操作系统 教学大纲

Operating Systems Subject Syllabus

一、课程信息 Subject Information

课程编号: Subject ID	EQV-31061	开课学期: Semester	3
课程分类: Category	专业教育 PA	所属课群: Section	专业基础 MF
课程学分: Credit Points	4	总学时/周: Total Hours/Weeks	64
理论学时: LECT. Hours	64	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 Sydney Smart Technology College Northeastern University	适用专业: Stream	计算机科学与技术 CST
课程属性: Pattern	必修 Compulsory	课程模式: Mode	互认 EQV
中方课程协调人: NEU Coordinator	王鑫 Wang Xin	成绩记载方式: Result Type	百分制 Marks
先修课程: Requisites	数据结构 Data Structures		
英文参考教材: EN Textbooks	Operating System Concepts, Abrahan Silberschatz		
中文参考教材: CN Textbooks	无 None		
教学资源: Resources			
课程负责人(撰写人): Subject Director		提交日期: Submitted Date	3/17/2023
任课教师(含负责人): Taught by	王鑫 Wang Xin		
审核人: Checked by	韩鹏	批准人: Approved by	史闻博
		批准日期: Approved Date	3/19/2023

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.

整体目标: Overall Objective	本课程主要研究操作系统在常规计算环境（PC 和服务器）中的职责作用，以及如何使操作系统更好的满足各类程序设计和系统服务的需求。 This course mainly studies the responsibilities of the operating system in the conventional computing environment (PC and server), and how to make the operating system better meet the needs of various programming and system services.	
（1）专业目标: Professional Ability	1-1	掌握操作系统在通用计算机系统中的作用。 Students should be able to understand the role of operating systems in general-purpose computer systems.
	1-2	掌握设计和实现一个操作系统的基本原理。 Students should be able to learn the basic principles of designing and implementing an operating system.
	1-3	能够解决和操作系统设计、使用相关的问题 Students should be able to solve problems related to the design and use of operating systems.
（2）德育目标: Essential Quality	2-1	基础软件对行业和社会发展的重要性。 The importance of basic software to the development of the industry and the country.
	2-2	认识到创新能力的重要性。 Students should realize the importance of innovation ability.

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
1、工程知识：能够将数学、自然科学、工程基础和专业知识用于解决复杂工程问题。 GA1. Engineering Knowledge: Apply knowledge of mathematics, natural science, engineering fundamentals and an engineering specialization to the solution of complex engineering problems.	指标点 1-2：掌握程序设计、数据结构、算法分析与设计、计算机数字系统、操作系统等专业知识，具备计算机程序设计开发能力和计算机与信息系统设计开发与维护能力。 1-2: Mastery of programming, data structure, algorithms analysis and design, computer digital system, and operating system, etc., and capable of computer programming and design, design and maintenance of computer and information systems;	1-1, 1-2, 1-3 2-1, 2-2
3、设计/开发解决方案：能够设计针对复杂工程问题的解决方案，设计满足特定需	指标点 3-1：能够设计针对本专业相关复杂工程问题的解决方案，能够设计和开发实现特定功能、满足特定需求的计算	1-2, 1-3

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。 Design/Development of Solutions: Design solutions for complex engineering problems and design systems, components or processes that meet specified needs with appropriate consideration for public health, and safety, cultural, societal and environmental considerations.	机、软件或网络系统。 3-1: Capable of designing solutions to complex engineering problems related to the major, and capable of designing and developing computers, software or network systems that can function specifically and meet specific requirements.	
	指标点 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。 3-2: Capable of comparing and optimizing different design schemes, and innovative in all aspects of the work.	1-1, 1-2, 1-3
4、研究：能够基于科学原理并采用科学方法对复杂工程问题进行研究，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。 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.	指标点 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工程问题设计实验进行研究。 Capable of designing experiments and doing research on complex engineering problems based on scientific principles and scientific methods, under the guidance of related theories of the major.	1-2, 1-3, 2-2
8、职业规范：具有人文社会科学素养、社会责任感，能够在工程实践中理解并遵守工程职业道德和规范，履行责任。 Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of engineering practice.	指标点 8-1：具备健全的人格，坚定的理想信念和社会责任感，科学的世界观、人生观和价值观，良好的人文社会科学素养； 8-1: A sound personality, firm ideal and beliefs and social responsibility, scientific world outlook, outlook on life and values, good humanistic and social science literacy; 指标点 8-2：了解本专业相关的职业道德与规范并认识其重要性，具备良好的职业道德和社会责任感，能够对工程实践活动的社会道德进行判断和评鉴，并履行相应的责任；	2-1

