POLITEKNIK MALAYSIA
TUN SYED NASIR

MPC
PERBADANAN PRODUKTIVITI MALAYSIA

SYLLABUS OF CHEMICAL PROCESS CERTIFICATION

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CHEMICAL PROCESS CERTIFICATION

POLITEKNIK TUN SYED NASIR SYED ISMAIL

COURSE **:** CPE101 OCCUPATIONAL SAFETY AND HEALTH

DURATION : 10 HOURS

SYNOPSIS

OCCUPATIONAL SAFETY AND HEALTH course is to provide an understanding of the regulation and management of occupational safety and health in the workplace. This course presents in-depth aspects of occupational safety and health, safe practices in preventing accidents at work. This course will also explain hazard identification, risks assessment and risk control in ensuring good safety and health in the workplace.

LEARNING OBJECTIVES (LO)

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

1. Discuss the occupational safety and health regulations and practices in Malaysia.
2. Relate necessary actions in terms of responding to accidents in the workplace.
3. Identify hazards, risks and safe work practice in order to keep healthy and safe in workplace.

CONTENT

(LECTURE : PRACTICAL)

TOPIC **TIME ALLOCATION**

1.0 INTRODUCTION TO OCCUPATIONAL SAFETY AND HEALTH (02 : 00)

This topic will introduce the concepts and history of occupational safety and health legislation and the basic understanding on safety and health. This topic also explain the understanding on concept of occupational safety and health management system.

2.0 INCIDENT PREVENTION (02 : 00)

This topic will explain the concepts of incident, theory on accident causation and cost involved in an incident.

3.0 EMERGENCY PREPAREDNESS AND RESPONSE (02 : 00)

This topic will discuss emergency preparedness and emergency response. This topic also explain the basic of first aid and the causes of fire and the equipment used to extinguish fire at workplace include action plans taken to address fire situation at workplace.

4.0 WORKPLACE ENVIRONMENT AND ERGONOMICS (02 : 00)

The topic covers the requirements of workplace environment and workplace ergonomics

5.0 HAZARD IDENTIFICATION, RISK ASSESSMENT AND RISK CONTROL (HIRARC) (02 : 00)

This topic will introduce the basic understanding of hazard identification, risk assessment and risk control.

SYLLABUS

1.0 INTRODUCTION TO OCCUPATIONAL SAFETY AND HEALTH

1.1 Understand the history of occupational safety and health in Malaysia.
- 1.1.1 Explain the safety and health of occupational development in Malaysia.

1.2 Understand the concept of occupational safety and health
- 1.2.1 Recognize occupational safety and health legislation

1.3 Understand the importance of safety in the workplace and statutory requirements
- 1.3.1 Recognize the Factories and Machinery Act 1967
- 1.3.2 State the objective of Occupational Safety and Health Act 1994 (Act 514)
- 1.3.3 List Employer's responsibilities (Act 514, Part IV, Section 15-19)
- 1.3.4 List Employee's responsibilities (Act 514, Part VI, Section 24-27)

1.4 Understand the role of safety and health organization in Malaysia
- 1.4.1 Explain the role of Department of Safety and Health (DOSH).
- 1.4.2 Explain the role of National Institute of Occupational Safety and Health (NIOSH)

1.5 Understand the concepts of safety management
- 1.5.1 Describe the concept of occupational safety and health management system
- 1.5.2 Discuss occupational safety and health element
- 1.5.3 Safety and health committee (Act 514, Part VII, Section 30 and Section 31)
- 1.5.4 Explain the roles of management

2.0 INCIDENT PREVENTION

2.1 Understand the concept of incident prevention
- 2.1.1 Differentiate between incident and accident
- 2.1.2 Explain principle of incidents prevention

2.2 Understand the accident causation theories

2.2.1 List the model of accident theories

a. Heinrich's Domino Theory

b. Bird's Loss Causation Model

c. Multi-causality Accident Model

2.3 Understand incidents prevention costs

2.3.1 Identify the costs in incident prevention

a. design cost

b. operational cost

c. future cost safeguarding.

2.4 Understand the accident prevention programme

2.4.1 State management commitment in accident prevention.

2.4.2 Determine the accident prevention planning

2.4.3 Develop the accident prevention training

3.0 EMERGENCY PREPAREDNESS AND RESPONSE

3.1 Understand emergency preparedness and response

3.1.1 Recognise an emergency.

3.1.2 Classify types of emergency.

3.1.3 Differentiate between emergency preparedness and emergency response

3.1.4 Discuss the elements of emergency management system.

3.2 Understand the emergency and fire safety planning

3.2.1 Discuss fire safety management strategy.

3.2.2 Discuss the fire safety plan.

3.2.5 Identify the active and passive fire protection systems.

3.3 Understand first aid.

3.3.1 Define first aid, first aid box and first aid equipment.

3.3.2 State the purpose of first aid.

3.3.3 Explain the requirement under the first aid guideline by DOSH.

3.4 Understand basic first-aid and treatment.

3.4.1 Discuss common accidents that require first aid treatment:

a. burns and scalds

b. bleedings

c. shock

d. bone fractures

e. poisoning

3.4.2 Explain Cardio Pulmonary Resuscitation (CPR)

3.4.3 Determine workplace and occupational first aid.

4.0 WORKPLACE ENVIRONMENT AND ERGONOMICS

4.1 Describe ergonomics.

4.1.1 List three domain of ergonomics.

4.1.2 State the principles of ergonomics

4.2 Understand ergonomic risk.

4.2.1 List ergonomics risk factor.

4.2.2 Describe Musculoskeletal Disorders.

4.3 Understand workstation design principle.

4.3.1 Discuss safety guideline for seating at work.

4.3.2 Discuss safety guideline for standing at work.

4.3.3 Discuss safety guideline for working with video display unit

4.3.4 Discuss safety guideline on occupational vibration.

4.5 Understand Workplace Environment.

4.5.1 Explain indoor air quality and its effect on the respiratory system.

4.5.2 Measure lighting and sightedness.

4.5.3 Measure temperature and humidity.

4.5.4 Measure noise and hearing quality.

5.0 HAZARD IDENTIFICATION, RISK ASSESSMENT AND RISK CONTROL (HIRARC)

5.1 Understand hazard, risk and danger

5.1.1 Define hazard, risk and danger

5.2 Understand risk identification types of hazard.

5.2.1 Classify types of hazard

a. physical hazard.

b. biological hazard.

c. chemical hazard.

d. psychological hazard.

e. ergonomic hazard.

