

软件体系结构 教学大纲

Software Architecture Subject Syllabus

一、课程信息 Subject Information

课程编号: Subject ID	3100213008	开课学期: Semester	5
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	3.5	总学时/周: Total Hours/Weeks	56
理论学时: LECT. Hours	56	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	引进 UTS
中方课程协调人: NEU Coordinator	王鑫, Wang Xin 沈哲, Shen Zhe	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 业务需求建模, Business Requirements Modeling		
英文参考教材: EN Textbooks	Len Bass, Paul Clements, Rick Kazman. Software Architecture in Practice, Fourth Edition, 机械工业出版社, 2020		
中文参考教材: CN Textbooks	无		
教学资源: Resources	https://www.imoooc.com/article/30450		
课程负责人(撰写人): Subject Director	王鑫, Wang Xin 沈哲, Shen Zhe	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	王鑫, Wang Xin 沈哲, Shen Zhe		
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.

<p>整体目标: Overall Objective</p>	<p>本课程教授学生当前的行业实践来设计、开发和评估软件架构，以满足预定义的功能(适用性、安全性)、可用性(可操作性)、效率(时间、行为、资源利用)和可维护性(可更改性、可测试性)的质量特征。根据需要介绍和解释方法和技术的概念、理论和技术。学生应用他们所学到的行业实践来开发业务系统的体系结构。</p> <p>为此，本课程通过课堂教学，使学生了解掌握软件体系结构的主要内容。</p> <ol style="list-style-type: none"> 1. 描述影响体系结构上下文和需求的因素； 2. 基于概念、执行和实现，开发和改进软件系统架构的多个视图； 3. 理解选择和实现架构模式的关键问题； 4. 为满足一个系统的质量属性而选择架构设计的原因； 5. 为实际行业问题的解决方案开发一个完整的软件体系结构。 <p>This subject teaches students current industry practices to design, develop and evaluate software architecture meeting predefined quality characteristics of functionality (suitability, security), usability (operability), efficiency (time, behaviour, resource utilisation) and maintainability (changeability, testability). Concepts, theories and technologies underlying the methods and techniques are introduced and explained as required. Students apply the industry practices that they have learned to develop an architecture of a business system.</p> <p>Therefore, through classroom teaching students can understand the basic methods of software architecture.</p> <ol style="list-style-type: none"> 1. Describe the factors that affect the architectural context and requirements. 2. Develop and refine multiple views of a software system architecture, based on the conceptual, execution and implementation architecture. 3. Understand the key issues in choosing and implementing architectural patterns. 4. Reason about alternative architectural designs to satisfy a system's quality attributes. 5. Develop a complete software architecture for a proposed solution to a realistic industry problem 	
<p>(1) 专业目标: Professional Ability</p>	<p>1-1</p>	<p>理解软件体系结构的概念与功能，明确其在项目中的作用。 Understand the concepts and functions of software architecture and define its role in the project.</p>
	<p>1-2</p>	<p>掌握与软件体系结构相关的架构，包括概念架构，运行架构，实现架构等。 Master the architecture related to software architecture, including conceptual architecture, execution architecture, implementation architecture, etc.</p>
	<p>1-3</p>	<p>掌握架构质量与评价方法。</p>

		Master the method of architecture qualities and evaluation.
	1-4	合理利用工具对项目进行划分与合作，团队协作完成项目。 Make use of tools to divide and cooperate with the project, and complete the project with team cooperation.
(2) 德育目标: Essential Quality	2-1	明确软件体系结构对项目开发和社会建设的重要意义及发展趋势。 Make clear the important significance and development trend of software architecture for project development and social construction.
	2-2	软件体系结构强调逻辑分析与实践相结合，理论联系实际，保证基础软件安全稳定，实现知行合一。 Software architecture emphasize the combination of logical analysis and practice, theory with practice, ensure the security and stability of basic software, realize the unity of knowledge and practice.
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, 1-4, 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	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.	1-3, 1-4
	指标点 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、	2-2

