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	人工智能 B Artificial Intelligence B
2.	授课院系 Originating Department	计算机科学与工程系 Department of Computer Science and Technology
3.	课程编号 Course Code	CS303B
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	英文 English
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）	Adam Ghandar，助理教授，计算机科学与工程系，aghandar@sustech.edu.cn Adam Ghandar, Assistant Professor, Department of Computer Science and Engineering, aghandar@sustech.edu.cn
9.	实验员/助教、所属学系、联系方式 Tutor/TA(s), Contact	王友权，科研助理，计算机科学与工程系，wangyq6@mail.sustech.edu.cn Youquan Wang, Research Assistant, Department of Computer Science and Technology, wangyq6@mail.sustech.edu.cn
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	32		32		64

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 — Introduction to Computer Programming A CS203B 数据结构与算法分析 B — Data Structures and Algorithm Analysis B MA212 概率论与数理统计 — Probability and Statistics Limited background in programming (no specific language required). Knowledge of data structures and algorithms including basic ideas of computational complexity. Some background in probability and statistics. A large component of the course is a mini project in a topic of the students choice, hence some experience in implementing a relatively large software or computing project is beneficial (but not a strict requirement).
13.	后续课程、其它学习规划 **Courses for which this course is a pre-requisite**	
14.	其它要求修读本课程的学系 **Cross-listing Dept.**	

教学大纲及教学日历 SYLLABUS

15. 教学目标 **Course Objectives**

This course provides an introduction to artificial intelligence. Topics covered include heuristic search, deductive reasoning, planning, and learning. By taking this course, students are expected to obtain knowledge about the basic technology in AI and how to apply them in real-world problems. The work in the course will consist of 5-6 homework assignments (about one every two weeks), a group project presentation, and a final exam. At least 1 homework will be a mini-project, which is about the application of AI technology in a real-world problem. The real-world problem is expected to be identified by the students themselves, based on their major.

16. 预达学习成果 **Learning Outcomes**

1. Understand the importance of AI in the modern world
2. Be able to identify and understand applications of AI
3. Be able to understand the principles of AI
4. Understand search algorithms and heuristics
5. Understand the concept of an agent
6. Broadly understand and apply principles of machine learning

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.)

Lecture 1 – Introduction (i.e. week 1 / 1 lecture per week)

a. Cognitive systems
b. Simulation
c. Philosophical foundations
d. History of AI

Lecture 2 – Applications, Recommendation Systems, Decision Support Systems

a. Games
b. Industrial automation
c. Natural language
d. Office automation
e. Professions automation: law, medicine, science

Lecture 3 – Problem Solving and Searching I

a. Problem types
b. Problem formulation
c. Dynamic programming
d. Back tracking
e. Graph and tree search strategies

Lecture 4 – Problem Solving and Searching II

a. Global and local search
b. A* algorithm

Lecture 5 – Problem Solving and Searching III

a. Modern heuristic methods
b. Constraint handling
c. Planning and scheduling problems

Lecture 6 – Problem Solving and Searching IV

a. Games
b. Minimax algorithm
c. Stochastic games

Lecture 7 – Knowledge and Reasoning I

a. Knowledge based agents
b. Propositional logic
c. Model checking
d. Logical agents

Lecture 8 – Knowledge and Reasoning II

a. First order logic
b. Knowledge representation
c. Knowledge engineering
d. Inference

Lecture 9 – Natural language

a. Discourse
b. Language models

c. Language parsing and understanding
d. Text and speech

Lecture 10 – Planning and Recommending I
a. Classical planning
b. State space search
c. Planning graphs
d. Other approaches

Lecture 11 - Planning and Recommending II
a. Resource constrained problems
b. Planning
c. Probalistic reasoning
d. Decisions
e. Making recommendations

Lecture 12 - Agent Based Modelling and Simulation I
a. Complex systems and interactions
b. Multiple agents
c. Belief systems and rules
d. Simulation models

Lecture 13 – Agent Based Modelling and Simulation II
a. Tools for agent based modelling
b. What-if analysis and prediction
c. Real applications

Lecture 14 – Machine Learning I
a. Principles of machine learning
b. Supervised and unsupervised learning
c. Decision trees
d. Learning theory

Lecture 15 – Machine Learning II
a. Artificial neural networks
b. Ensemble learning
c. Practical applications

Lecture 16 – Review

Practical component

Weeks 1 – 2: Tools and development environment, introduction to Python

Weeks 3 – 4: Searching problems and heuristics

Weeks 5 – 6: Games

Weeks 7 – 8: Agents and first order logic

Weeks 10 – 12: Planning and scheduling systems

Weeks 13 – 14: Agent based models and simulation

Weeks 15 – 16: Machine learning

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

Russell, Stuart J., and Peter Norvig. Artificial intelligence: a modern approach. Malaysia; Pearson Education Limited, 2016.

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	16 weeks	10%		Attendance at lectures and practicals
课堂表现 Class Performance				
小测验 Quiz				
课程项目 Projects				
平时作业 Assignments		60%		5 approximately bi-weekly assignments with first released in week 3. The final assignment is a “mini-project” and will take 4 weeks
期中考试 Mid-Term Test				
期末考试 Final Exam		20%		
期末报告 Final Presentation		10%		Presentation is related to a “mini-project” that is a group work of the final assignment
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