5.2.2 Identify hazard identification technique.

5.3 Understand risk assessment.

6.3.1 Construct Qualitative Assessment.

6.3.2 Construct Semi-Quantitative Assessment.

5.4 Understand risk control

5.4.1 Classify types of control

a. at source of hazard

b. engineering control

c. administrative controls

d. personal protectection equipment

5.4.2 Identify hierarchy of controls

5.5 Understand the HIRARC table

5.5.1 Discuss the HIRARC table

REFERENCES

Department of Occupational Safety and Health (2010). *Occupational Safety And Health Act 1994 (Act 514 & Regulations.* Malaysia: Penerbitan Akta (M). (ISBN: 978-9675769221)

Department of Occupational Safety and Health (2011). *Factories and Machinery Act (Act 139) 1967 Regulation and Rules*. Malaysia: International Law Book Services. (ISBN: 978-9678921152)

Department of Occupational Safety and Health (2006). *GuidelinesOn Occupational Safety and Health Act 1994 (ACT 514).* (ISBN 13 : 978-983-2014-55-3)

Department of Occupational Safety and Health(2011). *Guidelines On Occupational Safety and Health Management Systems.* Mashi Publication Sdn Bhd. (ISBN: 978-983-2014-75-1)

Department of Occupational Safety and Health (2004). *Guidelines On First-Aid Facilities In The Workplace (2nd Edition*).(ISBN : 983-2014-43-3)

Department of Occupational Safety and Health(2008). *Guidelines for Hazard Identification, Risk Assessement and Risk Control (HIRARC).* (ISBN 978-983-2014-62-1)

Department of Occupational Safety and Health(2004). *Guidelines On Gender Issues In Occupational Safety and Health.* (ISBN : 983-2014-18-2)

Department of Occupational Safety and Health(2004). *Guidelines For Public Safety And Health At Construction Sites (1st Revision).* (ISBN:978-983-2014-58-4)

Department of Occupational Safety and Health(2003). *Guidelines On Occupational Safety and Health For Seating At Work*.(ISBN: 983-2014-25-5)

Department of Occupational Safety and Health(2004). *Guidelines On Occupational Safety and Health In Service Sector.* (ISBN : 983-2014-37-9)

Mohd Khairul Domadi and Koo Kean Eng (2016). *Occupational Safety and Health*. Oxford Fajar Bakti Sdn Bhd. (ISBN:9789834717384)

Learning Objectives (LO) vs Delivery method

Learning Objectives (LO)		Recommended Delivery Methods	Assessment
1.	Discuss the occupational safety and health regulations and compliance in Malaysia.	Interactive Lecture and Discussion	Quiz, test and final exam
2.	Relate necessary actions in terms of responding to accidents in the workplace.		Quiz, test and final exam
3.	Identify hazards, risks and safe work practice in order to keep healthy and safe in workplace.		Quiz, test and final exam

ASSESSMENT

The course is assessed through:

i. Coursework Assessment (CA) - 50%

Coursework assessments that measures knowledge and practical skills are carried out in the form of continuous assessment.

ii. Final Examination Assessment (FE) – 50%

Final examination is carried out at the end of the course.

Learning Objectives	TOPICS					ASSESSMENT METHODS FOR COURSEWORK (CA)		FINAL ASSESSMENT (FE)
	1	2	3	4	5	Test	Quiz	Final Exam
						20% (1)	30% (2)	*(1) 50%
1. Discuss the occupational safety and health regulations and compliance in Malaysia.	●						⁄	⁄
2. Relate necessary actions in terms of responding to accidents in the workplace.		●				⁄	⁄	⁄
3. Identify hazards, risks and safe work practice in order to keep healthy and safe in workplace.				●		⁄		⁄

No.	DISTRIBUTION OF LEARNING TIME	LT
	FACE TO FACE LEARNING	
1.0	**Delivery Method**	
1.1	Lecture	10
	Coursework Assessment (CA)	
2.0	Lecture-hour-assessment	
2.1	- Test [1] - Quiz [2]	
	TOTAL	**10**

CHEMICAL PROCESS CERTIFICATE

POLITEKNIK TUN SYED NASIR SYED ISMAIL

COURSE **:** CPE102 ENVIRONMENTAL ENGINEERING

DURATION : 12 HOURS

SYNOPSIS

ENVIRONMENTAL ENGINEERING introduces knowledge related to environment. The students will have an understanding of water quality, air quality and solid waste management.

LEARNING OBJECTIVES (LO)

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

1. Explain the importance of environment and types of pollution.
2. Apply preventive measures and treatment against pollution.
3. Contribute awareness and consideration to improve the environmental quality

CONTENT

(LECTURE : PRACTICAL)

TOPIC **TIME ALLOCATION**

1.0 INTRODUCTION OF ENVIRONMENT (02 : 00)

The basic understanding of environment and the impact of humans' activity towards the environment. This topic also covers the impact of environment towards human and the way to improve environmental quality.

2.0 WATER QUALITY (04 : 00)

This topic provides understanding of hydraulic cycle and water cycle in order to understand the water parameter quality such as physical, chemical and biological.