meet specified needs with appropriate consideration for public health, and safety, cultural, societal and environmental considerations.	文化以及环境等因素。 3-3: Capable of taking social, health, safety, legal, cultural and environmental factors in consideration during all aspects of design and development.	
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 4-3：能够追踪国际前沿技术动态，掌握本专业涉及的重要技术指标以及达到指标所需的技术途径。 Capable of tracking the international cutting-edge technology trends, master the important technical indicators involved in the major and the technical approaches needed to achieve the indicators.	2-1, 2-2

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, 2-2
知识单元名称 Unit Title	软件体系结构简介 Introduction to Software Architecture.		
知识点: Knowledge Delivery	软件体系结构的概念 The concept of software architecture.		
	软件体系结构的历史与发展 The history and development of software architecture.		
	软件体系结构的作用 The function of software architecture.		
学习目标: Learning Objectives	了解: Recognize	软件体系结构的历史与发展 The history and development of software architecture.	
	理解: Understand	软件体系结构的作用 The function of software architecture.	
	掌握: Master	软件体系结构中常用的表示方法。 The common representation in software architecture.	
德育目标 Moral Objectives	2-1, 2-2		

重点: Key Points	软件体系结构中常用的表示方法。 The common representation in software architecture.
难点: Focal points	软件体系结构在软件开发中的作用 The function of software architecture in software development.

知识单元序号: Knowledge Unit No.	2	支撑教学目标: SLOs Supported	1-2, 1-4
知识单元名称 Unit Title	软件体系结构上下文 Software architecture in context		
知识点: Knowledge Delivery	上下文的定义 The definition of context.		
	上下文的作用 The function of context.		
	上下文的表示 The representation of context.		
学习目标: Learning Objectives	了解: Recognize	上下文的定义 The definition of context.	
	理解: Understand	上下文的作用 The function of context.	
	掌握: Master	上下文的表示 The representation of context.	
德育目标 Moral Objectives	2-1, 2-2		
重点: Key Points	上下文的表示 The representation of context.		
难点: Focal points	上下文的概念提取 The concept extraction of context.		

知识单元序号: Knowledge Unit No.	3	支撑教学目标: SLOs Supported	1-2, 1-3, 1-4
知识单元名称 Unit Title	概念架构 Conceptual Architecture		
知识点: Knowledge Delivery	概念架构的定义 The definition of conceptual architecture.		
	概念架构的功能与特点 The characteristics and function of conceptual architecture.		
	概念架构的表示 The representation of conceptual architecture.		
学习目标: Learning Objectives	了解: Recognize	概念架构的定义 The definition of conceptual architecture.	
	理解: Understand	概念架构的功能与特点 The characteristics and function of conceptual architecture.	
	掌握: Master	概念架构的表示 The representation of conceptual architecture.	
德育目标 Moral Objectives	2-1, 2-2		
重点: Key Points	概念架构的表示 The representation of conceptual architecture.		

难点: Focal points	概念架构的生成 The generation of conceptual architecture.
---------------------	--

知识单元序号: Knowledge Unit No.	4	支撑教学目标: SLOs Supported	1-2, 1-3, 1-4
知识单元名称 Unit Title	运行架构 Execution Architecture		
知识点: Knowledge Delivery	运行架构的定义 The definition of execution architecture.		
	运行架构的功能与特点 The characteristics and function of execution architecture.		
	运行架构的表示 The representation of execution architecture.		
学习目标: Learning Objectives	了解: Recognize	运行架构的定义 The definition of execution architecture.	
	理解: Understand	运行架构的功能与特点 The characteristics and function of execution architecture.	
	掌握: Master	运行架构的表示 The representation of execution architecture.	
德育目标 Moral Objectives	2-1, 2-2		
重点: Key Points	运行架构的表示 The representation of execution architecture.		
难点: Focal points	运行架构的应用 The application of execution architecture.		

