**\*\*课程教学大纲**

|  |
| --- |
| 课程基本信息（Course Information） |
| 课程代码（Course Code） | AV423 | \*学时（Credit Hours） | 48 | \*学分（Credits） | 3 |
| \*课程名称（Course Name） | 卫星导航 |
| Satellite Navigation |
| 课程性质(Course Type) | 任选课 |
| 授课对象（Target Audience） | 航空宇航学科、控制科学与工程学科、仪器科学与技术学科等专业的本科生Undergraduates majoring in (1) Aeronautics and Astronautics (2) Control Science and Engineering, and (3) Instrumentation Science and Technology |
| 授课语言(Language of Instruction) | 中文（普通话）Mandarin |
| \*开课院系（School） | 航空航天学院School of Aeronautics and Astronautics |
| 先修课程（Prerequisite） | 高等数学、航空航天导论College Mathematics, Introduction to Aeronautics and Astronautics |
| 授课教师（Instructor） | 战兴群（Xingqun Zhan） | 课程网址(Course Webpage) | 无 N/A |
| \*课程简介（Description） | 《卫星导航》面向航空宇航学科、控制科学与工程学科、仪器科学与技术学科等专业的高年级本科生开设。本课程结合授课教师在本领域学术及工业界的长期积累，在讲授过程中将反映卫星导航系统与应用技术的最新发展动态，通过本课程的学习，学生们应了解卫星导航技术和系统的发展历程、与传统导航定位技术的比较优势和广泛用途，掌握卫星导航系统的基础理论知识、包括卫星导航定位原理、系统构成、信号结构，掌握卫星导航接收机的工作原理和误差分析，熟悉卫星导航的应用方法和与其它导航传感器的组合导航技术。 |
| \*课程简介（Description） | This course is designed for senior undergraduate students from aerospace, automation, instrumentation, etc. The academic and industrial experiences of the lecturers on satellite navigation and integrated navigation will be included in their lectures, as well as the state-of-art information of GNSS technologies on system designs and application development. After the required lectures and an oral defense, the students are expected to have a clear view of the evolution of satellite navigation systems, advantages over traditional navigation technologies, and diversity of application opportunities. They are also expected to grasp the fundamentals of satellite navigation, including basic positioning paradigms, system architecture, signal structures, receiver principles, error models, PVT algorithms, and integration with other sensors. |
| 课程教学大纲（Course Syllabus） |
| \*学习目标(Learning Outcomes) | 1．树立“奋发图强、空天报国”信念（A3.1）2．追求真理，树立创造未来的远大目标（A4）3．扎实的专业核心（B2）4．领先的专业前沿（B4）5．掌握完整的航空航天工程的基础知识体系，理解科学、工程、社会的关系，理解航空航天系统的复杂性，正确认识航空航天作为现代社会最尖端的技术之一的重要性和潜在的发展能力（B6.2）6．系统地掌握本专业的基本实验方法与技能，能够归纳、整理、分析实验结果（C7）7. 熟练掌握本专业的计算分析软件，能够针对具体问题进行仿真以及进行数值分析（C8）8．具备关于大型工程系统的复杂性的认识（D7） |
| \*教学内容进度安排及要求(Class Schedule & Requirements) |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| 教学内容 | 学时 | 教学方式 | 作业及要求 | 基本要求 | 考查方式 |
| Module 1 Introduction to GNSS | 4 | Lecture, Discussion, and Demos | Course Project Introduction | Understand the basics of GNSS | Quiz |
| Module 2 Positioning (I): Pseudoranges | 4 | Lecture and Discussion | Course Project | Understand the thinking underlying positioning paradigms | Quiz |
| Module 3 Positioning (II): Orbits and Signals | 4 | Lecture and Discussion | Course Project | Understand how satellites and signals are related to positioning | Quiz |
| Module 4 Receiver (I): Architecture and Front-end | 4 | Lecture and Discussion | Course Project | Understand the components of a GNSS receiver | Quiz |
| Module 5 Receiver (II): Correlation and Acquisition | 4 | Lecture, Discussion, and Demos | Course Project | Understand the most basic and important operations in a GNSS receiver | Quiz |
| Module 6 Receiver (III): PLL, DLL, & FLL | 4 | Lecture and Demos | Course Project | Understand how measurements are formed | Quiz |
| Module 7 Receiver (IV): Measurements & Positioning | 6 | Lecture and Demos | Course Project | Understand how positioning is done using all the information from Module 2 to 7 | Quiz |
| Module 8 Integration (I): INS/GNSS Integration | 4 | Lecture and Discussion | Course Project | Understand the complementary properties of the two sensors: INS and GNSS | Quiz |
| Module 9 Integration (II): All Source Positioning and Navigation | 4 | Lecture and Discussion | Course Project | Understand existing and emerging solutions to ASPN | Quiz |
| Module 10 Applications (I): Location-Based Services and Pseudolite | 2 | Lecture and Discussion | Course Project | Understand the basics of LBS and unique advantages offered by pseudolites | Quiz |
| Module 11 Applications (II): Differential Positioning and Precise Positioning | 2 | Lecture and Discussion | Course Project | Understand how positioning accuracy can be improved by several orders of magnitude and its limitation | Quiz |
| Experiment | 2 | Use of tools | Course Project | Use of professional tools to collect and analyze GNSS data | Homework |
| Presentation | 4 | Questions and Oral Defense | Course Project | Investigate new GNSS applications | Course Project |

 |
| \*考核方式 (Grading) | Attendance rate 10%In-class homework and quizzes 10%Course note 10%Mid-term homework 30%Project report 20%Oral defense 20% |
| \*教材或参考资料(Textbooks & Other Materials) | GPS原理与接收机设计，谢钢，电子工业出版社，2009.7，ISBN 978-7-121-09077-6(Gang Xie, *Principles of GPS and Receiver Design*, Publishing House of Electronic Industry. 2009. ISBN: 978-7-121-09077-6) |
| 其它（More） | John W. Betz, Engineering Satellite-Based Navigation and Timing: Global Positioning Satellite Systems, Signals, and Receivers, Wiley-IEEE Press, ISBN-13 987-1118615973, 2015.Alfred Leick, Lev Rapoport, Dmitry Tatarnikov, GPS Satellite Surveying, Wiley, 4 edition, ISBN-13 978-1118675571, 2015.Pratap Misra, Per Enge, Global Positioning System: Signals, Measurements, and Performance (Revised Second Edition) Ganga-Jamuna Press, ISBN-13 978-0970954428, 2010. |
| 备注（Notes） |  |

备注说明：

1．带\*内容为必填项。

2．课程简介字数为300-500字；课程大纲以表述清楚教学安排为宜，字数不限。