3.0 AIR QUALITY (03 : 00)

The basic understanding of air quality. This topic wills overview the history of air pollution, the state global implication and sources of air pollution. This topic also covers the classification of pollutants.

4.0 SOLID WASTE MANAGEMENT (03 : 00)

The classify types of solid wastes and describe sources of solid wastes. This topic also covers the properties of solid wastes and explains solid-waste management.

SYLLABUS

1.0 INTRODUCTION OF ENVIRONMENT

1.1 Explain in detail about the environment
- 1.1.1 State the definition of environment

1.2 Explain overview implication between Humans and Environment
- 1.2.1 Describe impact of human's activities towards the environment
- 1.2.2 Describe the impact of the environment towards humans

1.3 Explain Environmental Quality
- 1.3.1 State the improvement of Environmental Quality

2.0 WATER QUALITY

2.1 Explain hydrologic cycle

2.2 Explain physical water quality
- 2.2.1 Classify the physical water quality parameters
  - a. Suspended Solids
  - b. Turbidity
  - c. Colour
  - d. Taste and odour
  - e. Temperature

2.3 Describe the chemical water quality
- 2.3.1 Classify the chemical water quality parameters
  - a. Total Dissolved Solids
  - b. Alkalinity
  - c. Hardness
  - d. Fluoride
  - e. pH
  - f. Dissolved oxygen
  - g. Biochemical Oxygen Demand (BOD)
  - h. Chemical Oxygen Demand (COD)

2.4 Explain the biological water quality
- 2.4.1 Classify the biological water quality parameters
  - a. Bacteria
  - b. Viruses
  - c. Protozoa

3.0 AIR QUALITY

3.1 Explain Air Pollution

- 3.1.1 Study the historical review
- 3.1.2 State global implication of air pollution
- 3.1.3 Review units of measurement
- 3.1.4 Name sources of pollutants

3.2 Identify the Classification of Pollutants

- 3.2.1 State particulates
- 3.2.2 Define hydrocarbons
- 3.2.3 Describe Carbon Monoxide
- 3.2.4 State oxides of Sulphur
- 3.2.5 State oxides of Nitrogen
- 3.2.6 Describe photochemical oxidants
- 3.2.7 Recognize indoor air pollution

4.0 SOLID WASTE

4.1 Explain the definition of solid waste.

- 4.1.1 Classify the types of solid wastes
  - a. municipal wastes
  - b. industrial wastes
  - c. hazardous waste

4.2 Identify the characteristics of solid wastes

- 4.2.1 Describe the characteristics of solid waste
  - a. physical characteristics
  - b. chemical characteristics

REFERENCES

Agarwal, S.K. (2005), *Air Pollution : Volume 1 of Pollution Management,* APH Publishing.

Chris C. Park (2001), *The Environment : Principles and Applications*, Psychology Press.

C. David Cooper (2014), *Introduction to Environmental Engineering*, Waveland Press.

Cossu, R., Stegmann, R., (2018), *Solid Waste Landfilling : Concepts, Processes, Technology*, Elsevier.

Danny Reible (2017) *Fundamentals of Environmental Engineering*, CRC Press.

Flagan, R.C., Seinfeld, J.H., (2012), *Fundamentals of Air Pollution Engineering*, Courier Corporation.

Frank R. Spellman (2020), *Essentials of Environmental Engineering*, Rowman & Littlefield.

Harrison, R.M., Hester, R.E., (2019), *Indoor Air Pollution*, Royal Society of Chemistry.

Introduction to Indoor Air Quality. (n.d.). EPA. Retrieved February 11, 2021 from https://www.epa.gov/indoor-air-quality-iaq

Jeff Kuo (2018), *Air Pollution Control : Fundamentals and Applications*, CRC Press.

John Pichtel (2005), *Waste Management Practices : Municipal, Hazardous and Industrial,* CRC Press.

Omer, N.H. (2019, October 16). *Water Quality Parameters*. Intech Open. https://www.intechopen.com/books/water-quality-science-assessments-and-policy/water-quality-parameters

Puja Mondal (n.d.). *6 Main Types of Solid Waste Management*. Your Article Library. https://www.yourarticlelibrary.com/solid-waste/6-main-types-of-solid-waste-management

Raut, S., Sen, S. K., (2017), *Environmental Engineering and Safety,* Scientific Publishers.

Robert Guderian (2012), *Air Pollution by Photochemical Oxidants: Formation, Transport, Control, and Effects on Plants: Volume 52 of Ecological Studies*, Springer Science & Business Media.

Solid Waste Characteristics. (n.D.). Properties of Solid Waste. Retrieved February 11, 2021 from https://2ch458npc.files.wordpress.com/2014/12/3-properties-of-solid-waste.pdf

Tomasic, V., Zelic, B., (2018), *Environmental Engineering : Basic Principles*, Walter de Gruyter GmbH & Co KG

Learning Objectives (LO) vs Delivery method

Learning Objectives (LO)		Recommended Delivery Methods	Assessment
1.	Explain the importance of environment and types of pollution	Lecture and Discussion	Quizzes, Test and Final Exam.
2.	Apply preventive measures and treatment against pollution		Quizzes, Test and Final Exam.
3.	Contribute awareness and consideration to improve the environmental quality		Quizzes, Test and Final Exam.

ASSESSMENT

The course is assessed through:

i. Coursework Assessment (CA) - 50%

Coursework assessments that measures knowledge and practical skills are carried out in the form of continuous assessment.

ii. Final Examination Assessment (FE) – 50%

Final examination is carried out at the end of the course.

