数学程序设计导论 教学大纲

Introduction to Programming for Mathematics Subject Syllabus

一、课程信息 Subject Information

课程编号: Subject ID	3100313002	开课学期: Semester	3
课程分类: Category	专业教育 PA	所属课群: Section	专业平台 MT
课程学分: Credit Points	2	总学时/周: Total Hours/Weeks	32
理论学时: LECT. Hours	32	实验学时: EXP. Hours	0
PBL 学时: PBL Hours	0	实践学时/周: PRAC. Hours/Weeks	0
开课学院: College	东北大学 悉尼智能科技学院	适用专业: Stream	应用统计学 AS
课程属性: Pattern	必修 Compulsory	课程模式: Mode	自建 NEU
中方课程协调人: NEU Coordinator	张建波 Jianbo Zhang	成绩记载方式: Result Type	百分制 Marks
先修课程: Requisites	C++程序设计基础 Fundamentals of C++ Programming		
英文参考教材: EN Textbooks	Charles R. Severance, Python for Everybody, Createspace Independent Publishing Platform, 2016.		
中文参考教材: CN Textbooks	王恺, 王志 等. Python 语言程序设计, 机械工业出版社, 2021 年		
教学资源: Resources	无		
课程负责人(撰写人): Subject Director	张建波 Jianbo Zhang	提交日期: Submitted Date	单击或点击此处输入日期。
任课教师(含负责人): Taught by	张建波 Jianbo Zhang		
审核人: Checked by	韩鹏	批准人: Approved by	史闻博
		批准日期: Approved Date	单击或点击此处输入日期。

二、教学目标 Subject Learning Objectives (SLOs)

注：毕业要求及指标点可参照悉尼学院本科生培养方案，可根据实际情况增减行数

Note: GA and index can be referred from undergraduate program in SSTC website. Please add/reduce lines based on subject.

<table>
<tr><td>整体目标:
Overall Objective</td><td colspan="2">如今，数学计算问题主要依靠计算机来完成。特别是在大数据时代，随着数据量的不断变大，人们一方面在研究高效的计算方法，另一方面也在用计算机完成这些计算。本课程从数学计算角度出发介绍用 Python 语言的基础知识，旨在让学生通过 Python 语言编程解决数学计算问题。
Nowadays, mathematical calculation problems mainly rely on computers. Especially in the era of big data, with the increasing amount of data, on the one hand, people are studying efficient calculation methods, on the other hand, they are also using computers to complete these calculations. This subject introduces the basic knowledge of using Python language from the perspective of mathematical calculation, and aims to enable students to solve mathematical calculation problems through Python language programming.</td></tr>
<tr><td rowspan="5">（1）专业目标:
Professional Ability</td><td>1-1</td><td>了解 Python 语言的起源、发展和安装
Recognize the brief history of Python and its development and installation
理解 Python 语言的编程风格
Understand the style of programming with Python
掌握 Python 编程中常见错误
Master common errors when programming with Python</td></tr>
<tr><td>1-2</td><td>了解 Python 语言中数据的类型及其之间的相互转换
Recognize data types and their transitions
理解数据的常量表示和变量表示
Understand expression of data using constant and variable
掌握常见的运算符及其优先级和结合性，表达式
Master operators and its precedence and associativity, expression</td></tr>
<tr><td>1-3</td><td>了解 Python 语言中的数据结构
Data structures in Python
理解序列及其通用操作
Understand sequence and its common operations
掌握列表、元组、字符串、集合、字典的基本操作
Recognize the basic operations of lists, tuples, strings, sets and dictionary</td></tr>
<tr><td>1-4</td><td>了解 Python 编程环境的使用
Recognize setup of programming environment (IDE)
掌握分支结构和循环结构
Master branching structure and loop structure
理解生成器、迭代器及可迭代对象之间的关系
Understand Generator, iterator, and iterative object</td></tr>
<tr><td>1-5</td><td>理解函数的基本概念，函数的定义与调用方法
Understand functions and their definition and calling</td></tr>
</table>

