MECH S395 Mechatronics

Course Guide

Contents

1 Introduction 1
2 Aims of the Course 2
3 Course Components 2
   Textbook 2
   Study Guides 2
   Home Computer 2
   CD-ROM containing SmartLab 2
   Supplementary Materials 2
   Laboratory Classes 2
   Face-to-Face Tutorials and Surgeries 2
   Continuous Assessment 3
   Final Examination 3
4 Studying the Course 3
5 Internet Support 3

1 Introduction

Welcome to MECH S395! We hope you enjoy studying this course. This guide is designed to help you to see the course as a whole. Please read it before you start reading the course material. You may also find it useful during the year, as it describes the components of the course, advises you on study patterns, and explains the assessment procedures. You will also receive a separate Presentation Schedule which shows all the important dates for the course.

The design of intelligent machines is a subject area that has emerged in the past few decades, driven by the practical need to design machines that are capable of working autonomously under conditions of some uncertainty, i.e., in situations where, from time-to-time, unpredictable events occur.

The subject of Mechatronics is vast in scope – it combines mechanical, electrical and software engineering, as well as information systems, communication, control and artificial intelligence, to mention only its major elements. In this course, we will concentrate on:

1. New aspects of the subject, such as the capability of machines to build models of themselves and of their environment, to reason about these model and update them, to plan their actions and modify these plans; and, to a lesser extent on
2. Problems of the integration of different technologies into a coherent system.

The course therefore contains more material on information processing and artificial intelligence than on mechanical or electronic engineering.

A central element of the course is SmartLab, which includes the Home Experiment Kit (HEK) and associated software for a personal computer, and provides you with exciting opportunities to perform some experiments on your computer.

2 Aims of the Course

The educational aims of the course are as follows:

1. To explain concepts of intelligent machines and to demonstrate how they are used in practical situations.
2. To provide you with a selection of techniques for
analyzing and designing intelligent machines, emphasizing both their power and limitations.

3. To familiarize you with examples of practical intelligent machines.

The objectives are to enable you, upon the completion of this course, to carry out the following tasks and activities:

1. To communicate with both experts and novices in the field, using appropriate terminology.
2. To read and comprehend books and articles on intelligent machines, and to continue developing your knowledge and skills acquired during the course.
3. To participate in teams specifying and designing intelligent machines.
4. To identify and critically assess opportunities for deployment or development of intelligent machines.

3 Course Components

The course has the following components:

- Textbook.
- Study Guides.
- Home Computer.
- CD-ROM containing SmartLab.
- Supplementary Materials.
- Laboratory Classes.
- Face-to-face Tutorials and Surgeries.
- Continuous Assessment.
- Final Examination.
- Internet Support.

3.1 Textbook

The textbook is entitled *Mechatronics: Designing Intelligent Machines*. It consists of two volumes:

*Volume 1: Perception, Cognition and Execution;*  
*Volume 2: Concepts of Artificial Intelligence*

3.2 Study Guides

The study guides include this Course Guide, and Study Guides to the Introduction, Perception, Cognition, and Execution Blocks.

3.3 Home Computer

You need to have access to a personal computer and to the Internet. The recommended configuration is

- Pentium III 300MHz CPU
- Microsoft Windows XP or above

3.4 CD-ROM containing SmartLab

SmartLab contains a series of eight activities using an integrated set of computer programs and a Home Experiment Kit. SmartLabs 1, 2, 5, 6 and 8 involve the Home Experiment Kit (HEK).

3.5 Supplementary Materials

Printed supplementary materials include a presentation schedule, tutor-marked assignments, any study comments, stop-press material, and the booklet *Using the T395 SmartLab Software*. A specimen examination paper will also be provided on the Online Learning Environment (OLE).

3.6 Laboratory Classes

There will be 5 laboratory classes during which Home Experiment Kits (HEK) will be provided to perform some of the SmartLab activities. **You MUST attend at least 3 out of the 5 day-long labs** in order to gain credits for the course, and you are strongly advised to attend all, as some TMA questions will be based on these lab activities.

3.7 Face-to-Face Tutorials and Surgeries

OUHK will assign you to a course tutor who can help you with both the theoretical and practical aspects of the course. There are two-hour tutorials and two-hour surgeries. You will meet your tutor during tutorials. The tutorial schedule and groupings will be mailed to you separately. While it is not a requirement for you to attend the tutorials, you are encouraged to do so because you will meet with your tutor and fellow students. There are also surgeries during which you can raise questions to the tutor-on-duty (who may or may not be your tutor). If you have any problem with the course you should contact your tutor to get help.

You may find it useful to keep in touch with your fellow students for mutual assistance and comparing progress. In particular, you may be able to help each other with the practical work, as some students may have technical problems which others can overcome. For this, we strongly encourage you to make use of the discussion group on the OLE.

3.8 Continuous Assessment

Your progress with the course is assessed by 4
tutor-marked assignments (TMAs), which are summative and will together count for 50% of the overall course assessment. The best 2 out of TMAs 01, 02 and 03 are counted; TMA 04 is required. The TMA documents will be available for download from the OLE.

You are encouraged to submit your assignments according to schedule. If you foresee difficulties in completing the assignment, please contact your tutor for help early on. If you cannot meet the deadline, please apply for extension before the cut-off date. For the three assignments TMA 01, TMA 02 and TMA 03, your tutor has the authority to give you up to 7 days’ extension, provided the application is made before the assignment cut-off date, and is substantiated with a good reason. “Too busy at work” or “Sent by the company to overseas trips” are not considered as good reasons. Please note that there will be no extension for TMA 04’s cut-off date, so that the marked assignments with tutor’s comments can be returned to you as a reference in time for preparation for the examination.

3.9 Final Examination

The final examination is a written paper of three hours. You will receive on OLE a Specimen Examination Paper, which resembles the actual paper in style and format. There is no trick question on the examination paper. Any material which has been described as non-assessable will not be assessed. Remember it is our intention to see that as many students as possible successfully completing the course. The final examination comprises 50% of the overall course assessment.

4 Studying the Course

The printed texts give you most of the knowledge elements required to specify and participate in the design of intelligent machines.

Volume 1 provides background information about intelligent machines and their major functional subsystems – perception, cognition and execution. It also includes an overview of the concept of architecture and describes approaches to designing mechatronic products.

Volume 2 is a source of concepts and techniques in artificial intelligence which are applicable in practical situations. You will be expected to use these concepts and techniques in machine design and analysis exercises.

MECH S395 is structured in five blocks, listed below in the recommended sequence of study:

- Introduction Block
- Perception Block
- Cognition Block
- Execution Block
- Integration Block

Study Guides for the Blocks provide you with a commentary on each chapter. These set the scene, add detailed teaching points and give you the opportunity to test your grasp of the teaching material via self-assessment questions (SAQs).

While knowledge can be acquired both passively and actively, you will have to develop the design skills through active learning – answering the SAQs, completing the assignments, and performing the SmartLab activities.

In the absence of broadcasts, TMAs provide the only ‘pacing’ element in the course, so you should make sure you do not build up a backlog of work that prevents you from meeting the TMA submission deadlines.

5 Internet Support

The course is supported by the OUHK Online Learning Environment (OLE). Please familiarize yourself with the OLE early on. Some of the course information, including assignments, will be available only on the OLE so you may wish to check the website regularly.

You are also encouraged to participate in the MECH S395 discussion group. Your course coordinator and tutors will also visit the discussion board regularly and participate in the discussion.

For details about the OLE, please refer to Introduction to the Online Learning Environment and OLE User Guide (http://ole.ouhk.edu.hk/help.html).