Learning Objectives	TOPICS				ASSESSMENT METHODS FOR COURSEWORK (CA)		FINAL ASESSMENT (FE)
	1	2	3	4	Test	Quiz	Final Exam
					20%(1)	30%(2)	50%(1)
Explain the importance of environment and types of pollution		●	●	●	/		/
Apply preventive measures and treatment against pollution			●	●		/	/
		●				/	
Contribute awareness and consideration to improve the environmental quality	●					/	

No.	DISTRIBUTION OF LEARNING TIME	LT
	FACE TO FACE LEARNING	
1.0	**Delivery Method**	
1.1	Lecture	12
	Coursework Assessment (CA)	
2.0	Lecture-hour-assessment	
2.1	- Test [1] - Quiz [2]	
	TOTAL	**12**

CHEMICAL PROCESS CERTIFICATION

POLITEKNIK TUN SYED NASIR SYED ISMAIL

COURSE **:** CPE103 ENGINEERING FUNDAMENTALS

DURATION : 17 HOURS

SYNOPSIS

ENGINEERING FUNDAMENTALS course introduces the basic concepts in engineering. The topics includes fundamental principles of measurement in electrical, unit conversion, force, motion, solid, fluid, temperature, heat and electric. Student will learn the knowledge in order to identify and solve engineering problems. Student will be able to perform experiment to mastery engineering concepts.

LEARNING OBJECTIVES (LO)

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

1. Use basic concepts to solve engineering problems.
2. Apply the knowledge of fundamental engineering to mastery engineering problems.
3. Perform an experiments related to engineering concepts.

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CONTENT

(LECTURE : PRACTICAL)

TOPIC	**TIME ALLOCATION**

1.0 MEASUREMENT IN ELECTRICAL AND UNIT CONVERSION **(04 : 00)**

This topic covers understanding the basic of measurement in electrical such as current, potential difference, resistance and Ohm's law and unit conversion of Metric Unit.

2.0 FORCE AND MOTION **(02 : 02)**

The topic covers description of force, Newton's Law, uniform and non-uniform motion.

3.0 SOLID AND FLUID **(02:02)**

This topic explains the theory of solid and fluid materials. Students will be exposed to density and pressure. Pascal's, Archimedes' and Bernoulli Principles will be described.

4.0 TEMPERATURE AND HEAT **(04:01)**

This topic describes temperature and heat . Student will be Exposed to heat and thermal equilibrium. They will be able to Solve problems related to specific heat capacity and heat quantity.

SYLLABUS

1.0 MEASUREMENT IN ELECTRICAL AND UNIT CONVERSION

1.1 Define measurement in electrical and physical quantities

- 1.1.1 Describe the consistensy and accuracy.
- 1.1.2 Describe the measurement in electrical.
- 1.1.3 Describe Ohm's law.
- 1.1.4 Describe base quantities, derived quantities and SI of units.
- 1.1.5 Define scalar and vector quantities.

1.2 Solve problems of unit conversion

- 1.2.1 Convert Metric Unit.

2.0 FORCE AND MOTION

2.1 Apply the concept of force.

- 2.1.1 Define force and its units.
- 2.1.1 State the effect of net force.
- 2.1.2 State the Newton First and Second Law of motion.
- 2.1.3 Describe forces in equilibrium.
- 2.1.4 Solve the resultant force by using resolution method.

2.2 Apply the concepts of motion

- 2.2.1 Define motion
- 2.2.2 Define uniform and non-uniform motion.
- 2.2.3 Calculate engineering problems by using kinematic equations:
- 2.2.4 Carry out an experiment of linear motion.

3.0 SOLID AND FLUID

3.1 Understand concept of solid and fluid.

- 3.1.1 State the characteristic of particle in solid and fluid.
- 3.1.2 Define the density and relative density.
- 3.1.3 Solve problem involving density and relative density.

3.2 Understand pressure.

- 3.2.1 Define pressure.
- 3.2.2 Solve problem involving pressure.

3.3 Understand Pascal's principle.

3.3.1 State the Pascal's principle and its application.

3.3.2 Solve problem involving Pascal's principle.

3.4 Understand Archimedes' principle.

3.4.1 State the Archimedes' principle and its application.

3.4.2 Solve problem involving Archimedes' principle.

4.0 TEMPERATURE AND HEAT

4.1 Understand temperature and heat.

4.1.1 Define temperature and heat and its unit.

4.1.2 State relation between Celsius, Kelvin and Fahrenheit.

4.2 Understand specific heat capacity, c.

4.2.1 Define specific heat capacity and its unit.

4.2.2 Describe application of specific heat capacity.

4.3 Understand heat quantity, Q

4.3.1 Define heat quantity, $Q = mc\theta$ and its unit.

4.3.2 Solve problem involving heat quantity.

4.4 Understand thermal equilibrium.

4.4.1 Explain temperature at thermal equilibrium.

4.4.2 Solve problem involving thermal equilibrium between two object.

REFERENCES

Main:

Halliday, D., Resnick, R. and Walker, J, (2013). Fundamentals of Physics, Volume 1, 10th Edition. Singapore: John Wiley and Sons.

Additional:

Foo SengTeek, Yee Cheng Teik, Lee Beng Hin, Lee Chen Xi, Chong Geok Chuan. (2010). Success Physics SPM, Oxford Fajar.

John D. Cutnell, Kenneth W. Johnson (2012). Introduction to Physics.9th Edition.John Wiley and Sons.

Wolfgang Baner, Gary Westfall., (2011). University Physics with Modern Physics.1st Edition.McGraw Hill.

Learning Objectives (LO) vs Delivery method

Learning Objectives (LO)		Recommended Delivery Methods	Assessment
1.	Use basic concepts to solve engineering problems.	Lecture, Discussion and Practical	Quizes and Final Exam.
2.	Apply the knowledge of fundamental engineering to mastery engineering problems.		Quizes And Test.
3.	Perform an experiments related to engineering concepts.		Labwork

ASSESSMENT

The course is assessed through:

i. Coursework Assessment (CA) - 50%

Coursework assessments that measures knowledge and practical skills are carried out in the form of continuous assessment.

ii. Final Examination Assessment (FE) – 50%

Final examination is carried out at the end of the course.

