareness of innovation. They should also be capable of analyzing and studying the complex engineering problems in the field of surveying and mapping with information that obtained by literature search, data query, and modern information technology. (Problem Analysis)	**① Curriculum Teaching:** Social Investigation, Information Retrieval and Academic Writing, Frontier Knowledge Lecture of Surveying and Mapping Engineering, Graduation Design (Thesis), Linux Technology and Geodetic Programming Design, Distortion Observation & Data Disposing, Surveying Project Supervision and Bidding, Software Design and Development of Geomatics, Data Processing of Geomatics, Fundamentals of Geodesy, Mapping Projection and Its Algorithm Implementation, Engineering Surveying A, Basis of InSAR, Photogrammetry, Information Retrieval and Academic Writing, Error Theory and Foundation of Surveying Adjustment, Digital Surveying, Engineering Surveying Teaching Practice, Laser Radar Technology, Precision Industrial Surveying **② Out-of-class Learning:** Encourage students to take National Computer Grade Examination and Software Engineer Examination.
3	3. The graduates should have the capability to design solutions that embody innovation and consider humanities, society,	**① Curriculum Teaching:** Linux Technology and Geodetic Programming Design, Distortion Observation & Data Disposing, Real Estate Surveying and Management, Surveying Project Supervision

No.	Graduation requirements	Ways to achieve（Teaching process）
	security, law and environmental factors for complex surveying and mapping engineering problems. They should also be capable of designing work plans that meet the specific surveying and mapping demands of industries such as geology, transportation, energy, and territorial planning, and analyzing their feasibility by testing or experiments. (Design/Develop Solutions)	and Bidding, Software Design and Development of Geomatics, Data Processing of Geomatics, Mapping Projection and Its Algorithm Implementation, Engineering Surveying A, Photogrammetry, Digital Surveying, Information Retrieval and Academic Writing, Error Theory and Foundation of Surveying Adjustment, Photogrammetry Teaching Practice, GNSS Surveying Teaching Practice, Productive Practice of Geodesy, Digital Topographic Surveying Teaching Practice, Precision Industrial Surveying, Satellite Navigation Algorithm and Implementation, etc. **② Out-of-class Learning:** Organize students to practice in the exercitation base of the school and participate in production practices in enterprises and institutions. Organize students to participate in discipline competitions. Invite experts from inside and outside the school for lectures on Engineering and technology, and frontier discipline.
4	4. The graduates should have the capability to carry out professional experiment design, data analysis and other research works on complex engineering problems in the field of surveying and mapping based on scientific principles and scientific method, and obtain reasonable and effective conclusions through information synthesis s. They should also have the initial ability to engage in scientific research and technological development. (Research)	**① Curriculum Teaching:** GNSS Principles and Applications A, Distortion Observation & Data Disposing, Real Estate Surveying and Management, Surveying Project Supervision and Bidding, Software Design and Development of Geomatics, Data Processing of Geomatics, Fundamentals of Geodesy, Basis of InSAR, Photogrammetry, Digital Surveying , Information Retrieval and Academic Writing, Error Theory and Foundation of Surveying Adjustment, Digital Surveying, Photogrammetry Teaching Practice, Laser Radar Technology, Precision Industrial Surveying, Satellite Navigation Algorithm and Implementation, Graduation Design (Thesis), Frontier Knowledge Lecture of Surveying and Mapping Engineering, and 3S Forum, etc. **② Out-of-class Learning:**

