

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	人机工程学 Human Factors Engineering
2.	授课院系 Originating Department	系统设计与智能制造学院 School of System Design and Intelligent Manufacturing
3.	课程编号 Course Code	SDM354
4.	课程学分 Credit Value	3
5.	课程类别 Course Type	专业核心课 Major Core Courses
6.	授课学期 Semester	秋季 Fall
7.	授课语言 Teaching Language	中英双语 English & 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)	李凡, 助理教授 系统设计与智能制造学院 (设计智造学院) LI Fan, Assistant Professor School of System Design and Intelligent Manufacturing (SDIM) Email: lifan@ntu.edu.sg
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)	待公布 To be announced

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
	32	0	32	0	64
学时数 Credit Hours					
12. 先修课程、其它学习要求 Pre-requisites or Other Academic Requirements	CS102A 计算机程序设计基础 A CS102A Introduction to Computer Programming A				
13. 后续课程、其它学习规划 Courses for which this course is a pre-requisite	无 NIL				
14. 其它要求修读本课程的学系 Cross-listing Dept.	无 NIL				

教学大纲及教学日历 SYLLABUS

15. 教学目标 Course Objectives

<p>本课程主要讲解有关人机工程学的基本知识，并将其应用于一系列物理工作环境设计、数字化虚拟人体模型、人机系统设计和评估等工业设计问题上，以剖析系统设计以及工作场所中人的绩效的本质。课程内容包含：</p> <ul style="list-style-type: none"> ○ 人机工程学研究方法：观察法，实验法，访谈法，问卷法，任务分析，设计原则 ○ 生理工效学：人体测量，人体运动系统，动作分析，手握工具设计，工作台尺寸设计 ○ 认知工效学：知觉信息加工方式，认知状态，决策过程，人的差错，物理环境因素，社会组织因素 ○ 人机系统：人机功能分配，人机系统性能评估，数字化虚拟人，交互设计，环境设计 <p>参考课程： MIT: Human Factors Engineering NTU M4857: Human Factors for Design NUS IE5301: Human Factors in Engineering and Design SCUT: Ergonomic I</p> <p>This course focuses on basic knowledge of human factors and ergonomics, applies them to industrial design problems, including physical work environment design, digital virtual human model, human-machine system design and evaluation. This course explores the nature of human performance in system design and workplace design. Topics include:</p> <ul style="list-style-type: none"> ○ Research methods: observation, experiment, interview, questionnaire, task analysis, and design principles. ○ Physical Ergonomics: anthropometry, psychomotor skill and controls, action analysis, hand-held tool design, and workplace design. ○ Cognitive Ergonomics: information process, cognition, decision making, human errors, physical environment, and organizational factors. ○ Human-machine System: human-machine function arrangement, system evaluation, digital virtual human model, interaction design, and environment design. <p>External reference: MIT: Human Factors Engineering NTU M4857: Human Factors for Design NUS IE5301: Human Factors in Engineering and Design SCUT: Ergonomic I</p>
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16. 预达学习成果 Learning Outcomes

<p>通过课程学习和实验课程，学生应该掌握以下能力：</p> <ul style="list-style-type: none"> ○ 将人的感觉，认知和身体的局限和优势纳入人机系统设计中。
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- 可以选择并正确使用适当的人机系统分析和设计工具。
- 识别和分析人为和组织错误的来源。
- 运用合理的人机系统设计原则以改善人机设计和降低人为差错。
- 设计适合信息处理和控制的界面。
- 设计人机工效学实验并对人机系统进行全面评估。
- 针对复杂工程问题提出设计解决方案，以及满足指定需求的设计，并全面考虑人，硬件，组织，安全，文化，社会和环境因素。

Upon completion of this course, students will be able to:

- Relate human sensory, cognitive, and physical capabilities and limitations to the design of human-machine systems.
- Select and correctly use appropriate human-machine system analysis and design tools.
- Identify and analyze sources of human and organizational errors.
- Apply sound human-machine system design principles to human-system design improvement and reduce human errors.
- Design human-computer interfaces for information processing and control.
- Design human factor experiment and conduct overall human-system design evaluation.
- Design solutions for complex engineering problems that meet the specified needs with consideration for human, hardware, organization, safety, cultural, societal, and environmental factors.

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.)

课程安排 Course Schedule & Reading Assignments				
教学周 Week	课程标题 Lecture Title	课时 Hour	实验 Lab	课时 Hour
1	人机工程学概论 Introduction to Human Factors and Ergonomics	2	迷你项目 1: 对人的运动建立数字化模型	2
2	研究方法 Research methods	2	Mini Project 1: Development of user physical action digital model	2
3	设计和评估工具 Design and evaluation tools	2		2
4	人体尺寸测量和应用 Anthropometric measuring and data application	2		2
5	手握工具和作业岗位设计 Hand-held tool and workplace design	2		2
6	工作中的生物力学 Biomechanics of work	2	Mini Project 2: Workplace analysis and design for intelligent manufacturing	2
7	视觉感知系统 Visual sensory system	2		2
8	听觉, 触觉, 前庭系统 Auditory, tactile, and vestibular systems	2		2
9	人的认知和决策过程 Cognition and decision Making	2	迷你项目 3: 用户心理和认知状态数字化建模 Mini Project 3: Development of user mental and cognitive states digital model	2
10	人机系统, 显示装置设计 Human-machine system and display design	2		2
11	操纵装置设计 Control design	2		2
12	人的表现评估 Human performance analysis	2		2
13	人为差错分析 Human errors	2	迷你项目 4: 系统设计中的人为因素分析 Mini project 4: Human factors analysis in system design	2
14	物理环境因素, 组织社会因素 Physical environment and organizational factors	2		2
15	Safety and accident prevention 安全和事故预防	2		2
16	人机工程学发展趋势 The trend of human factors and ergonomics 作业: 智能制造中的人机工效分析报告 Assignment: A report of human factor analysis in intelligent manufacturing	2		2

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

<p>Textbook:</p> <p>Wickens, C.D., Lee, J.D., Liu, Y., Gordon Becker, S.E. (2004). An Introduction to Human Factors in Engineering (2nd Ed.). Upper Saddle River, New Jersey: Pearson Prentice-Hall.</p> <p>Sanders, M.S. and McCormick E.J. (1997). Human Factors in Engineering and Design (7th Ed.). McGraw-Hill, Inc.</p> <p>Supplementary Readings:</p> <p>Kroemer K.H.E. Fitting the Human: Introduction to Ergonomics (6th ed), CRC, Press, 2008.</p> <p>Kroemer, K.H.E., Kroemer, H.B., and Kroemer-Elbert, K.E. (2001). Ergonomics: How to Design for Ease and Efficiency (2nd Ed.). Upper Saddle River, New Jersey: Prentice Hall.</p>
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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					
课堂表现 Class Performance					
小测验 Quiz					
课程项目 Projects					
平时作业 Assignments	16 周 Week 16	20		智能制造中的人机工效分析报告 A report of human factor analysis in intelligent manufacturing	
期中考试 Mid-Term Test					
期末考试 Final Exam					
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)	迷你项目 1 Mini project 1	1-4 周 Week 1-4	20	无 NIL	生理工效模块 Physical ergonomics module
	迷你项目 2 Mini project 2	5-8 周 Week 5-8	20	无 NIL	工作台设计模块 Workplace design module
	迷你项目 3 Mini project 3	9-12 周 Week 9-12	20	无 NIL	认知工效模块 Cognitive ergonomics module
	迷你项目 4 Mini project 4	13-16 周 Week 13-16	20	无 NIL	人机系统模块 Human-system module

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