City University of Hong Kong

Information on a Course
offered by Department of Computer Science
with effect from Semester A in 2012 / 2013

Part I

Course Title: AI Scheduling
Course Code: CS4387
Course Duration: One Semester
No. of Credit Units: 3
Level: B4
Medium of Instruction: English
Prerequisites: Nil
Precursors: CS2360 Java Programming or CS2363 Computer Programming
Equivalent Courses: Nil
Exclusive Courses: Nil

Part II

1. Course Aims:

This course aims to introduce students to the application of Artificial Intelligence (AI) to scheduling, planning, resource allocation, timetabling and other related tasks. It also aims to develop students’ ability in creating AI models, designing algorithms and implementing programs in AI scheduling system development.
2. Course Intended Learning Outcomes (CILOs)

*Upon successful completion of this course, students should be able to:*

<table>
<thead>
<tr>
<th>No.</th>
<th>CILOs</th>
<th>Weighting (if applicable)</th>
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<tbody>
<tr>
<td>1.</td>
<td>evaluate AI algorithms/technologies and explain their applications to solving different scheduling-related tasks;</td>
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<td>2.</td>
<td>analyze a scheduling-related problem to determine whether or not it can benefit from using an AI approach and which AI approach is most appropriate;</td>
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<td>3.</td>
<td>create an AI model and design an AI algorithm to solve a scheduling-related problem and implement it in a modern programming language.</td>
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3. Teaching and learning Activities (TLAs)

*(designed to facilitate students’ achievement of the CILOs)*

Teaching pattern:
*Suggested lecture/tutorial/laboratory mix: 2 hours lecture, 1 hour tutorial.*

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<thead>
<tr>
<th>CILO No.</th>
<th>TLAs</th>
<th>Hours/week (if applicable)</th>
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| CILO 1 – 3 | **Journal** or report  – Students are required to document their learning and insights in a journal or report as evidence of their achievement of the CILOs.  
**Presentations** – Students are required to make presentations and discuss their findings in class. The teacher will guide discussions and help focus issues.  
**Mini-Project** – Each student will be required to evaluate some AI algorithms and technologies, create an AI model for a given scheduling-related problem, then analyze, design and implement a simple AI scheduling system using the concepts and techniques learned in class. The software mini-project gives students an opportunity to apply knowledge learned in class to actual AI application development. The mini-project may include software requirements, design, AI modelling, implementation, and testing. The mini-project should be documented in a final project report. |                           |
4. Assessment Tasks/Activities
(designed to assess how well the students achieve the CILOs)

<table>
<thead>
<tr>
<th>CILO No.</th>
<th>Type of assessment tasks/activities</th>
<th>Weighting (if applicable)</th>
<th>Remarks</th>
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<tbody>
<tr>
<td>CILO 1</td>
<td><strong>Coursework</strong> – The quality of the collective coursework will be used to assess this CILO, in particular the students’ presentation quality and the content of the project report. <strong>Exam</strong> – Questions will be designed to assess students’ analytical and evaluative knowledge of AI algorithms/technologies and how they may applied to solve a given problem.</td>
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<td>CILO 2 – 3</td>
<td><strong>Coursework</strong> – The quality of the mini-project design and implementation will be used to assess these CILOs. <strong>Exam</strong> – Questions will be designed to assess students’ practical skills and knowledge of analysis, modelling, design and implementation issues.</td>
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5. Grading of Student Achievement:

Examination duration: 2 hours

Percentage of coursework, examination, etc.: 30% CW; 70% Exam

Grading pattern: Standard (A+AA–…F)

For a student to pass the course, at least 30% of the maximum mark for the examination must be obtained.

Part III

Keyword Syllabus

Overview of AI and scheduling. Introduction to AI concepts, algorithms, techniques such as business rules, search algorithms, constraint-programming, artificial neural network, genetic algorithms, evolutionary algorithms, clustering, etc. Case studies of scheduling, planning, resource allocation, and timetabling applications. Overview of development processes and best practices for AI scheduling projects. Overview of implementation tools and technologies.
Syllabus

1. Overview of AI
   Overview and history of AI. State of the art. Future of AI.

2. Scheduling application areas
   Problem characteristics of scheduling, planning, time-tabling, resource allocation systems. Case studies.

3. AI-related algorithms

4. Rule-based expert systems
   AI rule-based production systems (such as OPS5). Rule compilation algorithms, such as the Rete algorithm. Use of rule-based algorithms to develop expert systems. Case studies of classic AI expert systems.

5. Constraint-based programming
   Constraint-based programming and its application to scheduling and resource allocation. Overview of the key concepts such as constraint propagation, backtracking, and non-deterministic search.

6. Problem solving algorithm
   General problem solver. Applications and limitations.

Recommended Reading

Text

Supplementary Reading