No.	Graduation requirements	Ways to achieve（Teaching process）
		Organize students to participate in industry-study-research cooperation projects and discipline competitions, and declare innovation and entrepreneurship projects for undergraduates. Hold academic reports and lectures on frontier discipline.
5	5. The graduates should have the capability to carry out analysis and simulation studies by developing, choosing and using appropriate technologies, resources, modern engineering tools and information technology tools for complex engineering problems of surveying and mapping, and, and summarize their applicability and limitations. (Usage of Modern Tools)	**① Curriculum Teaching:** Linux Technology and Geodetic Programming Design, Real Estate Surveying and Management, Surveying Project Supervision and Bidding, Fundamentals of Geodesy, Marine Surveying and Charting, Basis of InSAR, Photogrammetry, Digital Surveying , Error Theory and Foundation of Surveying Adjustment A, Specialized English Reading, Digital Surveying, Photogrammetry Teaching Practice, GNSS Surveying Teaching Practice, Productive Practice of Geodesy, Digital Topographic Surveying Teaching practice, Engineering Surveying Teaching Practice, Laser Radar Technology, Precision Industrial Surveying, Satellite Navigation Algorithm and Implementation, Remote Sensing Image Interpretation, Remote Sensing Image Processing, Graduation Practice and Graduation Design, GNSS Principles and Applications A, etc. **② Out-of-class Learning:** Organize students to participate in various discipline competitions such as “The Challenge Cup”, the innovative experimental plan, and surveying and mapping skills competition. Organize students to participate in research projects, industry-study-research cooperation projects, etc.
6	6. The graduates should be familiar with surveying and mapping laws and regulations, industry technical standards and norms, and intellectual property	**① Curriculum Teaching:** Distortion Observation & Data Disposing, Real Estate Surveying and Management, Surveying Project Supervision and Bidding, Digital Surveying, Laser Radar Technology, Precision Industrial Surveying, Satellite Navigation Algorithm and

No.	Graduation requirements	Ways to achieve（Teaching process）
	rights. They should also have the capability to conduct reasonable analysis based on engineering-related background knowledge, evaluate the impact of surveying engineering practice and complex engineering problem solutions on society, health, safety, law and cultural aspects, and understand the responsibilities. (Engineering and Society)	Implementation, Morality Education and Fundamentals of Law, Geomatics Laws and Regulations & Project Management, etc. **② Out-of-class Learning:** Organize students to participate in social surveys, visit enterprises and institutions, the Three Gorges and Geheyan Dam, etc. Invite outside experts for lectures.
7	7. The graduates should understand the relevant policies, laws and regulations regarding environmental protection and social sustainable development and have the capability to understand and evaluate the impact of surveying and mapping engineering practices of surveying and mapping complex engineering problems on the environmental and social sustainable development. (Environment and Sustainable Development)	**① Curriculum Teaching:** Morality Education and Fundamentals of Law, Introduction to Ecology, Geomatics Laws and Regulations & Project Management, Surveying Project Supervision and Bidding, Introduction to Earth Sciences, Distortion Observation & Data Disposing, Introduction to Surveying and Mapping Engineering, Engineering Surveying A, Marine Surveying and Charting, Basis of InSAR, etc. **② Out-of-class Learning:** Organize students to participate in social surveys, environmental protection publicity and public welfare activities, and visit enterprises and institutions. Invite outside experts for lectures.
8	8. The graduates should have good accomplishment and knowledge of humanities and social sciences, including ideological and moral quality, political quality, scientific quality, humanistic quality, psychological and physical quality, and practice Socialist Core Values. They should also be capable to	**① Curriculum Teaching:** Morality Education and Fundamentals of Law, Distortion Observation & Data Disposing, Real Estate Surveying and Management, Surveying Project Supervision and Bidding, Engineering Surveying A, GNSS Surveying Teaching Practice, Productive Practice of Geodesy, Digital Topographic Surveying Teaching Practice, Engineering Surveying Teaching Practice, Geomatics Laws and Regulations & Project Management, etc.