		掌握形参和实参的概念、种类及特点，返回值 Master parameters and arguments, return values 掌握模块和包的概念及作用，模块的定义、导入方式和使用方法 Master modules and packages, and their importing and usages 了解变量的作用域，函数的高级应用，常见的内置函数 Recognize scope of variables, advance usage of functions, common build-ins
	1-6	了解面向对象编程的基本思想 Recognize basic thinking of object-oriented programming 理解继承和多态的概念及实现方法 Understand inheritance and polymorphism 掌握类的定义与对象的创建，成员函数的调用 Master definitions of class and creations of objects, member functions and theirs calling 掌握类的一些高级应用方法 Master advanced methods about class
	1-7	了解目录和文件的相关操作 Recognize common operations about directories and files 理解一维数据和二维数据的概念 Understand 1-dimensionality and 2-dimensionality data 掌握一般文件和 CSV 文件的打开、读写和关闭操作 Master opening, reading, writing and closing general files and CSV files 掌握异常的概念，异常处理的相关方法 Master exceptions and the related operations
（2）德育目标: Essential Quality	2-1	培养具有不畏困难、不惧失败、锲而不舍、敢于尝试、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 Cultivate the spirit of not fearing difficulties or failure, perseverance, daring to try, and cultivate their own careful and patient courage and spirit in the process of learning
	2-2	培养服务意识，具有“以人为本”的服务精神 Cultivate service consciousness and have the service spirit of "people-oriented"
	2-3	培养遵守法律、懂规则、守规则的新时代公民 Cultivate citizens of the new era who abide by the law, understand and obey the rules
	2-4	了解主要矛盾和次要矛盾，在面对复杂问题的时候要实事求是、抓住主要矛盾 Understand the main contradiction and secondary contradiction, seek truth from facts and grasp the main contradiction in the face of complex problems
	2-5	培养有条理和计划，做到心中有数、有条不紊、循序渐进地完成一项工作

		Cultivate a sense of order and plan, and complete a work in an orderly and gradual manner

课程教学目标与毕业要求的对应关系 Matrix of GA & SLOs

毕业要求 GA	指标点 GA Index	教学目标 SLOs
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. Design/Development of Solutions**: Design solutions for complex practical problems and design systems, components or processes that meet specified needs with appropriate consideration for public health, and safety, cultural, societal and environmental considerations.	3-1：能够设计针对本专业相关复杂实际问题的解决方案 3-1: Capable of designing solutions to complex practical problems related to this major	1-1 到 1-7 2-5
	3-2：能够对不同设计方案进行比较和优化，在工作各环节中具有创新意识和批判意识，善于发现、分析、系统表述和解决实际问题 3-2: Capable of comparing and optimizing different design schemes, having a sense of innovation and criticism in all aspects of work, and be good at discovering, analyzing, systematically elaborating and solving practical problems	
	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 3-2: Capable of comparing and optimizing different design schemes, having a sense of innovation and criticism in all aspects of work, and be good at discovering, analyzing, systematically elaborating and solving practical problems	
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. Investigation**: Conduct investigations of complex problems using research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of information to provide valid conclusions	4-1：能够基于科学原理并采用科学方法，在本专业相关理论指导下对复杂实际问题设计实验进行研究 4-1: Capable of design experiments on complex problems with scientific knowledge and research methods of this major	1-1 到 1-7 2-4
	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 4-2: Capable of analyzing and interpreting the experimental data, designing and optimizing the experimental schemer with the knowledge of this major; reasonable and effective conclusions are obtained through information synthesis	

5、使用现代工具：能够针对复杂实际问题，开发、选择与使用恰当的技术、资源、现代信息技术工具，包括对复杂实际问题的预测与模拟，并能够理解其局限性 **5. Modern Tool Usage**: Create, select and apply appropriate techniques, resources and modern engineering and IT tools, including prediction and modeling, to complex practical problems, with an understanding of the limitations	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 5-2: Familiar with the technology and resources required to solve complex practical problems related to the major, capable of using modern information technology to conduct document retrieval and data query, and obtaining professional solutions	1-1 到 1-7 2-4、2-5
	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 5-3: Capable of selecting and using appropriate technology, resources, and modern information technology tools in response to complex practical problems related to the major	

三、教学内容 Content (Topics)

注：以中英文填写，各部分内容的表格可根据实际知识单元数量进行复制、扩展或缩减

Note: Filled in both CN and EN, extend or reduce based on the actual numbers of knowledge unit

