东北大学秦皇岛分校本科课程教学大纲

一、课程基本信息

<table>
<tr><td>开课单位</td><td colspan="5">东北大学悉尼智能科技学院</td><td>课程编号</td><td colspan="3">3060513054</td></tr>
<tr><td>中文名称</td><td colspan="8">Python 程序设计</td></tr>
<tr><td>英文名称</td><td colspan="8">Programming with Python</td></tr>
<tr><td>总学时</td><td>32</td><td rowspan="2">理论学时</td><td rowspan="2">32</td><td rowspan="2">实验学时</td><td rowspan="2">0</td><td rowspan="2">上机学时</td><td rowspan="2">0</td><td rowspan="2">设计学时</td><td rowspan="2">0</td><td rowspan="2">课外学时</td><td rowspan="2">0</td></tr>
<tr><td>学分</td><td>2</td></tr>
<tr><td>课程类型</td><td colspan="11">☑ 理论课程 ☐ 理论(含实验)课程 ☐ 实践类课程</td></tr>
<tr><td>课程类别</td><td colspan="11">☐ 通识类 ☐学科基础类 ☑ 专业方向类 ☐ 实践类</td></tr>
<tr><td>适用专业</td><td colspan="11">应用统计学</td></tr>
<tr><td>先修课程</td><td colspan="11">C++语言程序设计
C++ Language Programming</td></tr>
<tr><td>建议开课学期</td><td colspan="11">☐1-1 ☐1-2 ☑2-1 ☐2-2 ☐3-1 ☐3-2
☐4-1 ☐4-2 ☐5-1 ☐5-2 ☐*（代表每学期都开设）</td></tr>
<tr><td>考核方式</td><td colspan="4">☑考试 ☐考查</td><td colspan="3">成绩分制</td><td colspan="4">☑百分制 ☐五级制 ☐二级制</td></tr>
<tr><td>使用教材</td><td colspan="11">1. John Hunt, “A Beginners Guide to Python 3 Programming”, Springer, 2023.</td></tr>
<tr><td>参考书
及教学资源</td><td colspan="11">1. T. J. Barth, M. Griebel, D. E. Keyes, et al., “Programming for Computations – Python”, Springer, 2020.
2. Robert Johansson, “Numerical Python (Scientific Computing and Data Science Applications with Python)”, Apress, 2019.</td></tr>
<tr><td>其他说明</td><td colspan="11">无</td></tr>
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二、课程简介

中文描述

本课程为应用统计学本科专业的一门专业平台课，是一门实践性较强的课程。课程内容主要包括 Python 环境搭建、数字类型与字符串、流程控制、列表与元组、集合和字典、函数、类与对象、模块、文件与文件路径操作、错误和异常等。通过课程的学习，学生应了解脚本语言的特性及用途，掌握 Python 语言的基本构成和程序设计方法，能够使用 Python 开发实际应用，形成并培养运用 Python 语言解决复杂工程问题的能力，并具备良好的科学素养与成才报国的责任意识，为后续专业课程的学习、创新创业活动、课程设计和毕业设计的开展，以及从事相应的软件开发奠定坚实基础。

English Description

As a practical subject，Python Programming is a compulsory subject for undergraduates majoring in Applied Statistics. The content of this subject mainly includes Python environment construction, number types and strings, process control, lists and tuples, collections and dictionaries, functions, classes and objects, modules, file and file path operations, errors, and exceptions, etc. After the learning of this subject, students should understand the characteristics and uses of scripting language, master the basic composition and programming methods of Python language, be able to develop practical applications using Python, develop and cultivate the ability to solve complex engineering problems using Python language, and have good scientific literacy and a sense of responsibility to contribute to the country. And it will lay a solid foundation for subsequent professional subjects learning, innovation and entrepreneurship activities, course design and graduation design, as well as engaging in corresponding software development.

