



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	<p>CLO1 Perform the operation of process control instrument using process variables data</p> <p>CLO2 Display good values, attitudes and ethics in understanding the process control mechanism.</p> <p>CLO3 Demonstrate good managerial skills in performing process control analysis.</p>
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	<ul style="list-style-type: none"> • <i>Printed Notes, Handbook and manuals from the supplier of the control system</i> • Thomas Marlin 2002, <i>Process Control: Designing Processes and Cont</i>, 2 Ed., Mc Graw-Hill,2002 • Wayne Buequette 2002, <i>Process Control: Modelling, Design and Simula</i>, Prentice Hall, 2002 • Jose Ramagnoli and Ahmet Palazoglu 2000, <i>Introduction to Process Control</i>, Ed., , CRC, Taylor and Francis [ISBN:] • Summers, G.R. and Williams 1981, <i>D. Engineering Instrumentation and Control</i>, Edward Arnold Publishing Co.
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Article/Paper List	This Course does not have any article/paper resources
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Other References	This Course does not have any other resources
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