No.	Graduation requirements	Ways to achieve（Teaching process）
	understand and compliance the professional ethics and norms and fulfill the responsibilities. (Professional Norm)	**② Out-of-class Learning:** Organize students to participate in various measurement practices, curriculum design, graduation design (thesis), social practice, social survey, and scientific and technological activities. Call on students to participate in associations and serve as cadres. Organize the theme education activities such as “Youth Art Festival for Undergraduates” and “Elegant Art into the Campus”. Carry out campus cultural activities such as surveying and mapping instrument skill competitions, sports games, speech contests, style exhibitions, and community culture festivals, etc..
9	9. The graduates should have capability to assume the roles of individual, team member and responsible individual in a multidisciplinary team, understand the importance of solidarity and cooperation in the context of Surveying and Mapping Engineering and relative disciplines, and listen and respect the opinions of others. They should also have the teamwork awareness and the capabilities of organizing and coordinating. (Individuals and teams)	**① Curriculum Teaching:** Linux Technology and Geodetic Programming Design, Real Estate Surveying and Management, Surveying Project Supervision and Bidding, Fundamentals of Geodesy, Marine Surveying and Charting, Photogrammetry, Digital Surveying, Error Theory and Foundation of Surveying Adjustment, Photogrammetry Teaching Practice, GNSS Surveying Teaching Practice, Productive Practice of Geodesy, Digital Topographic Surveying Teaching Practice, etc. **② Out-of-class Learning:** Organize students to participate in various measurement practices, curriculum design, social practice, social survey, and scientific and technological activities with a team. Call on students to participate in associations and serve as cadres. Carry out campus cultural activities such as surveying and mapping instrument skill competitions, sports games, and community culture festivals.
10	10. The graduates should have the capabilities to effectively communicate with industry peers and the public on complex	**① Curriculum Teaching:** College English I-IV, The Second Foreign Language, Specialized English Reading, Linux Technology and Geodetic Programming Design, Distortion Observation & Data

No.	Graduation requirements	Ways to achieve（Teaching process）
	surveying engineering issues, including writing reports and designing documents, presenting statements, articulating or responding to instructions, use English comprehensively, and skilled in reading English technical literature of Surveying and Mapping Engineering. They should also have the international perspective and the capabilities of communicating under cross-cultural background (Communication).	Disposing, Introduction to Surveying and Mapping Engineering, Fundamentals of Geodesy, Engineering Surveying A, Basis of InSAR, Information Retrieval and Academic Writing, Photogrammetry Teaching Practice, GNSS Surveying Teaching Practice, Productive Practice of Geodesy, Digital Topographic Surveying Teaching Practice, etc. **② Out-of-class Learning:** Organize students to participate in English competition, mathematical modeling, design competition, speech contest, Chinese-Western culture month, the National English Grade Examination, and the National Computer Grade Examination. Recommend students to join the innovative talent program, Li Siguang plan, and General plan. Select students and teachers to participate in international conferences abroad and invite foreign experts for lectures.
11	11. The graduates should have strong capabilities of Engineering project organizing , managing and executing, and understand and master the principles of engineering management and the methods of economic decision-making, and the capabilities of applying it in Surveying and Mapping Engineering practices in many industries and disciplines such as geology, transportation, energy, and territorial planning (Project Management).	**① Curriculum Teaching:** Geomatics Laws and Regulations & Project Management, Real Estate Surveying and Management, Surveying Project Supervision and Bidding, Marine Surveying and Charting, Basis of InSAR, Error Theory and Foundation of Surveying Adjustment, etc. **② Out-of-class Learning:** Organize students to take advantage of holidays to participate in various measurement production practices and social practices. Each graduate is required to complete a graduation production practice. Invite experts with project management experience for lectures.
12	12. The graduates should have the awareness of autonomic and Lifelong learning and have the	**① Curriculum Teaching:** Real Estate Surveying and Management, Linux Technology and Geodetic Programming Design, Distortion Observation & Data

No.	Graduation requirements	Ways to achieve（Teaching process）
	capabilities to continuous learning and adapt to the development. (Lifelong Learning).	Disposing, Introduction to Surveying and Mapping Engineering, Engineering Surveying A, Basis of InSAR, Photogrammetry, Digital Surveying, Information Retrieval and Academic Writing, Specialized English Reading, etc. **② Out-of-class Learning:** Visiting the Three Gorges and Geheyan Dams and other institutions. Improve students' ability of adaption through activities such as school culture activities (e.g., mental health education and safety education), study style construction, and examination style education. Provide students with opportunities to continue learning through the Innovative Talent Program, Li Siguang Program, and overseas study tour.