知识单元序号: Knowledge Unit No.	5	支撑教学目标: SLOs Supported	1-2, 1-3, 1-4
知识单元名称 Unit Title	实现架构 Implementation Architecture		
知识点: Knowledge Delivery	实现架构的定义 The definition of implementation architecture.		
	实现架构的功能与特点 The characteristics and function of implementation architecture.		
	实现架构的表示 The representation of implementation architecture.		
学习目标: Learning Objectives	了解: Recognize	实现架构的定义 The definition of implementation architecture.	
	理解: Understand	实现架构的功能与特点 The characteristics and function of implementation architecture.	
	掌握: Master	实现架构的表示 The representation of implementation architecture.	
德育目标 Moral Objectives	2-1, 2-2		

重点: Key Points	实现架构的表示 The representation of implementation architecture.
难点: Focal points	实现架构的应用 The application of implementation architecture.

知识单元序号: Knowledge Unit No.	6	支撑教学目标: SLOs Supported	1-2, 1-3, 1-4
知识单元名称 Unit Title	架构质量与评价 Architecture qualities and evaluation		
知识点: Knowledge Delivery	架构质量与评价的定义 The definition of architecture qualities and evaluation.		
	架构质量与评价的作用 The characteristics and function of architecture qualities and evaluation.		
	架构质量与评价的实现 The representation of architecture qualities and evaluation.		
学习目标: Learning Objectives	了解: Recognize	架构质量与评价的定义 The definition of architecture qualities and evaluation.	
	理解: Understand	架构质量与评价的作用 The characteristics and function of architecture qualities and evaluation.	
	掌握: Master	架构质量与评价的实现 The representation of architecture qualities and evaluation.	
德育目标 Moral Objectives	2-1, 2-2		
重点: Key Points	架构质量与评价的实现 The representation of architecture qualities and evaluation.		
难点: Focal points	架构质量与评价的应用 The application of architecture qualities and evaluation.		

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.
软件体系结构简介 Introduction to Software Architecture	4			
软件体系结构上下文 SA in context	4			

概念架构 Conceptual Architecture	4			
运行架构 Execution Architecture	4			
实现架构 Implementation Architecture	4			
架构质量与评价 Architecture qualities and evaluation	8			
团队项目与小组互评 Team Project and peer review	28			
总计 Total	56			

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
<input checked="" type="checkbox"/>	多媒体教学：基于信息化设备的课堂教学 Multi-media-based lecturing
<input checked="" type="checkbox"/>	实践能力传授：理论与行业、实际案例相结合 Combining theory with industrial practical problems
<input checked="" type="checkbox"/>	课程思政建设：知识讲授与德育相结合 Knowledge delivery with ethic education
<input checked="" type="checkbox"/>	PBL 教学：问题驱动的分组学习与交流 Problem-based learning
<input type="checkbox"/>	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	沈哲 Shen Zhe
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，使用学习通记录学生平时的课堂表现，每次考勤计 10 分，缺勤不得分，缺勤五次及以上取消考试资格。 The full score is 100 points. Students' usual classroom performance is recorded by learning pass. Each attendance is 10 points. No score is given if they are absent from work. If they are absent for five times or more, they will be disqualified.		

考核环节: Assessment Content	期中 Mid-term	环节负责人: Director	沈哲 Shen Zhe
给分形式: Result Type	百分制 Marks	课程总成绩比重(%): Percentage (%)	20
考核方式: Measures	满分 100 分, 包含 5 次小测, 每次 20 分。 The full score is 100, including 5 quizzes, 20 points each time.		

考核环节: Assessment Content	期末 Final	环节负责人: Director	沈哲 Shen Zhe
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, 通过关于项目的讲解和互评给出学生成绩。 The full score is 100, and students' scores are given by the presentation and the peer-review about the project.		

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.
--	-----------