(1) 理论教学 Lecture

知识单元序号: Knowledge Unit No.	1	支撑教学目标: SLOs Supported	1-1、2-1 到 2-3
知识单元名称 Unit Title	Python 语言概述 Introduction to Python		
知识点: Knowledge Delivery	Python 语言的起源与发展 A brief history of Python and its development		
	Python 语言环境的安装 Installing Python		
	Python 语言的编程风格 The style of programming with Python		
	Python 编程中常见错误 Common errors when programming with Python		
学习目标: Learning Objectives	了解: Recognize	Python 语言的起源与发展 A brief history of Python and its development	
		Python 语言环境的安装 Installing Python	
	理解: Understand	Python 语言的编程风格 The style of programming with Python	
	掌握:	Python 编程中常见错误	

	Master	Common errors when programming with Python
德育目标 Moral Objectives	2-1, 2-2, 2-3	
重点: Key Points	Python 语言环境的安装 Installing Python	
	Python 语言的编程风格 The style of programming with Python	
难点: Focal Points	Python 编程中常见错误 Common errors when programming with Python	

知识单元序号: Knowledge Unit No.	2	支撑教学目标: SLOs Supported	1-2、2-4
知识单元名称 Unit Title	数据的表示及运算 Expression and Computation of Data		
知识点: Knowledge Delivery	Python 语言中数据的类型及其之间的相互转换 Data types and their transitions		
	数据的常量表示和变量表示 Expression of data using constant and variable		
	常见的运算符及其优先级和结合性，表达式 Operators and its precedence and associativity, expression		
学习目标: Learning Objectives	了解: Recognize	Python 语言中数据的类型及其之间的相互转换 Data types and their transitions	
	理解: Understand	数据的常量表示和变量表示 Expression of data using constant and variable	
	掌握: Master	常见的运算符及其优先级和结合性，表达式 Operators and its precedence and associativity, expression	
德育目标 Moral Objectives	2-4		
重点: Key Points	Python 语言中数据的类型及其之间的相互转换 Data types and their transitions		
	数据的常量表示和变量表示 Expression of data using constant and variable		
难点: Focal Points	常见的运算符及其优先级和结合性，表达式 Operators and its precedence and associativity, expression		

知识单元序号: Knowledge Unit No.	3	支撑教学目标: SLOs Supported	1-3、2-5
知识单元名称 Unit Title	列表，元组，字符串，集合，字典 Lists, Tuples, Strings, Sets, Dictionaries		
知识点: Knowledge Delivery	Python 语言中的数据结构 Data structures in Python		
	序列及其通用操作 Sequence and its common operations		
	列表的创建及其他等操作		

	The creation and operations of lists	
	元组的创建及其他操作 The creation and operations of tuples	
	字符串的创建方法与基本操作 The creation and other operations of string	
	字符串的格式化及其常用方法 The formation of string and the common processing methods of string	
	集合的创建与集合的基本操作 The creation and basic operation of sets	
	字典的创建与字典的常见方法 The creation and common methods of dictionary	
学习目标: Learning Objectives	了解: Recognize	Python 语言中的数据结构 Data structures in Python
		字符串的创建方法与基本操作 The creation and other operations of string
	理解: Understand	序列及其通用操作 Sequence and its common operations
		字符串的格式化及其常用方法 The formation of string and the common processing methods of string
	掌握: Master	列表的创建及其他等操作 The creation and operations of lists
		元组的创建及其他操作 The creation and operations of tuples
		集合的创建与集合的基本操作 The creation and basic operation of sets
		字典的创建与字典的常见方法 The creation and common methods of dictionary
德育目标 Moral Objectives	2-1	
重点: Key Points	序列及其通用操作 Sequence and its common operations	
	列表的创建及其他等操作 The creation and operations of lists	
	元组的创建及其他操作 The creation and operations of tuples	
	集合的创建与集合的基本操作 The creation and basic operation of sets	
	字典的创建与字典的常见方法 The creation and common methods of dictionary	
难点: Focal Points	Python 语言中的数据结构 Data structures in Python	

知识单元序号: Knowledge Unit No.	4	支撑教学目标: SLOs Supported	1-4、2-5

知识单元名称 Unit Title	控制语句 Control Statements	
知识点: Knowledge Delivery	Python 编程环境的搭建 Setup programming environment (IDE)	
	分支结构的作用与基本用法 Branching structure and its basic usages	
	循环结构的作用与循环结构的基本用法 Loop structure and its basic usages	
	生成器、迭代器及可迭代对象之间的关系 Generator, iterator, and iterative object	
学习目标: Learning Objectives	了解: Recognize	Python 编程环境的搭建 Setup programming environment (IDE)
	理解: Understand	生成器、迭代器及可迭代对象之间的关系 Generator, iterator, and iterative object
	掌握: Master	分支结构的作用与基本用法 Branching structure and its basic usages
		循环结构的作用与循环结构的基本用法 Loop structure and its basic usages
德育目标 Moral Objectives	2-5	
重点: Key Points	分支结构的作用与基本用法 Branching structure and its basic usages	
	循环结构的作用与循环结构的基本用法 Loop structure and its basic usages	
难点: Focal Points	生成器、迭代器及可迭代对象之间的关系 Generator, iterator, and iterative object	