Major Disciplines: Surveying and Mapping Science and Technology

Main Courses: Introduction to Digital Surveying, Error Theory and Foundation of Surveying Adjustment, Fundamentals of Geodesy, Photogrammetry, GNSS Principles and Applications A, Principles and Applications of Remote Sensing, Principles of Geographic Information Systems, Engineering Surveying A, Software Design and Development of Geomatics, Emergency Survey of Geological Disaster.

Lab Experiments:

(1) Use of instrument of surveying and mapping:

Use of dumpy level, total station, clinometer, GNSS receivers, 3-d laser scanner, UAV aerial survey platform, etc.

(2) Use of surveying and mapping system platform:

Use of Digital Surveying, GNSS, Photogrammetry, Remote Sensing, Geographic Information System, etc.

(3) Development of surveying and mapping application software:

Satellite Navigation Algorithm and Implementation, Mapping Projection and Its Algorithm Implementation and Software Design and Development of Geomatics.

Practical Work:

1. Projects of High-level programming language (C/C++)	3 weeks
2. Projects of Data Structure A	3 weeks
3. Geospatial Information System Teaching Practice B	2 weeks
4. Remote Sensing Teaching Practice	2 weeks
5. Practice of Physical Geography and Geology	2 weeks
6. Digital Topographic Surveying Teaching Practice	3 weeks
7. Digital surveying Teaching Practice	6 weeks
8. Photogrammetry Teaching Practice	3 weeks
9. Productive Practice of Geodesy	3 weeks
10. GNSS Surveying Teaching Practice	3 weeks
11. Engineering Surveying Teaching Practice	1 week
12. Surveying & Mapping Engineering Production Practice	4 weeks

Requirements for Graduation Credits: 172

Duration& Degree Granted: Four years, Bachelor of engineering

Recommended minor: Civil Engineering, Cartography and Geographic Information Engineering, Navigation Engineering, Land Resource Management, Spatial Information and Digital Technology.

Related Specialties: Remote Sensing Science and Technology, Geographical Situation Monitoring.

测绘工程专业课程教学计划表

Course Descriptions of Geomatics

课程类别 Classi-fication		课程编号 Code	课程名称 Course Name	学分 Crs	课内总学时 Hrs	学时分类 Class Hours					先修课程 Prerequisite courses	学期学分分配 Semester Credits							
						课内学时		课外学时											
						讲课 Lec.	课内实验 Lab	实验/科研实践 Lab/Res.	研讨 Dis	素质拓展 Exp		一 1st	二 2nd	三 3rd	四 4th	五 5th	六 6th	七 7th	八 8th
通识教育课 Liberal Education Courses	必修 Compulsory	11706200	马克思主义基本原理概论 Principles of Marxism	3	48	48							3						
		11706500	毛泽东思想和中国特色社会主义理论体系概论 Introduction to Mao Tse-tung Thought and the Theoretical System of Socialism with Chinese Characteristics	4	64	64									4				
		11711800	中国近现代史纲要 The Essentials of Modern Chinese History	2	32	32						2							
		12005200	思想道德修养与法律基础 Morality Education and Fundamentals of Law	3	48	48						3							
		12005300	形势与政策 Situation and Policy	2	32	32						每学期平均分配							
		113076*0	体育 Physical Education	4	144	144						1	1	1	1				
		109234*0	大学英语 College English	9	144	144				48		3	3	3					
		14300300	军事理论 Military Theory	2	36	36						2							
	选修 Elective	70100300	地球科学概论 Introduction to Earth Sciences	1.5	24	24		8											
		70400600	生态学概论 Introduction to Ecology	1.5	24	24													
		包括地球科学概论、生态学概论两门必修课程总计 12 学分，含创新创业选修课学分，跨学科选修课不低于 4 学分		9	144														
		小计 Sum		**41**	**740**	**596**		**8**		**48**		**11**	**7**	**4**	**5**				
Platform Courses	大类平台课	21121100	测绘学概论 Introduction to Geomatics	1	16	16						1							
		21130500	计算科学基础 Fundamentals of Computational Science	2	32	32						2							
		21930900	计算机高级语言程序设计(C/C++) Programming of Advanced Computer Language (C/C++)	3	48	48		16					3						
		21944900	数据结构 Data Structure	3	48	48								3					
		21131200	数字地形测量学 Digital Topographic Surveying	2.5	40	40								2.5					