三、课程目标

1、知识目标：

1-1：了解 Python 语言的基本特点，环境的安装，和 Python 编程思想。

1-2：掌握数据的类型及其基本操作，包括数字、列表、元组、字符串、集合和字典等。

1-3：掌握控制结构的特点及其用法。

1-4：理解函数的基本概念，掌握函数的定义、调用、参数传递，以及函数返回值的原理。

1-5：理解模块和包的概念和作用，掌握模块的定义、导入方式和使用方法。

1-6：了解面向对象编程的基本思想，掌握类的定义与对象的创建，能使用对象。

1-7：理解继承和多态的概念及实现方法。

1-8：了解异常的概念，掌握异常处理的相关方法。

2、能力目标：

2-1：会使用集成开发环境，能够编辑、编译并运行程序。

2-2：能完成简单的输入和输出，能熟练使用 Python 语言中的数据。

2-3：能用控制结构完成简单的数学运算任务。

2-4：能编写并调用函数。

2-5：能声明类，并能用类定义对象，能通过对象调用成员。

3、德育/素养目标：

3-1：培养具有不畏困难、锲而不舍、敢于尝试、不惧失败、迎难而上的精神，并在学习过程中培养自己的细心和耐心的勇气和精神。

3-2：培养服务意识，具有 “以人为本” 的服务精神。

3-3：守正与创新：既与中华民族几千年来坚守正道、革故鼎新的文化传统相承接，又与我们党一贯坚持的解放思想、实事求是、与时俱进、求真务实的理论品格相贯通。

表 1 课程目标与毕业要求的对应关系

毕业要求 Graduation Requirements	指标点 Indicator point	SLOs	关联 Relevancy (H/M/L)
3. 设计/开发解决方案：能够设计针对复杂实际问题的解决方案，设计满足特定需求的系统、单元或流程，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 能够设计针对本专业相关复杂实际问题的解决方案。	1-1 ~ 1-8 2-1 ~ 2-5 3-1 ~ 3-2	H
	3.3 能够在设计和开发的各个环节中综合考虑社会、健康、安全、法律、文化以及环境等因素。	3-1 ~ 3-3	L
4. 研究：能够基于科学原理并采用科学方法对复杂实际问题进行研究，包括设计实验、分析与解释数据、并通过信息综合得到合理有效的结论。	4.2 能够结合本专业知识对实验数据进行分析与解释，设计并优化实验方案，并通过信息综合得到合理有效的结论。	1-1 ~ 1-8 2-1 ~ 2-5	M
5. 具有恰当使用现代工具能力。在解决问题过程中，能够开发、选择与使用恰当的研究方法、现代仪器设备或信息技术工具，并对获取信息进行正确分析和综合评估。	5.2 熟悉解决本专业相关复杂实际问题所需的技术和资源，能够运用现代信息技术进行文献检索和资料查询，获取专业解决方案。	1-1 ~ 1-8 2-1 ~ 2-5	M
	5.3 能够针对本专业相关复杂实际问题，选择与使用恰当的技术、资源、现代信息技术工具。	1-1 ~ 1-8 2-1 ~ 2-5	H

四、主要教学内容

（一）理论教学

第 1 章：Introduction（支撑课程目标 1-1、2-1、3-1、3-2）

【1】知识点：

(1) Introduction to Python.

(2) The installation of Python.

(3) The Programming Style of Python.

(4) Common Errors in Program.

【2】学习目标：

了解：Introduction to Python, Common Errors in Program.

掌握：The installation of Python.

理解：The Programming Style of Python.

【3】重点：

(1) Introduction to Python.

(2) The Programming Style of Python.

【4】难点：

(1) The installation of Python.

(2) Common Errors in Program.

【5】思政案例：

(1) In recent years, the Python language has consistently ranked among the top five global programming languages, and mastering it is of great significance. However, beginners may find it difficult to get started and find it quite boring. I hope everyone has the courage to learn without fear of difficulties and persevere.

(2) The code style should be well-organized, and if you should go back, go back. Code is not only used to tell computers how to run, but also to show people, which is "people-oriented".

第 2 章：Strings（支撑课程目标 1-2、2-2）

【1】知识点：

(1) The method of creating strings.

(2) Basic operations of strings.

(3) The formatting method for strings.

(4) Common methods for strings.

(5) String templates.

【2】学习目标：

了解：Common methods for strings.

掌握：The method of creating strings, basic operations of strings, the formatting method for strings, string templates.