Learning Objectives	**TOPICS**				**ASSESSMENT METHODS FOR COURSEWORK (CA)**			**FINAL ASSESSMENT (FE)**
	1	**2**	**3**	**4**	**Test**	**Quiz**	**Practical**	**Final Exam**
					***(1) 20%**	***(2) 20%**	***(3) 10%**	***(1) 50%**
Use basic concepts to solve engineering problems.	●		●			/		
	●	●	●	●				/
Apply the knowledge of fundamental engineering to mastery engineering problems.		●		●	/			
Perform an experiments related to engineering concepts.		●	●	●			/	

No.	DISTRIBUTION OF LEARNING TIME	LT
	FACE TO FACE LEARNING	
1.0	**Delivery Method**	
1.1	Lecture	12
1.2	Practical	5
2.0	**Coursework Assessment (CA)**	
2.1	Lecture-hour-assessment - Test [1] - Quiz [2]	
2.2	Practical-hour-assessment - Practical Exercises	
	TOTAL	**17**

CHEMICAL PROCESS CERTIFICATION

POLITEKNIK TUN SYED NASIR SYED ISMAIL

COURSE : CPE104 BASIC PIPING AND INSTRUMENTATION DIAGRAM

DURATION : 12 HOURS

SYNOPSIS

BASIC PIPING AND INSTRUMENTATION DIAGRAM (P&ID) provides the introductory fundamentals of essential process instruments which are commonly used in process industries. This course also covers knowledge on interpreting symbols and describing block flow diagram(BFD),process flow diagram (PFD) and piping & instrumentation diagram (P&ID). CPE104 aims to provide knowledge and understanding of basic process control system including feedback and feedforward control system.

LEARNING OBJECTIVES (LO)

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

1. Interpret the symbols and identification letter of a flow diagram.
2. Explain processes of a flow diagram and process control systems.
3. Examine the plant operations using piping and instrumentation diagram.

CONTENT

(LECTURE : PRACTICAL)

TOPIC	**TIME ALLOCATION**

1.0 SYMBOLS IN PIPE FLOW DIAGRAM **(04 : 00)**

This topic explains the symbols used in pipe flow diagram such as instrumentation and control symbols, line indicators, valve symbols, and process equipment symbols.

2.0 FLOW DIAGRAM **(03 : 00)**

This topic covers block flow diagram and process flow diagram. The topic also includes the characteristics of each diagram.

3.0 FUNDAMENTALS OF PROCESS CONTROL SYSTEM **(03 : 00)**

This topic covers the general principles and terminology of control system. It also focuses on the basic principles of process control loops such as single-loop feedback control and feedforward control.

4.0 PIPING AND INSTRUMENTATION DIAGRAM **(02: 00)**

This topic provides the knowledge of piping and instrumentation diagram such as characteristics and importance of the diagram. The topic also offers the technique to construct and interpret the piping identification system.

SYLLABUS

1.0 SYMBOLS IN PIPE FLOW DIAGRAM USING ISA STANDARD

1.1 Determine the symbols of instrument
- 1.1.1 Name the instrument symbols
- 1.1.2 Describe the tag number of the instruments symbols
- 1.1.3 Write the instrument letter
- 1.1.4 Name the instrument line symbols

1.2 Determine the symbols of line indicator
- 1.2.1 Name the line indicator symbols
- 1.2.2 Describe the function of the line indicator symbols

1.3 Determine the symbols of valve
- 1.3.1 Name the valve symbols
- 1.3.2 Describe the function of the valve symbols

1.4 Determine the symbols of process equipment
- 1.4.1 Name the process equipment symbols
- 1.4.2 Describe the function of the process equipment symbols

2.0 FLOW DIAGRAM

2.1 Explain Block Flow Diagram (BFD)
- 2.1.1 Point out the characteristics of Block Flow Diagram
- 2.1.2 Sketch the Block Flow Diagram
- 2.1.3 Interpret the Block Flow Diagram

2.2 Discuss the Process Flow Diagram (PFD)
- 2.2.1 Point out the characteristics of Process Flow Diagram
- 2.2.2 Write the Equipment Identification System in PFD
- 2.2.3 Sketch the Process Flow Diagram using appropriate symbols
- 2.2.4 Interpret the Process Flow Diagram
- 2.2.5 Locate the utility streams in PFD

3.0 FUNDAMENTALS OF PROCESS CONTROL SYSTEM

3.1 Explain the control system
- 3.1.1 Define process
- 3.1.2 Define process control
- 3.1.3 Describe the importance of process control in terms of variability, efficiency and safety.

3.2 Explain the basic concept of control system with general block diagram

3.2.1 Point out the process control terminology

i. Process Variable
ii. Set point
iii. Measured variable and manipulated variable
iv. Error
v. Load disturbance

3.2.2 Recall the function of control loop components

3.2.3 Differentiate the open loop system and close loop system

3.2.4 Explain the basic implementation process for feedback and feedforward control loops

4.0 PIPING AND INSTRUMENTATION DIAGRAM (P&ID)

4.1 Determine Piping Identification System in P&ID

4.1.1 State the importance of Piping Identification System in P&ID
4.1.2 Name the fluid codes
4.1.3 Write the Piping Identification System in P&ID
4.1.4 Construct the Piping Identification System in given situations

4.2 Discuss the Piping and Instrumentation Diagram (P&ID)

4.2.1 Point out the characteristics of Piping and Instrumentation Diagram
4.2.2 Read the Piping and Instrumentation Diagram
4.2.3 Apply the control system in the diagram

REFERENCES

Brian, S. (2009). *Piping Systems Manual*. McGraw Hill Education.

Frankel (2001). *Facility Piping Systems Handbook*. McGraw-Hill International Education.