课程类别 Classi-fication	课程编号 Code	课程名称 Course Name	学分 Crs	课内总学时 Hrs	学时分类 Class Hours					先修课程 Prerequisite courses	学期学分分配 Semester Credits							
					课内学时		课外学时											
					讲课 Lec.	课内实验 Lab	实验/科研实践 Lab/Res.	研讨 Dis	素质拓展 Exp		一 1st	二 2nd	三 3rd	四 4th	五 5th	六 6th	七 7th	八 8th
	21131300	遥感原理与应用 Principles and Applications of Remote Sensing	2.5	40	40				8				2.5					
	21130702	地理信息系统原理 B Principles of Geographic Information Systems B	2	32	32								2					
	小计 Sum		**16**	**256**	**256**		**16**		**8**		**3**	**3**	**10**					
学科基础课 Disciplinary Fundamental Courses	212127*1	高等数学 A Advanced Mathematics A	11.5	184	184						5	6.5						
	21212801	线性代数 A Linear Algebra A	3.5	56	56						3.5							
	21213501	概率论与数理统计 A Probability and Statics A	3.5	56	56								3.5					
	212130*3	大学物理 C College Physics C	6	96	96							3.5	2.5					
	21216902	物理实验 B Physics Experiments B	1.5	48	4	44						1.5						
	小计 Sum		**26**	**440**	**396**	**44**					**8.5**	**11.5**	**6**					
专业主干课 Main Specialty Courses	21137500	地图制图学基础 Fundamentals of Cartography	2	32	24	8									2			
	21137601	大地测量学基础 A Fundamentals of Geodesy A	3	48	48					数字地形测量学、误差理论与测量平差				3				
	20515100	数字测图 Digital Surveying	2	32	24	8				测绘学概论、高等数学、概率论与数理统计				2				
	21137701	误差理论与测量平差基础 A Error Theory and Foundation of Surveying Adjustment A	3	48	48					概率论与数理统计、数字地形测量学				3				
	21137800	摄影测量学 Photogrammetry	3	48	48					大地测量学、误差理论与测量平差					3			
	21135201	GNSS 原理及其应用 A* GNSS Principles and Applications A	2.5	40	40					大地测量学					2.5			
	21137900	测绘软件设计与开发 Software Design and Development of Geomatics	2.5	40	16	24				误差理论与测量平差						2.5		

课程类别 Classi-fication	课程编号 Code	课程名称 Course Name	学分 Crs	课内总学时 Hrs	学时分类 Class Hours					先修课程 Prerequisite courses	学期学分分配 Semester Credits							
					课内学时		课外学时											
					讲课 Lec.	课内实验 Lab	实验/科研实践 Lab/Res.	研讨 Dis	素质拓展 Exp		一 1st	二 2nd	三 3rd	四 4th	五 5th	六 6th	七 7th	八 8th
	21138000	工程测量学 Engineering Surveying	3	48	48					大地测量学						3		
	21138100	测绘法律法规与项目管理* Geomatics Laws and Regulations & Project Management	1.5	24	24											1.5		
	21138200	地质灾害应急测绘 Emergency Survey of Geological Disaster	1.5	24	24											1.5		
	小计 Sum		**24**	**384**	**344**	**40**								**8**	**7.5**	**8.5**		
专业选修课 Specialty Elective Courses		可按方向设课，具体见专业选修课列表	16	256														
合计 Sub-total			**123**	**2076**	**1592**	**84**	**24**		**56**		**22.5**	**21.5**	**20**	**13**	**7.5**	**8.5**		
实践环节 Practical Work	44300400	军事训练 Military Training	2	2 周							2							
	41931000	计算机高级语言课程设计（C/C++） Projects of Advanced Programming Language (C/C++)	2	2 周								2						
	41931300	数据结构课程设计 Projects of Data Structure	3	3 周									3					
	41124100	自然地理与地质学实习 Practice of Physical Geography and Geology	2	2 周						地球科学概论		2						
	41130800	地理信息系统实习 Practice of Geographic Information Systems	2	2 周									2					
	41131500	遥感原理与应用课程实习 Practice of Principles and Applications of Remote Sensing	2	2 周									2					
	41131400	数字地形测量教学实习 Practice of Digital Topographic Surveying	3	3 周									3					
	41138400	数字测图教学实习 Digital Surveying Teaching Practice	6	6 周										6				
	41138500	摄影测量学课程实习 Practice of Photogrammetry	3	3 周											3			
	41126800	大地测量教学实习 Productive Practice of Geodesy	3	3 周												3		
	41138600	GNSS 教学实习 GNSS Surveying Teaching Practice	3	3 周												3		
	41127000	工程测量教学实习 Engineering Surveying Teaching Practice	1	1 周												1		