知识单元序号: Knowledge Unit No.	5	支撑教学目标: SLOs Supported	1-5
知识单元名称 Unit Title	函数 Functions		
知识点: Knowledge Delivery	函数的基本概念，函数的定义与调用方法 Functions and their definition and calling		
	形参和实参的概念、种类及特点，返回值 Parameters and arguments, return values		
	模块和包的概念及作用，模块的定义、导入方式和使用方法 Modules and packages, and their importing and usages		
	变量的作用域，函数的高级应用，常见的内置函数 Scope of variables, advance usage of functions, common build-ins		
学习目标: Learning Objectives	了解: Recognize	变量的作用域，函数的高级应用，常见的内置函数 Scope of variables, advance usage of functions, common build-ins	
	理解: Understand	函数的基本概念，函数的定义与调用方法 Functions and their definition and calling	
	掌握:	形参和实参的概念、种类及特点，返回值	

	Master	Parameters and arguments, return values
		模块和包的概念及作用，模块的定义、导入方式和使用方法 Modules and packages, and their importing and usages
德育目标 Moral Objectives	2-1	
重点: Key Points	形参和实参的概念、种类及特点，返回值 Parameters and arguments, return values	
	模块和包的概念及作用，模块的定义、导入方式和使用方法 Modules and packages, and their importing and usages	
难点: Focal Points	变量的作用域，函数的高级应用，常见的内置函数 Scope of variables, advance usage of functions, common build-ins	

知识单元序号: Knowledge Unit No.	6	支撑教学目标: SLOs Supported	1-6
知识单元名称 Unit Title	类和对象 Class and Objects		
知识点: Knowledge Delivery	面向对象编程的基本思想 Basic thinking of object-oriented programming		
	类的定义与对象的创建 Definitions of class and creations of objects		
	成员函数的调用 Member functions and theirs calling		
	继承和多态的概念及实现方法 Inheritance and polymorphism		
	类的一些高级应用方法 Advanced methods about class		
学习目标: Learning Objectives	了解: Recognize	面向对象编程的基本思想 Basic thinking of object-oriented programming	
	理解: Understand	继承和多态的概念及实现方法 Inheritance and polymorphism	
	掌握: Master	类的定义与对象的创建 Definitions of class and creations of objects	
		成员函数的调用 Member functions and theirs calling	
		类的一些高级应用方法 Advanced methods about class	
德育目标 Moral Objectives	2-1		
重点: Key Points	类的定义与对象的创建 Definitions of class and creations of objects		
	成员函数的调用 Member functions and theirs calling		
难点: Focal Points	类的一些高级应用方法 Advanced methods about class		

<table>
<tr><td>知识单元序号:
Knowledge Unit No.</td><td>7</td><td>支撑教学目标:
SLOs Supported</td><td>1-7</td></tr>
<tr><td>知识单元名称
Unit Title</td><td colspan="3">I/O 编程与异常
I/O Programming and Exceptions</td></tr>
<tr><td rowspan="5">知识点:
Knowledge Delivery</td><td colspan="3">目录和文件的相关操作
Common operations about directories and files</td></tr>
<tr><td colspan="3">文件的打开、读写和关闭操作
Open, read, write and close files</td></tr>
<tr><td colspan="3">一维数据和二维数据的概念
1-dimensionality and 2-dimensionality data</td></tr>
<tr><td colspan="3">CSV 格式文件的读写方法
Read and write CSV files</td></tr>
<tr><td colspan="3">异常的概念，异常处理的相关方法
Exceptions and the related operations</td></tr>
<tr><td rowspan="5">学习目标:
Learning Objectives</td><td>了解:
Recognize</td><td colspan="2">目录和文件的相关操作
Common operations about directories and files</td></tr>
<tr><td>理解:
Understand</td><td colspan="2">一维数据和二维数据的概念
1-dimensionality and 2-dimensionality data</td></tr>
<tr><td rowspan="3">掌握:
Master</td><td colspan="2">文件的打开、读写和关闭操作
Open, read, write and close files</td></tr>
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<tr><td>德育目标
Moral Objectives</td><td colspan="3">2-1</td></tr>
<tr><td rowspan="2">重点:
Key Points</td><td colspan="3">文件的打开、读写和关闭操作
Open, read, write and close files</td></tr>
<tr><td colspan="3">CSV 格式文件的读写方法
Read and write CSV files</td></tr>
<tr><td>难点:
Focal Points</td><td colspan="3">异常的概念，异常处理的相关方法
Exceptions and the related operations</td></tr>
</table>

