

课程详述

COURSE SPECIFICATION

以下课程信息可能根据实际授课需要或在课程检讨之后产生变动。如对课程有任何疑问，请联系授课教师。

The course information as follows may be subject to change, either during the session because of unforeseen circumstances, or following review of the course at the end of the session. Queries about the course should be directed to the course instructor.

1.	课程名称 Course Title	工业互联网及应用 Computer Networking and its Industrial Application
2.	授课院系 Originating Department	系统设计及智能制造学院 School of System Design and Intelligent Manufacturing
3.	课程编号 Course Code	SDM357
4.	课程学分 Credit Value	3
5.	课程类别 Course Type	专业选修课 Major Elective Courses
6.	授课学期 Semester	秋季 Fall
7.	授课语言 Teaching Language	中文 Chinese
8.	授课教师、所属学系、联系方式 (如属团队授课，请列明其他授课教师) Instructor(s), Affiliation & Contact (For team teaching, please list all instructors)	丁克蜜 副教授 系统设计及智能制造学院 Email: dingkm@sustech.edu.cn DING Kemi Associate Professor Email: dingkm@sustech.edu.cn School of System Design and Intelligent Manufacturing
9.	实验员/助教、所属学系、联系方式 Tutor/TA(s), Contact	待公布 To be announced
10.	选课人数限额(可不填) Maximum Enrolment (Optional)	

11. 授课方式 Delivery Method	讲授 Lectures	习题/辅导/讨论 Tutorials	实验/实习 Lab/Practical	其它(请具体注明) Other (Please specify)	总学时 Total
学时数 Credit Hours	40		16		56
12. 先修课程、其它学习要求 Pre-requisites or Other Academic Requirements	无 NA				
13. 后续课程、其它学习规划 Courses for which this course is a pre-requisite	无 NA				
14. 其它要求修读本课程的学系 Cross-listing Dept.	无 NA				

教学大纲及教学日历 SYLLABUS

15. 教学目标 Course Objectives

工业互联网及应用是自动化专业的一门选修专业课程，全面系统地介绍了计算机网络的发展和原理体系结构，物理层、数据链路层、局域网、广域网、网络互联、运输层、应用层、计算机网络的安全和因特网的演进等，重点介绍了网络协议，同时介绍现场总线、工业物联网的发展演进历史、体系架构、平台与应用开发等内容。通过对本课程的学习，使学生掌握计算机网络体系的基本概念、原理和方法，网络通信协议与实用工业互联网络技术，并形成一定的概念体系，能够灵活应用所学知识，为今后开展这方面的工作打下基础，适应工业控制智能化、网络化和集成化的发展方向。

Computer Networks is an elective course in the field of automation, which comprehensively and systematically introduces the development and principles of computer networks, including the physical layer, data link layer, LAN, WAN, network interconnection, transport layer, application layer, network security, and the evolution of the Internet. The course focuses on the introduction of network protocols. Through studying this course, students can master the basic concepts, principles, and methods of the computer network system, network communication protocols, and practical network technologies. They will form a certain conceptual system and be able to flexibly apply the knowledge they have learned, laying a foundation for future work in this field, and adapting to the development direction of industrial control intelligence, networking, and integration.

16. 预达学习成果 Learning Outcomes

课程目标 1：能够将 OSI 和 ICP/IP 协议族中各层的基本原理、运行机制、通信技术，用于综合复杂工程问题中的网络相关解决方案的比较和分析之中，具备根据实际工程问题设计相应计算机网络体系结构的能力。

课程目标 2：能够根据实际需求对计算机网络进行划分，具备正确区别、选择和使用合适网络设备、网络工具和仿真软件等现代工具的能力，并使用这些工具分析、调试、配置计算机网络的能力。

课程目标 3: 能将专业基础知识及数学模型方法用于诸如工业控制信息领域等复杂工程问题解决方案的比较与综合。

Course objective 1: To be able to compare and analyze network-related solutions for complex engineering problems using the basic principles, operating mechanisms, and communication technologies of each layer in the OSI and ICP/IP protocol families, and to possess the ability to design corresponding computer network architectures based on actual engineering problems.

Course objective 2: To possess the ability to partition computer networks based on actual requirements, correctly distinguish, select, and use appropriate network devices, network tools, and simulation software, and to use these tools to analyze, debug, and configure computer networks.

Course objective 3: To be able to apply professional foundational knowledge and mathematical modeling methods to compare and integrate solutions for complex engineering problems in fields such as industrial control information.

17. 课程内容及教学日历 (如授课语言以英文为主, 则课程内容介绍可以用英文; 如团队教学或模块教学, 教学日历须注明主讲人)

Course Contents (in Parts/Chapters/Sections/Weeks. Please notify name of instructor for course section(s), if this is a team teaching or module course.)