Jean-Pierre, C. (2018). *Process Control Theory and Applications*. Springer.

Liptak, B.G. Process Control and Optimization. 4th Edition, CRC Press, Florida, (2005)

Moe Toghraei (2019). *Piping and instrumentation Diagram Development.* John Wiley & Sons, Inc.

Myke, K. (2011). *Process Control A Practical Approach*. Wiley

Richard Turton, P.E.(2012).*Analysis, Synthesis and Design of Chemical Processe*s, 4th Edition. Pearson Education.

Sinnott R.K., John, M. C., John, F.R. (2005). *Coulson & Richardson's Chemical Engineering: Chemical Engineering Design*. Butterworth- Heinemann

Skousen, Philip. Valve Handbook – Second Edition, Chapter 1.5.1, McGraw-Hill Handbook (ISBN: 0071437738).

Learning Objectives (LO) vs Delivery method

Learning Objectives (LO)		Recommended Delivery Methods	Assessment
1.	Interpret the symbols and identification letter of a flow diagram	Lecture and Discussion	Quiz and Final Exam.
2.	Explain processes of a flow diagram and process control systems		Test and Final Exam.
3.	Examine the plant operations using piping and instrumentation diagram		Quiz and Final Exam.

ASSESSMENT

The course is assessed through:

i. Coursework Assessment (CA) - 50%

Coursework assessments that measures knowledge and practical skills are carried out in the form of continuous assessment.

ii. Final Examination Assessment (FE) – 50%

Final examination is carried out at the end of the course.

Learning Objectives	**TOPICS**				**ASSESSMENT METHODS FOR COURSEWORK (CA)**		**FINAL ASSESSMENT (FE)**
					Test	**Quiz**	**Final Exam**
	1	**2**	**3**	**4**	**20%*(1)**	**30%*(2)**	***(1) 50%**
Interpret the symbols and identification letter of a flow diagram	●					/	/
Explain processes of a flow diagram and process control systems		●			/		
Examine the plant operations using piping and instrumentation diagram				●		/	

No.	DISTRIBUTION OF LEARNING TIME	LT
	FACE TO FACE LEARNING	
1.0	**Delivery Method**	
1.1	Lecture	12
2.0	**Coursework Assessment (CA)**	
2.1	Lecture-hour-assessment - Test [1] - Quiz [2]	
	TOTAL	**12**

CHEMICAL PROCESS CERTIFICATE

POLITEKNIK TUN SYED NASIR SYED ISMAIL

COURSE **:** CPE105 PROCESS TECHNOLOGY EQUIPMENT

DURATION : 22 HOURS

SYNOPSIS

PROCESS TECHNOLOGY EQUIPMENT provides knowledge on concepts and basic principles of equipment which is static and rotary. The course will be on general uses and basic operating principles of static and rotary equipment such as valve, pipe, heat exchanger, pump, compressor, internal combustion engine and turbine. Students will be introduced to the classifications, types and functions of the components above.

LEARNING OBJECTIVES (LO)

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

1. Interpret process plant equipment commonly used in a process plan
2. Explain process plant equipment according to its classification, types and application
3. Practise safety measures at the workshop according to standard operating procedure.

CONTENT

(LECTURE : PRACTICAL)

TOPIC	**TIME ALLOCATION**
1.0 VALVES, SEALS, PIPES AND FITTINGS	**(02 : 02)**
This topic introduces the concepts of Valve, Pipes and Fittings in term of definitions, functions, components, types, materials, and operating principles.	
2.0 FURNACE, BOILER AND HEAT EXCHANGER	**(02 : 01)**
This topic elaborates the definitions, types, function, components, principle of operation and maintenance activities for Furnace, Boiler and Heat Exchanger.	
3.0 PUMP	**(02 : 01)**
This topic covers the definition, classification, types and uses, operating principles, characteristics and efficiency and parts of various pumps.	
4.0 COMPRESSOR	**(02 : 01)**
This topic discuss the definitions, classifications, types, operating principles, characteristics and operations of various compressors.	
5.0 TURBINE	**(02 : 03)**
This topic deals with gas and steam turbine; types, components, operating principles, and their auxiliary system.	
6.0 INTERNAL COMBUSTION ENGINE	**(02 : 02)**
This topic covers the introduction to internal combustion engines, types, components, basic operating principles and engine components and auxiliary system of internal combustion engines.	

SYLLABUS

1.0 VALVES, SEALS, PIPES AND FITTINGS

1.1 Concept of valve

1.1.1 Identify valve symbols and definitions

1.1.2 Define function of valve

1.1.3 Describe function of a basic components of valve

1.1.4 Identify types of valves

1.2 Concept of pipes

1.2.1 Define;
a. Pipe
b. Piping system
c. Pipe installation

1.3 Concept of pipe fitting

1.3.1 State the fitting definition

1.3.2 Identify types of fittings

1.4 Concept of seal

1.4.1 Define seal

1.4.2 Describe types of seal : static and dynamic seal

2.0 FURNACE, BOILER AND HEAT EXCHANGER

2.1 Furnace

2.1.1 Explain the Furnace definition

2.1.2 Describe the functions of furnace

2.1.3 Identify types of furnace:
a) Oil Fired Furnace
b) Gas Fired Furnace
c) Electric Fired Furnace

2.2 Boiler

2.2.1 State Boiler definition
2.2.2 Describe functions of boiler

2.3 Heat Exchanger

2.3.1 Define heat exchanger

2.3.2 Function of heat exchanger

3.0 PUMP

3.1 Define pump

3.2 State functions of pump

3.3 Determine types of pumps;

2.3.1 Dynamic pump

2.3.2 Positive displacement pump

3.4 Perform centrifugal and positive displacement pumps routine maintenance, service and troubleshooting.

4.0 COMPRESSOR

4.1 Define compressor

4.2 Function of a compressor

4.3 Determine types of compressors;

4.3.1 Dynamic unit

4.3.2 Positive displacement compressor

4.4 Perform dynamic and positive displacement compressors routine maintenance, service and troubleshooting.

5.0 TURBINE

5.1 Define turbine

5.2 Function of a turbine

5.3 Determine types of turbine;

5.3.1 Gas turbine

5.3.2 Steam turbine

5.4 Describe the basic operating principles of gas and steam turbines.

6.0 INTERNAL COMBUSTION ENGINE

6.1 Introduction to combustion engine

6.2 Explain internal combustion engine

6.3 Explain types of internal combustion engine

6.4 State operating principle of engine

REFERENCES

Charles E. Thomas, (2011), Process Technology – Equipment and Systems, 3rd Edition. Delmar Cengage Learning, (ISBN – 13 : 978-1-43549912-6)