课程类别 Classi-fication	课程编号 Code	课程名称 Course Name	学分 Crs	课内总学时 Hrs	学时分类 Class Hours					先修课程 Prerequisite courses	学期学分分配 Semester Credits							
					课内学时		课外学时											
					讲课 Lec.	课内实验 Lab	实验/科研实践 Lab/Res.	研讨 Dis	素质拓展 Exp		一 1st	二 2nd	三 3rd	四 4th	五 5th	六 6th	七 7th	八 8th
	41138700	测绘工程生产实践 Productive practice of surveying engineering	2	4 周													2	
	41132600	毕业设计（论文） Graduation Design (Thesis)	8	16 周														8
	小计 Sum		**42**	**52 周**							**2**	**4**	**10**	**6**	**3**	**7**	**2**	**8**
创新创业自主学习 Freedom study	ZZ35000S	社会调查 Social Investigation	2															
		其他(学科竞赛、发明创造、科研报告) Others (Contest, Invention, Innovation and Research resentation)	2															
		创新创业实践 Practice of Innovation and Entrepreneurship	2															
		产学研 Production-Study-Academic Research Projects	1															
	小计 Sum		**7**															
总计 Total			**172**	**2076+52 周**	**1592**	**84**	**24**		**56**		**24.5**	**25.5**	**30**	**19**	**10.5**	**15.5**	**2**	**8**
可开出专业选修课列表 Specialty Elective Courses	**工程测量**																	
	21138800	不动产测量与管理+ Real Estate Surveying and Management	2	32	24	8	8			数字地形测量学					2			
	20502300	变形观测与数据处理+ Distortion Observation & Data Disposing	2	32	32				4	误差理论与测量平差、工程测量学						2		
	21138900	激光雷达技术 Technique of Light Detection and Ranging	1.5	24	24		8								1.5			
	21139000	精密工业测量+ Precision Industrial Surveying	2	32	24	8										2		
	21139100	近代测量平差理论 Modern Surveying Adjustment Theory	2	32	24	8									2			
	21139200	海洋测绘 Marine Surveying and Charting	2	32	32											2		
	21139300	地图投影与算法实现 Mapping Projection and Its Algorithm Implementation	2	32	24	8									2			
	21139400	无人机测绘 UAV Mapping	1	16	8	8								1				
	20516200	土木工程概论 Introduction to Civil Engineering	2	32	32									2				

