UNIVERSITI TEKNOLOGI MARA

CMT350: PROCESS INSTRUMENTATION

Course Name (English)	PROCESS INSTRUMENTATION APPROVED
Course Code	CMT350
MQF Credit	2
Course Description	This is an introductory course involving theoretical and practical usage of process control systems, which gives students an insight into the historical background and the basic theoretical knowledge of the subject and the latest concept of Proportional, Integral, Derivative (PID) control modes. This course also exposes students to the various types of industrial controllers and related hardware available in industries and gives students the opportunity to learn 'hands on' about controller tuning.
Transferable Skills	Transfer skill of process control in understanding theories, solving authentic problems, express and articulate scientific ideas effectively.
Teaching Methodologies	Lectures, Blended Learning, Lab Work, Field Trip
CLO	CLO1 Perform the operation of process control instrument using process variables data CLO2 Display good values, attitudes and ethics in understanding the process control mechanism. CLO3 Demonstrate good managerial skills in performing process control analysis.
Pre-Requisite Courses	No course recommendations

Topics
1. Introduction: The importance of Process Control 1.1) n/a
2. Control Theory Basics 2.1) The control loop 2.2) Three tasks 2.3) Process control terms 2.4) Process variable and set-point 2.5) Measured variables, process variables, and manipulated variables 2.6) Error, offset and load disturbance 2.7) Control algorithm. 2.8) Manual and automatic control 2.9) Closed and open control loops
3. Lab 1: Flow control – Feedback/1st Element 3.1) n/a
4. Lab 2: Level control – Feedback/1st Element 4.1) n/a
5. Components of Control Loops 5.1) Primary elements/sensors 5.2) Transducers, converters and transmitters 5.3) Pneumatic, analog and digital signal 5.4) Indicators, recorders and controllers 5.5) Correcting elements/final control elements 5.6) Actuators
6. Lab 3: Temperature control – Feed-forward/2nd Element 6.1) n/a
7. Lab 4: pH Control – Introduction 7.1) n/a

8. ISA Symbology: The instrumentation, system and automation society 8.1) Piping and connections 8.2) Identification letters and tags
9. Controller Algorithms and Tuning 9.1) Controller algorithms 9.2) Discrete, multi step and continuous controllers 9.3) Why controllers need tuning? 9.4) Gain. 9.5) Proportional mode 9.6) Proportional gain and proportional band 9.7) Limits of proportional action 9.8) Determining the controller output 9.9) Proportional action-closed loop 9.10) Integral mode and integral action 9.11) Open loop and closed loop analysis 9.12) Reset windup 9.13) Derivative mode 9.14) Derivative action
10. Lab 5: pH Control – L – scheme method 10.1) n/a
11. Lab 6: pH Control – L – scheme method 11.1) n/a
12. Process Control Loops 12.1) Single control loops 12.2) Feedback control 12.3) Pressure control loops 12.4) Flow control loops 12.5) Level control loops 12.6) Temperature control loops 12.7) Multi-variable /Advanced control loops 12.8) Multivariable loops 12.9) Feed forward control 12.10) Feed forward plus feedback 12.11) Cascade control 12.12) Batch control 12.13) Ratio control 12.14) Selective control 12.15) Fuzzy control

Assessment Breakdown	%
Continuous Assessment	100.00%

Details of Continuous Assessment

Assessment Type	Assessment Description	% of Total Mark	CLO
Assignment	Field trip report will be delivered a week after the field trip (webinar).	20%	CLO3
Practical	Online process control experiments.	50%	CLO1
Test	Test will cover the topic of the course syllabus with time duration of 1 hour	30%	CLO2

Reading List

Reference Book Resources

- ***Printed Notes, Handbook and manuals from the supplier of the control system***
- **Thomas Marlin 2002, *Process Control: Designing Processes and Cont*, 2 Ed., Mc Graw-Hill,2002**
- **Wayne Bueqette 2002, *Process Control: Modelling, Design and Simula*, Prentice Hall, 2002**
- **Jose Ramagnoli and Ahmet Palazoglu 2000, *Introduction to Process Control*, Ed., , CRC, Taylor and Francis [ISBN:]**
- **Summers, G.R. and Williams 1981, *D. Engineering Instrumentation and Control*, Edward Arnold Publishing Co.**

Article/Paper List: This Course does not have any article/paper resources

Other References: This Course does not have any other resources