G.F. Hewitt & G. L. Shires & T.R. Bolt (1994). Process Heat Transfer. CRC Press.

Mohammad Nazri Mohd Jaafar(1992). Asas Turbin Gas. Unit Penerbitan UTM,Skudai.

Learning Objectives (LO) vs Delivery method

Learning Objectives (LO)		Recommended Delivery Methods	Assessment
1.	Recognize process plant equipment commonly used in a process plant	Lecture, Practical And Discussion	Quizes, Tests and Final Exam.
2.	Explain process plant equipment according to its classification, types and application		Quizes, Tests and Final Exam.
3.	Practise safety measures at the workshop according to standard operating procedure.		Practical Exercise.

ASSESSMENT

The course is assessed through:

i. Coursework Assessment (CA) - 50%

Coursework assessments that measures knowledge and practical skills are carried out in the form of continuous assessment.

ii. Final Examination Assessment (FE) – 50%

Final examination is carried out at the end of the course.

Learning Objectives	TOPICS						ASSESSMENT METHODS FOR COURSEWORK (CA)			FINAL ASSESSMENT (FE)
	1	2	3	4	5	6	Test	Quiz	Practical Task	Final Exam
							20% (1)	20% (2)	10% (2)	*(1) 50%
Recognize process plant equipment commonly used in a process plan	●							/		/
		●						/		
			●	●				/		
					●	●		/		
Explain process plant equipment according to its classification, types and application	●	●	●	●			/			/
					●	●	/			
	●	●	●	●	●	●				
Practise safety measures at the workshop according to standard operating procedure.					●	●			/	

No.	DISTRIBUTION OF LEARNING TIME	LT
	FACE TO FACE LEARNING	
1.0	**Delivery Method**	
1.1	Lecture	12
1.2	Practical	10
2.0	**Coursework Assessment (CA)**	
2.1	Lecture-hour-assessment - Test [1] - Quiz [2]	
2.2	Practical-hour-assessment - Practical Exercises [2]	
	TOTAL	**22**

CHEMICAL PROCESS CERTIFICATION

POLITEKNIK TUN SYED NASIR SYED ISMAIL

COURSE **:** CPE106 BASIC PRINCIPLE OF CHEMICAL PROCESSES

DURATION : 14 HOURS

SYNOPSIS

BASIC PRINCIPLE OF CHEMICAL PROCESSES is designed as an introduction for chemical and process engineering principles. The emphasis is on understanding the principles of material and energy balances in chemical process systems. Topics include chemistry for chemical process engineering, process and process variables, fundamental of material balances, single phase system, and thermodynamics (energy balances). The course will also discuss the theory and application of the processes involve in the chemical and process industries. The understanding of this basic principles will help to solve problems occured in industries of chemical process.

LEARNING OBJECTIVES (LO)

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

1. Explain knowledge of the theories and basic principles of engineering calculation in chemical and process engineering.
2. Apply the specific equations in solving basic problems related to material and energy balance with or without chemical reaction in chemical process system.
3. Apply the principles and techniques of solving problems related to material and energy balance in chemical and process industry.

CONTENT

(LECTURE : PRACTICAL)

TOPIC	**TIME ALLOCATION**
1.0 CHEMISTRY FOR CHEMICAL PROCESS ENGINEERING	**(02 : 00)**
This topic covers understanding the components the of matter and describe fundamentals of solution stoichiometry.	
2.0 PROCESS AND PROCESS VARIABLES	**(04 : 00)**
This topic covers understanding of basic engineering calculation of process variables including flow rates and chemical composition.	
3.0 FUNDAMENTAL OF MATERIAL BALANCES	**(04 : 00)**
This topic introduces basic of mass balance on single unit process and multiple unit process (non-reactive system), balance on reactive systems and combustion reaction.	
4.0 SINGLE PHASE SYSTEM	**(02 : 00)**
The topic covers understanding of one phase system, solving problems using ideal gas law and concept of real gasses.	
5.0 THERMODYNAMICS (ENERGY BALANCES)	**(02 : 00)**
This topic covers understanding the terminology associated with energy balance and solving energy balance problem for non-reactive and reactive process.	