【3】重点：

(1) The method of creating strings.

(2) Basic operations of strings.

(3) The formatting method for strings.

(4) String templates.

【4】难点：

(1) The formatting method for strings.

第 3 章：Numeric Data, Boolean Data and *None*（支撑课程目标 1-2、2-2）

【1】知识点：

(1) Types and operations of numbers: integer, floating point numbers, and complex numbers.

(2) Boolean values.

(3) Arithmetic operators and assignment operators.

(4) None value.

【2】学习目标：

掌握：Types and operations of numbers, Boolean values, arithmetic operators and assignment operators.

理解：None value.

【3】重点：

(1) Types and operations of numbers: integer, floating point numbers, and complex numbers.

(2) Boolean values.

(3) Arithmetic operators and assignment operators.

(4) None value.

【4】难点：

(1) Types and operations of numbers: integer, floating point numbers, and complex numbers.

(2) Arithmetic operators and assignment operators.

第 4 章：Lists and Tuples（支撑课程目标 1-2、2-2）

【1】知识点：

(1) The data structures in Python.

(2) Six common operations of sequences.

(3) The role of lists and tuples, as well as their relations.

(4) Create and copy lists, as well as modify, add, delete, and rearrange elements in the lists.

(5) The creation, concatenation, deletion, and modification of special elements in tuples.

【2】学习目标：

了解：The data structures in Python.

理解：The role of lists and tuples, as well as their relations.

掌握：Six common operations of sequences, Create and copy lists, as well as modify, add, delete, and rearrange elements in the lists, The creation, concatenation, deletion, and modification of special elements in tuples.

【3】重点：

(1) Six common operations of sequences.

(2) Create and copy lists, as well as modify, add, delete, and rearrange elements in the lists.

(3) The creation, concatenation, deletion, and modification of special elements in tuples.

【4】难点：

(1) The data structures in Python.

(2) The role of lists and tuples, as well as their relations.

第 5 章：Sets and Dictionaries（支撑课程目标 1-2、2-2）

【1】知识点：

(1) Create sets.

(2) Basic operations and common methods of sets.

(3) Create dictionaries.

(4) Common methods for dictionaries.

(5) Frozensets.

【2】学习目标：

掌握：Create sets, basic operations, and common methods of sets, create dictionaries, common methods for dictionaries, frozensets.

【3】重点：

(1) Create sets.

(2) Basic operations and common methods of sets.

(3) Create dictionaries.

(4) Common methods for dictionaries.

(5) Frozensets.

【4】难点：

(1) Basic operations and common methods of sets.

(2) Common methods for dictionaries.

(3) Frozensets.

第 6 章：Flow of Control（支撑课程目标 1-3、2-3

【1】知识点：

(1) Comparison operators and logical operators.

(2) The If statement.

(3) The While statement and For statement.

【2】学习目标：

掌握：Comparison operators and logical operators, the If statement, ihe While statement and For statement.

【3】重点：

(1) Comparison operators and logical operators.

(2) The If statement.

(3) The While statement and For statement.

【4】难点：

(1) Comparison operators and logical operators.

(2) The If statement.

(3) The While statement and For statement.

第 7 章：Functions（支撑课程目标 1-4、2-4）

【1】知识点：

(1) Structured analysis and functional decomposition.

(2) Defining and calling functions.

(3) Returning values from functions.

(4) Function parameters.

(5) Anonymous functions.

【2】学习目标：

了解：Structured analysis and functional decomposition.

理解：Defining and calling functions, returning values from functions.

掌握：Function parameters, anonymous functions.

【3】重点：

(1) Defining and calling functions.

(2) Returning values from functions.

(3) Function parameters.

(4) Anonymous functions.

【4】难点：

(1) Function parameters.

第 8 章：Scope and Lifetime of Variables（支撑课程目标 1-4、2-4）

【1】知识点：

(1) Local variables.

(2) The Global keyword.

(3) Nonlocal variables.

【2】学习目标：

了解：Local variables.

理解：The Global keyword.

掌握：Nonlocal variables.

【3】重点：

(1) The Global keyword.

(2) Nonlocal variables.