课程类别 Classi-fication	课程编号 Code	课程名称 Course Name	学分 Crs	课内总学时 Hrs	学时分类 Class Hours					先修课程 Prerequisite courses	学期学分分配 Semester Credits							
					课内学时		课外学时											
					讲课 Lec.	课内实验 Lab	实验/科研实践 Lab/Res.	研讨 Dis	素质拓展 Exp		一 1st	二 2nd	三 3rd	四 4th	五 5th	六 6th	七 7th	八 8th
	21126000	专业英语阅读 Specialized English Reading	1.5	24	24					数字地形测量学						1.5		
	21139500	文献检索与科技写作 Literature Retrieval and Scientific Writing	1.5	24	24			8							1.5			
	信息化测绘																	
	20512600	近景摄影测量 Close-range Photogrammetry	1.5	24	16	8										1.5		
	21138900	激光雷达技术+ Laser Radar Technology	1.5	24	24		8								2			
	21131900	数字图像处理 Digital Image Processing	2	32	32											2		
	21139600	雷达干涉测量 Radar Interferometry	1.5	24	24		8								1.5			
	21139700	卫星导航算法与实现+ Satellite Navigation Algorithm and Implementation	2	32	16	16										2		
	21139400	无人机测绘 UAV Mapping	1	16	8	8								1				
	21139800	Linux 技术与测绘程序设计 Linux technology and Geodetic programming design	2	32	24	8									2			
	21147300	工程识图# Engineering Drawing Identifying	1.5	24	24											1.5		
	20516200	土木工程概论 Introduction to Civil Engineering	2	32	32									2				
	21126000	专业英语阅读 Specialized English Reading	1.5	24	24					数字地形测量学						1.5		
	21139500	文献检索与科技写作 Literature Retrieval and Scientific Writing	1.5	24	24			8							1.5			
	创新创业类课程																	
	21139900	学科前沿知识讲座 lectures on frontier knowledge of surveying engineering	1	16	16											1		

注：1、全英课程须在课程名称后打*标出，通识教育选修课学分未列入具体学期，学院须根据学校创新创业自主学习学分认定一览表制订实施细则。
2、课程名称后打#标出的为专业限选课。
3、课程名称后打+标出的为各方向需选修的代表性课程。

测绘工程专业课程分类统计

课程类别 / 统计	通识教育课程 Liberal Education Courses		大类平台课+学科基础课 Plateform & Disciplinary Fundamental Courses	专业主干课 Main Specialty Courses	专业选修课 Specialty Elective Courses	实践环节 Practical Work	创新创业自主学习 Freedom Study	学时总计 Total Hour	学分总计 Total Credits
	必修	选修							
学时/学分	548/29	192/12	256/16 + 440/26	384/24	256/16	52 周/42	7	2076+53 周	172
学分所占比例	23.84%		24.42%	13.95%	9.30%	24.42%	4.07%		100%

附：

学校与企事业单位联合培养阶段实施方案

一、实习的目标和要求

本次实习是测绘工程专业高年级学生的一次综合实习，其目的是巩固专业知识，培养学生实践操作能力。通过本实践课程的训练，使学生进一步理解和领会专业知识、了解行业及相关学科的发展动态、初步具备分析解决本专业工程实际问题及进行新技术研发和工程设计的能力、培养学生语言表达和沟通能力、较强的团队合作意识和自主学习能力，使学生能学有所用，适应未来行业发展的需要。

要求学生掌握无人机摄影测量的基础理论知识，具备无人机数据采集、数据加工、信息提取及制作各种产品的技能，了解行业对测绘科学与技术发展的最新需求及发展趋势。能够综合运用所学基础理论、专业知识和技术手段分析并解决测绘工程领域的实际问题，分析和研究测绘领域中的复杂工程问题时体现创新意识。

二、实习的内容和形式

实习的主要内容是利用无人机航测软件，结合实际生产需要，完成仪器设置、数据采集、数据加工、信息提取及制作产品的数据处理工艺流程；了解基础测绘航测生产机构、人员和设备等情况；掌握面向信息化测绘条件下航测数据生产与更新一体化流程，操作相关的软件系统，掌握航测外业调绘、内业采集、编辑、成图、质检等一体化的工作流程和标准规范，能独立完成符合规范要求的测图产品。

实习形式以理论课与外业上机操作相结合的方式进行。

三、实习成绩考核的内容和考核方法

实习成绩考核的内容包括实习过程中的学习态度和考勤、实习成果、实习报告、考核答辩等；考核成绩按百分制进行评定，其中：

1. 考勤（20%）：要求学生每次实习签到。根据平时考勤情况与课堂表现打分。
2. 考核答辩（40%）：对实习小组的实习成果进行考核，要求讲解和演示数据处理过程，并对关键功能的原理进行解释说明。
3. 实习成果（40%）：根据设计文档、实习报告成果进行综合评分。