理论教学安排

章节名称	知识点	学时
第 1 章 概述 Overview	工业网络在信息时代中的作用, 工业互联网概述, 互联网的组成, 现场总线的产生与发展, 工业网络在我国的发展, 工业网络的定义, 现场总线的各种标准, 工业互联网体系结构的形成 The role of industrial networks in the information age, an overview of the industrial Internet, the composition of the Internet, the emergence and development of fieldbuses, the development of industrial networks in China, the definition of industrial networks, various standards of fieldbuses, and the formation of industrial Internet architecture	4
第 2 章 计算机网络基础一	计算机网络组织与结构, 物理	8



<p>Fundamentals of Computer Networking I</p>	<p>层的基本概念，数据通信的基础知识，数据传输技术，信道复用技术，数据交换技术等。</p> <p>Basic concepts of the physical layer, fundamental knowledge of data communication, transmission media below the physical layer, channel multiplexing techniques, digital transmission systems, broadband access technologies ; Data link layer using point-to-point channels, point-to-point protocols, data link layer using broadcast channels, extended Ethernet, high-speed Ethernet</p>	
<p>第3章 计算机网络基础二 Fundamentals of Computer Networking II</p>	<p>运输层协议概述，用户数据协议 UDP，传输控制协议 TCP，可靠传输的工作原理，TCP 报文段的首部格式，可靠传输的实现，流量控制，拥塞控制，运输连接管理，计算机网络体系结构，OSI 参考模型等</p> <p>Transportation layer protocol overview, user data protocol UDP, transmission control protocol TCP, the working principle of reliable transmission, the header format of TCP message segments, the implementation of reliable transmission, flow control, congestion control, transportation connection management, computer network architecture, OSI reference model, etc</p>	<p>8</p> <p>Southern University of Science and Technology</p>

<p>第 4 章 工业网络中现场总线技术</p> <p>Fieldbus technology in industrial networks</p>	<p>典型现场总线技术，典型串行通信接口，CAN 与 DeviceNet，说明计算机网络的体系结构、网络协议和组网技术对工业控制的渗透和影响</p> <p>Typical fieldbus technology, typical serial communication interface, CAN and DeviceNet, illustrate the penetration and impact of computer network architecture, network protocol and networking technology on industrial control</p>	<p>10</p>
<p>第 5 章 工业物联网</p> <p>Internet of Things</p>	<p>工业物联网概述，计算机网络技术对工业物联网的影响；数字孪生技术；区块链技术；5G 技术等</p> <p>Overview of the Internet of Things, the impact of computer network technology on industrial IoT, digital twin, block chain, 5G technology</p>	<p>10</p>

实验教学安排：（16 学时）

本课程理论与实践结合，实践部分涵盖物联网全栈技术体系介绍与硬件开发与实物制作，具体包括：

1. 物联网云平台
2. 智慧小屋整屋硬件组成
3. 智慧小屋的软件实现
4. 物联网服务规则编排、Web 开发、App 开发
5. 智慧小屋演示。

18. 教材及其它参考资料 Textbook and Supplementary Readings

[美] James F • Kurose / Keith W. Ross 著，计算机网络：自顶向下方法，机械工业出版社，2022.08

谢希仁 著，计算机网络（第7版），电子工业出版社，2017.01

史治国 陈积明，物联网操作系统 AliOS Things 探索与实践，浙江大学出版社，2018.

贺诗波，史治国，楼东武，陈积明，物联网系统设计，浙江大学出版社，2022

范其明，工业网络与现场总线技术，西安电子科技大学，2023

课程评估 ASSESSMENT

19. 评估形式 Type of Assessment	评估时间 Time	占考试总成绩百分比 % of final score	违纪处罚 Penalty	备注 Notes
出勤 Attendance		5		
课堂表现 Class Performance		5		
小测验 Quiz		10		
课程项目 Projects		25		
平时作业 Assignments		15		
期中考试 Mid-Term Test				
期末考试 Final Exam		40		
期末报告 Final Presentation				
其它（可根据需要 改写以上评估方式） Others (The above may be modified as necessary)				

20. 记分方式 GRADING SYSTEM

- A. 十三级等级制 Letter Grading
- B. 二级记分制（通过/不通过） Pass/Fail Grading

课程审批 REVIEW AND APPROVAL

21. 本课程设置已经过以下责任人/委员会审议通过
This Course has been approved by the following person or committee of authority



南方科技大学
SOUTHERN UNIVERSITY OF SCIENCE AND TECHNOLOGY