【4】难点：

(1) Nonlocal variables.

第 9 章：Higher-Order Functions and Curried Functions（支撑课程目标 1-4、2-4）

【1】知识点：

(1) Concepts of higher-order functions and currying functions.

(2) Python higher-order functions.

(3) Functions returning functions.

(4) Python curried functions.

(5) Closures.

【2】学习目标：

了解：Concepts of higher-order functions and currying functions,

掌握：Python higher-order functions, functions returning functions, Python curried functions, closures.

【3】重点：

(1) Python higher-order functions.

(2) Functions returning functions.

(3) Python curried functions.

(4) Closures.

【4】难点：

(1) Functions returning functions.

(2) Python curried functions.

(3) Closures.

第 10 章：Classes and Objects（支撑课程目标 1-6、1-7、2-5、3-3）

【1】知识点：

(1) The basic idea of object-oriented programming.

(2) Definition of classes and creation of objects.

(3) Calling member functions.

(4) The concepts and implementation methods of inheritance.

(5) Some advanced methods of classes.

【2】学习目标：

了解：The basic idea of object-oriented programming.

理解：The concepts and implementation methods of inheritance.

掌握：Definition of classes and creation of objects, calling member functions, some advanced methods of classes.

【3】重点：

(1) Definition of classes and creation of objects.

(2) The concepts and implementation methods of inheritance.

(3) Some advanced methods of classes.

【4】难点：

(1) Definition of classes and creation of objects.

(2) The concepts and implementation methods of inheritance.

(3) Some advanced methods of classes.

【5】思政案例：

(1) The essence of inheritance is a development that mainly includes three aspects: absorption, addition, and modification.

(2) These three aspects are actually a manifestation of "upholding integrity and innovation", namely "developing while inheriting, innovating while upholding integrity", "maintaining direction while upholding integrity, sailing far in innovation", "only by upholding integrity can we not lose direction and avoid disruptive mistakes, and innovation can we grasp the times and lead the times".

第 11 章：Error and Exception Handling（支撑课程目标 1-8）

【1】知识点：

(1) Errors and exceptions.

(2) Handling an exception.

(3) Raising an exception.

(4) Defining a custom exception.

【2】学习目标：

理解：Errors and Exceptions.

掌握：Handling an Exception, raising an exception, defining a custom exception.

【3】重点：

(1) Handling an exception.

(2) Raising an exception.

(3) Defining a custom exception.

【4】难点：

(1) Handling an exception.

(2) Raising an exception.

(3) Defining a custom exception.

第 12 章：Modules and Packages（支撑课程目标 1-5）

【1】知识点：

(1) Modules and Python modules.

(2) Importing Python modules.

(3) Module properties.

(4) Python packages.

【2】学习目标：

理解：Modules and Python modules,

掌握：Importing Python modules, module properties, Python packages.

【3】重点：

(1) Importing Python modules.

(2) Module properties.

(3) Python packages.

【4】难点：

(1) Importing Python modules.

(2) Python packages.

第 13 章：Decorators（支撑课程目标 1-4、1-6、2-4、2-5）

【1】知识点：

(1) Defining and using decorators.

(2) Functions with parameters.
(3) Stacked decorators.
(4) Parameterized decorators.
(5) Method decorators.
(6) Class decorators.

【2】学习目标：

理解：Defining and using decorators.

掌握：Functions with parameters, stacked decorators, parameterized decorators, method decorators, class decorators.

【3】重点：

(1) Defining and using decorators.
(2) Functions with parameters.
(3) Stacked decorators.
(4) Parameterized decorators.
(5) Method decorators.
(6) Class decorators.

【4】难点：

(1) Defining and using decorators.
(2) Functions with parameters.
(3) Stacked decorators.
(4) Parameterized decorators.
(5) Method decorators.
(6) Class decorators.

第 14 章：Generators, Iterables, and Iterators（支撑课程目标 1-3、1-4）

【1】知识点：

(1) Iteration.
(2) The itertools module.
(3) Generators.

【2】学习目标：

掌握：Iteration, the itertools module, generators.

【3】重点：

(1) Iteration.
(2) The itertools module.
(3) Generators.