(2) 实验教学 Experiments

None

(3) 课外实践教学 PBL

None

四、教学安排 Teaching Schedule

注：可根据实际情况增减行数

Note: Please add/reduce lines based on subject.

教学内容 Teaching Content	学时(周) Hour(Week)			
	理论 LECT.	实验 EXP.	课外实践 PBL	集中实践 PRAC.
Python 语言概述 Introduction to Python	2			
数据的表示及运算 Expression and Computation of Data	4			
列表，元组，字符串，集合，字典 Lists, Tuples, Strings, Sets, Dictionaries	10			
控制语句 Control Statements	4			
函数 Functions	4			
类和对象 Class and Objects	4			
I/O 编程与异常 I/O Programming and Exceptions	4			
总计 Total	32	0	0	0

五、教学方法 Teaching Methodology

注：可根据实际情况增减行数或修改内容

Note: Please add/reduce lines or revise content based on subject.

勾选 Check	教学方法与特色 Teaching Methodology & Characters
☑	多媒体教学：基于信息化设备的课堂教学 Multi-media-based lecturing
☑	实践能力传授：理论与行业、实际案例相结合 Combining theory with industrial practical problems
☑	课程思政建设：知识讲授与德育相结合 Knowledge delivery with ethic education
☐	PBL 教学：问题驱动的分组学习与交流 Problem-based learning
☐	其他:单击或点击此处输入文字。 Other:单击或点击此处输入文字。

六、成绩评定 Assessment

注：可根据实际情况增减行数或修改内容

Note: Please add/reduce lines or revise content based on subject.

考核环节: Assessment Content	平时 Behavior	环节负责人: Director	张建波 Jianbo Zhang
给分形式: Result Type	百分制 Marks	课程总成绩比重(%): Percentage (%)	50

考核方式: Measures	满分 100 分，使用“学习通”进行。出勤，50 分；作业，50 分。 The full score is 100 points. Students' usual classroom performance is recorded by "learning pass". 50 points are counted for each attendance, and no score is given for absence. And 50 points are counted for each assignment, no score for plagiarism, plagiarism for others or no assignment. The final total score is not more than 100 points, not less than 0 points

考核环节: Assessment Content	期末 Final	环节负责人: Director	张建波 Jianbo Zhang
给分形式: Result Type	百分制 Marks	课程总成绩比重(%): Percentage (%)	50
考核方式: Measures	满分 100 分，通过批阅期末考试试卷给出学生成绩。 The full score is 100, and the students' scores are given by marking the final examination papers.		

七、改进机制 Improvement Mechanism

注：未尽事宜以教学团队以及学院教学指导委员会商定为准。

Note: Matters not covered in this file shall be determined by TAB of SSTC, NEU.

教学大纲改进机制 Subject Syllabus Improvement Mechanism			
考核周期(年): Check Period (YR)	4	修订周期(年): Revise Period (YR)	4
改进措施: Measures	课程负责人根据课程教学内容与人才培养目标组织课程团队讨论并修改教学大纲，报分管教学工作副院长审核后由执行院长批准。 The subject coordinator shall be responsible for the syllabus discussion and improvement, and the revised version shall be submitted to deputy dean (teaching affairs) for reviewing then to executive dean for approval		
成绩评定改进机制 Assessment Improvement Mechanism			
考核周期(年): Check Period (YR)	1	修订周期(年): Revise Period (YR)	1
改进措施: Measures	课程负责人根据课程教学内容、课堂教学效果以及成绩分布，对课程教学方法和成绩评定环节进行改进，并同步优化评定办法。 The subject coordinator shall revise the syllabus based on the teaching content, effect and result distribution while optimize the assessment measures.		