	8-2：Understanding of the professional ethics and norms related to the major and recognize its importance, good professional ethics and social responsibility, capable of judging and evaluating the social ethics of engineering practice activities and fulfill corresponding responsibilities.	

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
知识单元名称 Unit Title	绪论 Introduction		
知识点: Knowledge Delivery	操作系统的特征和主要功能 The characteristics and functions of the operating systems		
	操作系统发展过程 The development of operating systems		
	操作系统体系结构 Operating system architecture		
学习目标: Learning Objectives	了解: Recognize	操作系统发展过程 The development of operating systems	
	理解: Understand	操作系统的特征和主要功能 The characteristics and functions of the operating systems	
	掌握: Master	不同操作系统体系结构间的区别 The difference between different operating system architectures	
德育目标 Moral Objectives	2-1 2-2		
重点: Key Points	操作系统的目标和作用；操作系统特征和主要功能 The objectives and functions of the operating system; operating system features and main functions		
难点: Focal points	不同操作系统体系结构间的区别 The difference between different operating system architectures		

知识单元序号: Knowledge Unit No.	2	支撑教学目标: SLOs Supported	1-1 1-2 1-3

知识单元名称 Unit Title	进程管理 Process management	
知识点: Knowledge Delivery	进程概念：静态组成、动态特征 Process concept: static composition, dynamic characteristics	
	进程的控制与同步 Process control and synchronization	
	进程通信 Process communication	
	线程：线程的概念、组成 Thread: the concept, composition	
学习目标: Learning Objectives	了解: Recognize	进程的特性、进程状态的转化 The characteristics of the process and the transformation of the state of the process
	理解: Understand	进程同步 Process synchronization 进程与线程的区别和联系 The difference and connection between process and thread
	掌握: Master	经典进程同步算法 Classic process synchronization algorithm 进程通信方法 The method of process communication
德育目标 Moral Objectives	2-1 2-2	
重点: Key Points	进程同步 Process synchronization	
难点: Focal points	进程同步算法 Process synchronization algorithm	

知识单元序号: Knowledge Unit No.	3	支撑教学目标: SLOs Supported	1-1 1-2 1-3
知识单元名称 Unit Title	CPU 调度与死锁 CPU scheduling and deadlock		
知识点: Knowledge Delivery	调度模型、调度准则、调度算法、实时调度 Scheduling model, scheduling algorithm, real-time scheduling		
	死锁的原因与条件、预防死锁的方法、检测与解除死锁 Causes and conditions of deadlocks, methods to prevent deadlocks, detection and removal of deadlocks		
学习目标: Learning Objectives	了解: Recognize	处理机调度的任务 The tasks of processor scheduling 处理机调度的模型 The models of processor scheduling	
	理解: Understand	死锁的原因及处理方法 Causes of deadlocks and treatment methods	

	掌握: Master	调度算法 Scheduling algorithms
德育目标 Moral Objectives	2-1 2-2	
重点: Key Points	调度算法 Scheduling algorithms 死锁的原因 Causes of deadlocks 预防死锁算法 Deadlock prevention algorithm	
难点: Focal points	预防死锁算法 Deadlock prevention algorithm	

知识单元序号: Knowledge Unit No.	4	支撑教学目标: SLOs Supported	1-1 1-2 1-3
知识单元名称 Unit Title	内存管理 Memory management		
知识点: Knowledge Delivery	存储系统体系结构 Storage system architecture		
	内存分配算法 Memory allocation		
	分页存储管理 Paging Storage management		
	虚拟存储器 Virtual memory		
学习目标: Learning Objectives	了解: Recognize	存储器体系结构和程序执行过程 Memory architecture and program execution	
	理解: Understand	离散和连续内存分配的不同 Different storage alloction methods	
	掌握: Master	地址变换过程 Address conversion mechanism 页面置换算法 Page replacement	
德育目标 Moral Objectives	2-1 2-2		
重点: Key Points	地址变换过程 Address conversion mechanism 页表 Page table		
难点: Focal points	地址变换过程 Address conversion mechanism 多级页表 Multi-level page table		