四、工作、生活及安全保障管理

1. 学院负责人是企业实习教学安全工作的第一责任人，主管教学的院长和学生主管书记是企业实习教学安全管理的具体负责人。
2. 教学系负责确定每届学生的企业实习课程负责人和校内指导教师，原则上每个班的课程负责人由班主任担任，负责审核和汇总学生提交的企业实习申请以及组织进行实习过程管理和考评,另每个班按师生比不低于1:10配备若干校内指导教师，与课程负责人共同完成学生企业实习过程管理和考评。
3. 学生参加企业实习实训期间，所在单位应与学生（及家长）、学院共同签署关于安全责任的三方协议（协议中必须有保障安全的详细条款，由学生辅导员保管）。在校内实训期间，按照中国地质大学学生管理条例，由学院指导教师进行管理。
4. 学生企业实习期间由所在单位参照单位员工管理办法予以管理，学生实习由企业导师与学院指派的校内指导教师共同指导和考核。实习期间，学生要每周向校内指导教师提交企业实习周记（电子版）。
5. 学生实习期满，由所在单位出具学生实习期间的考核意见并加盖公章。
6. 参加校内外企业实习实训后，须提交实习报告并参加答辩，审核通过后由教务科登记。
7. 外出实习学生要明确实习的离校和返校时间，要与辅导员保持联系，学生要严格遵守学校及企业的安全管理规定。
8. 如出现特殊情况，经学院核实审批并取得实习实训单位同意后可中断实习实训。

测绘工程专业辅修课程教学计划表

Course Descriptions of Geomatics（Minor）

课程类别 Classi-fication	课程编号 Code	课程名称 Course Name	学分 Crs	课内总学时 Hrs	学时分类 Class Hours					先修课程 Prerequisite courses	学期学分分配 Semester Credits							
					课内学时		课外学时											
					讲课 Lec.	课内实验 Lab	实验/科研实践 Lab/Res.	研讨 Dis	素质拓展 Exp		一 1st	二 2nd	三 3rd	四 4th	五 5th	六 6th	七 7th	八 8th
学科基础课 Disciplinary Fundamental Courses	21131200	数字地形测量学 Digital Surveying	2.5	40	40								2.5					
	21137601	大地测量学基础 A Fundamentals of Geodesy A	3	48	48					数字地形测量学、误差理论与测量平差				3				
	21137701	误差理论与测量平差基础 A Error Theory and Foundation of Surveying Adjustment A	3	48	48					概率论与数理统计、数字地形测量学				3				
	21137800	摄影测量学 Photogrammetry	3	48	48					大地测量学、误差理论与测量平差					3			
	小计 Sum		**11.5**	**184**	**184**								**2.5**	**6**	**3**			
专业主干课 Main Specialty Courses	20515100	数字测图 Digital Surveying	2	32	24	8				测绘学概论、高等数学、概率论与数理统计				2				
	21135201	GNSS 原理及其应用 A GNSS Principles and Applications A	2.5	40	40					大地测量学					2.5			
	21138000	工程测量学 Engineering Surveying	3	48	48					大地测量学						3		
	小计 Sum		**7.5**	**120**	**112**	**8**								**2**	**2.5**	**3**		
实践环节 Practical Work	41131400	数字地形测量教学实习 Digital Topographic Surveying Teaching practice	3	3 周									3					
	小计 Sum		**3**	**3 周**									**3**					

测绘工程辅修专业课程分类统计

课程类别 统计	学科基础课 Disciplinary Fundamental Courses	专业主干课 Main Specialty Courses	实践环节 Practical Work	学时总计 Total Hour	学分总计 Total Credits
学时/学分	184/11.5	120/7.5	3 周/3	304+3 周	22
学分所占比例	60.5%	39.5%			100%