【4】难点：

(1) Iteration.
(2) The itertools module.
(3) Generators.

（二）实验教学

None

五、教学安排与学时分配

This subject mainly focuses on classroom teaching of theory and on-site demonstrations, and teaches around the basic characteristics, concepts, and practical operations of the Python language. The subject

revolves around the fundamental task of cultivating moral character and nurturing talents, with the overall goal of cultivating socialist builders and successors with comprehensive development in morality, intelligence, physical fitness, aesthetics, and labor. It takes the basic usage methods of Python as the main line, fully utilizes offline classrooms, online teaching resources, and ideological and political cases to carry out teaching activities, and plays a role in imparting theoretical knowledge, experimental practice, and value guidance. It cultivates patriotism and the concept of building a strong country, solidifies basic knowledge, enhances practical skills and innovative spirit, and establishes a correct outlook on life, world, and values. The allocation of class hours for offline teaching is shown in Table 2.

表 2 学时分配表

讲 课 内 容		学时				
		讲课	实验	上机	设计	课外
第 1 章	Introduction	2	0	0	0	0
第 2 章	Strings	2	0	0	0	0
第 3 章	Numeric Data, Boolean Data and None	2	0	0	0	0
第 4 章	Lists and Tuples	2	0	0	0	0
第 5 章	Sets and Dictionaries	2	0	0	0	0
第 6 章	Flow of Control	2	0	0	0	0
第 7 章	Functions	2	0	0	0	0
第 8 章	Scope and Lifetime of Variables	2	0	0	0	0
第 9 章	Higher-Order Functions and Curried Functions	2	0	0	0	0
第 10 章	Classes and Objects	6	0	0	0	0
第 11 章	Error and Exception Handling	2	0	0	0	0
第 12 章	Modules and Packages	2	0	0	0	0
第 13 章	Decorators	2	0	0	0	0
第 14 章	Generators, Iterables, and Iterators	2	0	0	0	0
小计		32	0	0	0	0
总计	32					

六、教学方法

1. Teach basic principles, apply theory to practice, emphasize the basic characteristics of Python language, the basic ideas, and methods of Python programming, and cultivate students' innovative abilities.

2. Adopting a teaching method that combines multimedia courseware and blackboard writing, offline self-learning and self-directed computer learning, and online Q&A with traditional Q&A, to enhance classroom vitality and Q&A abilities.

3. Distribute extracurricular tasks in advance, encourage students to learn on their own, stimulate their learning enthusiasm, cultivate their self-learning ability, problem-solving ability, and teamwork ability.

七、成绩评定

1. The exam form for this subject is open examination and will be evaluated on a hundred marks system. Combine attendance, assignments, and final exams to comprehensively evaluate grades.

(1) Attendance (10%): Students are required to participate in all stages of this subject and are not allowed to be absent.

(2) Homework (40%): Students are required to complete online assignments on time.

(3) Final exam (50%): Open examination on Computer, 120 minutes.

2. The assessment qualification will be cancelled for those who lack more than one-third of the required assignments, or are absent for more than one-third of the planned class hours.

八、评价及持续改进

1. Syllabus

1、教学大纲

Check Period: 4 years, Revised Period: 4 years.

考核周期：4 年，修订周期：4 年。

Improvement Measures: the subject coordinator is responsible to organize all members in subject team for the syllabus discussion and modification, and the revised version shall be submitted to director of the major then the deputy dean (teaching affairs) for reviewing and approval, and finally be executed.

改进措施：课程负责人组织课程团队所有教师讨论后提出改进意见，经教研室主任审核后由教学院长批准。

2. Evaluation

2、成绩评定考核

Check Period: 1 years. Evaluation method can be improved based on the comprehensive analysis of students' final scores.

考核周期：1 学年，评价依据：学生最终成绩综合分析。

Improvement Measures: based on the distribution of students' final scores, editor(s) can make adjustment and optimization of subject content, and improve teaching methods.

改进措施：根据学生最终成绩的分布，进行相应的内容调整和优化，并改进教学方法。

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审核：　　薛昌涛

批准：　　史闻博

日期：　　2023.07.05