知识单元序号: Knowledge Unit No.	5	支撑教学目标: SLOs Supported	1-1 1-2 1-3

知识单元名称 Unit Title	设备管理 I/O equipment	
知识点: Knowledge Delivery	I/O 系统组成和控制方式 I/O system and its control method	
	I/O 软件 I/O software	
	磁盘系统的组成 The disk system	
学习目标: Learning Objectives	了解: Recognize	I/O 系统组成 I/O system
	理解: Understand	不同 I/O 控制方式的差异 The difference of different I/O control methods I/O 软件的作用 The architecture of I/O software
	掌握: Master	磁盘结构 Disk structure 磁盘调度 Disk scheduling
德育目标 Moral Objectives	2-1 2-2	
重点: Key Points	I/O 软件 I/O software 磁盘调度算法 Disk scheduling algorithm	
难点: Focal points	磁盘结构 Disk structure	

知识单元序号: Knowledge Unit No.	6	支撑教学目标: SLOs Supported	1-1 1-2 1-3

知识单元名称 Unit Title	文件系统 File system	
知识点: Knowledge Delivery	文件系统概念 File concept	
	文件系统结构 File-system structure	
	文件存储空间的管理 Free-Space management	
学习目标: Learning Objectives	了解: Recognize	文件系统基本操作 The basic operations of files
	理解: Understand	文件逻辑结构和物理结构 File logical structure and physical structure

	掌握: Master	目录结构 Directory structure 文件存储空间的管理 Free-Space management
德育目标 Moral Objectives	2-1 2-2	
重点: Key Points	文件逻辑结构 File logical structure 文件存储空间的管理 Free-Space management 目录管理 Catalog management	
难点: Focal points	文件存储空间的管理 Free-Space management	

知识单元序号: Knowledge Unit No.	7	支撑教学目标: SLOs Supported	1-1 1-2 1-3
知识单元名称 Unit Title	保护和安全 Protection and Security		
知识点: Knowledge Delivery	保护的目标与原则 Goals and Principles of protection		
	保护的方法与实现 Protection methods and implementation		
	安全问题 The security problem		
	实现安全防御 Implementation of security defenses		
学习目标: Learning Objectives	了解: Recognize	保护和安全中的问题 Issues in protection and security	
	理解: Understand	保护域 Domain of Protection	
	掌握: Master	安全防御的实现 Implementation of security defenses	
德育目标 Moral Objectives	2-1 2-2		
重点: Key Points	访问矩阵 Access Control		
难点: Focal points	漏洞评估 Risk assessment		

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.
概论 Introduction	4			
进程管理 Process Management	18			
CPU 调度与死锁 CPU Scheduling and Deadlock	10			
内存管理 Memory Management	12			
设备管理 I/O equipment	4			
文件系统 File system	12			
保护和安全 Protection and Security	4			
总计 Total	64			

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	王鑫
给分形式: Result Type	百分制 Marks	课程总成绩比重(%): Percentage (%)	20
考核方式: Measures	四次课堂测试，每次占比 25%，满分 100 分. Four Pre-Work quizzs, each accounting for 25%, with a maximum score of 100 points		

考核环节: Assessment Content	项目 Project	环节负责人: Director	王鑫
给分形式: Result Type	百分制 Marks	课程总成绩比重(%): Percentage (%)	30
考核方式: Measures	满分 100 分，通过 PBL 项目报告记录学生成绩，按照学生的报告完成情况和贡献程度酌情给分，抄袭、给他人抄袭或未交实验报告不得分。 The full score is 100, and the students' scores are recorded through PBL Project report. According to the students' report completion and contribution degree, the score is given. Plagiarism, plagiarism to others or failure to hand in the experimental report will not be scored.		

考核环节: Assessment Content	期末 Final	环节负责人: Director	王鑫
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 students' scores are given according to the final examination.		

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 approvement.		
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.		