

Department of Industrial Engineering
and Decision Analytics

IEDA 2100S: COMPUTING IN INDUSTRIAL APPLICATIONS (Spring Semester 2024)

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Aims:

To equip IEDA students with the knowledge of microprocessor controls and automation so that they are confident to work in high value-added industries such as RFID systems, medical devices, IoT devices, industrial electro-pneumatic systems and high-end consumer products.

Learning Philosophy:

Successful IEDA graduates are creative in using advanced technology. Creativity is about making new and original associations among different technologies. This course will provide hands-on experience in automation technology.

Course Learning outcomes: after this course, students should be able to:

Knowledge/Content Related:

1. Acquire and practice the ability to design, construct, analyse, and critique a simple control system with sensor and actuators.
2. Acquire and practice the ability to identify, compare the basic architecture of different computers.

Academic Skills/Competencies:

3. Acquire and practice the ability to program a Programmable Logic Controller to perform some automated tasks.
4. Practice the ability to solve automation technology problems through self-learning.

Lectures: We 02:30PM - 04:20PM; Rm 2302, Lift 17-18

Labs: (LA1) We 09:00AM - 11:50AM (LA2) Tu 12:00PM - 02:50PM; rm.4223

Office hours: We 01:30PM - 02:20PM or appointments via emails (nickchin@ust.hk)

Reference Text:

This is a lab-based course and full lecture notes and laboratory instructions have been written and will be put on the CANVAS.

Supplementary Reading:

Jacob, J.M. (1988) Industrial control electronics: application and design. Prentice Hall. ISBN 0-13-459306-5. (TK7881.2 J33 1988).

Phipps, C.A. (1995) Fundamentals of Electrical Control. The Fairmont Press Inc. ISBN 0-13-504846-X. (TK 7881.2 P55 1995).

Smith, E. and Vivian, B.E. (1995) An introductory guide to valve selection. Mechanical Engineering Publications Limited, London. ISBN 0-85298-914-8. (TJ 223 V3 S65 1995).

Course Grading:

Mid-Term Exam	25%	(Open-book Exam)
Final Exam	35%	(Open-book Exam)
Lab. Work	30%	(NO Copying *)
Assignment 1	5%	(NO Copying *)
Class & Lab Participation	5%	
100%		

*** Heavy Penalty for copying or free riding!**

Course Syllabus:

	LECTURES	LAB SESSIONS
Week 1 [Add / Drop] L1: Wed, Jan 31 LA1: Wed, Jan 31 LA2: Sat, Jan 00	Topic 1: Introduction to Automation <ul style="list-style-type: none"> Automation in HK Components & structures of automated systems Course Overview & Intro to the lab 	NO Lab.
Week 2 [Add / Drop] L1: Wed, Feb 07 LA1: Wed, Feb 07 LA2: Tue, Feb 06	Topic 2: Pneumatic Control <ul style="list-style-type: none"> Usage in HK Basic Components Symbols & circuit diagram 	NO Lab.
Week 3 [Add / Drop] L1: Wed, Feb 14 LA1: Wed, Feb 14 LA2: Tue, Feb 13	Continue Topic 2...	NO Lab.
Week 4 L1: Wed, Feb 21 LA1: Wed, Feb 21 LA2: Tue, Feb 20	Topic 3: Sensors, transducers & transceivers < Assignment 1 > <ul style="list-style-type: none"> Definitions & usage in HK Types & characteristics Working principles 	Lab 1: Design & build a Pneumatic control door.
Week 5 L1: Wed, Feb 28 LA1: Wed, Feb 28 LA2: Tue, Feb 27	Continue Topic 3...	Lab 2: Design & build automatic door with safety sensors
Week 6 L1: Wed, Mar 06 LA1: Wed, Mar 06 LA2: Tue, Mar 05	Topic 4: Ladder Logic & PLC <ul style="list-style-type: none"> Basic PLC Hardware Ladder logic diagram for circuit design Ladder logic as a programming tool Case studies & exercises 	Lab 3: Mission Impossible! A FUN lab to illustrate the importance of circuit diagrams - Part I
Week 7 L1: Wed, Mar 13 LA1: Wed, Mar 13 LA2: Tue, Mar 12	Continue Topic 4... < Assignment 1 deadline >	Lab 4: Mission Impossible! A FUN lab to illustrate the importance of circuit diagrams - Part II

<p>Week 8</p> <p>L1: Wed, Mar 20</p> <p>LA1: Wed, Mar 20</p> <p>LA2: Tue, Mar 19</p>	<p>Topic 5: Electro-magnetic Actuation</p> <ul style="list-style-type: none"> • Usage in HK • Types of motors & relays • Stepping motors & Servo motors 	<p>Lab 5:</p> <p>First exercise with PLC</p>
<p>Week 9</p> <p>L1: Wed, Mar 27</p> <p>LA1: Wed, Mar 27</p> <p>LA2: Tue, Mar 26</p>	<p>*Midterm Exam (Tentative Date)*</p>	<p>Lab 6:</p> <p>Design & build an automatic material selection system - Part I</p>
<p>Week 10</p> <p>L1: Wed, Apr 03</p> <p>LA1: Wed, Apr 03</p> <p>LA2: Tue, Apr 02</p>	<p>Mid-term Break</p>	<p>NO Lab.</p>
<p>Week 11</p> <p>L1: Wed, Apr 10</p> <p>LA1: Wed, Apr 10</p> <p>LA2: Tue, Apr 09</p>	<p>Topic 6: Analogue, Digital & Microprocessor Controls</p> <ul style="list-style-type: none"> • Basics of digital signals • Architecture of a PC • Standard I/O interfaces of a PC 	<p>Lab 7:</p> <p>Design & build an automatic material selection system - Part II</p>
<p>Week 12</p> <p>L1: Wed, Apr 17</p> <p>LA1: Wed, Apr 17</p> <p>LA2: Tue, Apr 16</p>	<p>Continue on Topic 6...</p>	<p>Lab 8:</p> <p>Design & build a simple industrial IoT System</p>
<p>Week 13</p> <p>L1: Wed, Apr 24</p> <p>LA1: Wed, Apr 24</p> <p>LA2: Tue, Apr 23</p>	<p>Topic 7: Internet of things (IoT) & Automation in HealthCare</p>	<p>Lab 9:</p> <p>Automation in HealthCare: noninvasive heart rate monitor - Part I</p>
<p>Week 14</p> <p>L1: Wed, May 01</p> <p>LA1: Wed, May 01</p> <p>LA2: Tue, Apr 30</p>	<p>Public Holiday</p>	<p>NO Lab.</p>
<p>Week 15</p> <p>L1: Wed, May 08</p> <p>LA1: Wed, May 08</p> <p>LA2: Tue, May 07</p>	<p>Continue on Topic 7...</p>	<p>Lab 10:</p> <p>Automation in HealthCare: noninvasive heart rate monitor - Part II</p>

NB: Lecture notes and lab instructions can be downloaded from the CANVAS.