SYLLABUS

1.0 CHEMISTRY FOR CHEMICAL PROCESS ENGINEERING

1.1 Explain components of matter

1.1.1 Describe elements, compounds and mixtures.

1.2 Explain stoichiometry of formulas and equations

1.1.1 Describe fundamentals of solution stoichiometry

2.0 PROCESS AND PROCESS VARIABLES

2.1 Explain the basic engineering calculation

2.1.1 Describe the system of units and dimensions

2.1.2 Calculate the conversion units

2.1.3 Explain the temperature, pressure, weight and force.

2.2 Apply mass, volume, density, specific gravity and flow rates

2.2.1 Explain the mass, volume, density, specific gravity and flow rates

2.2.2 Calculate the flow rates

2.2.3 Solve problems related to flow rates using density and specific gravity

2.3 Calculate the chemical composition and concentration

2.3.1 Calculate the mole fraction and mass fraction

2.3.2 Calculate the total volume, average molecular weight, total mass and total moles of a mixture.

2.3.3 Solve problems related to the mass concentration and molar concentration

3.0 FUNDAMENTAL OF MATERIAL BALANCES

3.1 Identify process classification

3.1.1 Describe types of processes in chemical and process engineering

3.2 Explain material balances system

3.2.1 Describe material balances

3.2.2 Explain strategy in solving material balance problems

3.3 Apply material balances for non-reactive system

3.3.1 Draw and label a flowchart from a given process description

3.3.2 Construct mass balance equations for non-reactive system at steady state

3.3.3 Solve material balances problems for a single unit and multiple units

3.4 Apply material balances for reactive system

3.4.1 Explain the chemical reactions and stoichiometry

3.4.2 Explain terminology for reactive process

3.4.3 Calculate the fractional conversion, extent of reaction, yield and selectivity in reactive process.

3.4.4 Solve material balances that involve chemical reaction using Extent of Reaction, Atomic Balance and Molecular Balance methods

4.0 SINGLE PHASE SYSTEM

4.1 Explain the single phase system

4.1.1 Identify the critical point in a phase diagram

4.1.2 Explain the properties of pure ideal components

4.1.3 Explain density of liquids and solids

4.1.4 Explain the concept of standard conditions of temperature and pressure

4.2 Apply the material balance on single phase system

4.2.1 Explain the ideal gas law and gas mixture

4.2.2 Solve material balance problems involving ideal gas and real gases

4.2.3 Apply the ideal gas law for mass balances

5.0 THERMODYNAMICS (ENERGY BALANCES)

5.1 Apply the First law of Thermodynamics (Forms of Energy)

5.1.1 Explain the terminology associated with energy balances

5.1.2 Explain the types of energy to be included in energy balances

5.2 Apply energy balance on non-reactive process

5.2.1 Calculate the heat and enthalpy entering and leaving the units

5.2.2 Apply the concept of balance for closed system including its calculation

5.3 Apply energy balance on reactive process

5.3.1 Calculate the enthalpy changes

5.3.2 Calculate the heat of reaction from heat of other reactions using Hess's Law

5.3.3 Calculate standard enthalpy and internal energy of reaction from known standard heat of formation

REFERENCES

David M.Himmelblau. James B.Riggs (2015). Basic Principles And Calculations In Chemical Engineering, Eight Edition. Pearson Education India

Nayef Ghasem, Redhouane Henda (2014). Principles of Chemical Engineering Process: Material and Energy Balances, Second Edition. Wiley & Son.

Martin S. Silberberg (2013), Principles of General Chemistry, Third Edition, McGraw-Hill International Edition.

Richard M. Felder and Ronald W. Rousseau (2005). Elementary Principles of Chemical Processes, 3rd Edition, John Wiley & Sons.

Learning Objectives (LO) vs Delivery method

Learning Objectives (LO)		Recommended Delivery Methods	Assessment
1.	Apply knowledge of the theories and basic principles of engineering calculation in chemical and process engineering.	Lecture and Discussion	Quizes, Test and Final Exam.
2.	Apply the specific equations in solving basic problems related to material and energy balance with or without chemical reaction in chemical process system.		Quizes, Test and Final Exam.
3.	Practice the principles and techniques of solving problems related to material and energy balance and designing reactors in chemical and process industry.		Quizes, Test and Final Exam.

ASSESSMENT

The course is assessed through:

i. Coursework Assessment (CA) - 50%

Coursework assessments that measures knowledge and practical skills are carried out in the form of continuous assessment.

ii. Final Examination Assessment (FE) – 50%

Final examination is carried out at the end of the course.

<table>
<tr><th rowspan="3">Learning Objectives</th><th colspan="5" rowspan="2">TOPICS</th><th colspan="2">ASSESSMENT METHODS FOR COURSEWORK (CA)</th><th>FINAL ASSESSMENT (FE)</th></tr>
<tr><th>Test</th><th>Quiz</th><th>Final Exam</th></tr>
<tr><th>1</th><th>2</th><th>3</th><th>4</th><th>5</th><th>*(1) 20%</th><th>*(2) 30</th><th>*(1) 50%</th></tr>
<tr><td rowspan="2">Apply knowledge of the theories and basic principles of engineering calculation in chemical and process engineering.</td><td></td><td colspan="3">●</td><td></td><td>/</td><td></td><td rowspan="2">/</td></tr>
<tr><td colspan="2">●</td><td></td><td>●</td><td></td><td></td><td>/</td></tr>
<tr><td rowspan="2">Apply the specific equations in solving basic problems related to material and energy balance with or without chemical reaction in chemical process system.</td><td></td><td colspan="3">●</td><td></td><td>/</td><td></td><td rowspan="2">/</td></tr>
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<tr><td>Practice the principles and techniques of solving problems related to material and energy balance and designing reactors in chemical and process industry.</td><td></td><td></td><td colspan="3">●</td><td></td><td></td><td>/</td></tr>
</table>

No.	DISTRIBUTION OF LEARNING TIME	LT
	FACE TO FACE LEARNING	
1.0	**Delivery Method**	
1.1	Lecture	14
2.0	**Coursework Assessment (CA)**	
2.1	Lecture-hour-assessment - Test [1] - Quiz [2]	
	TOTAL	**14**

CHEMICAL PROCESS CERTIFICATION

POLITEKNIK TUN SYED NASIR SYED ISMAIL

COURSE **:** CPE107 CHEMICAL HANDLING

DURATION : 12 HOURS

SYNOPSIS

CHEMICAL HANDLING cover the chemical substances and chemical waste management. This course presents the responsibilities of employers and employees in implementing and complying the chemical substances and chemical wastes management process. This course provides an understanding of the regulations on chemical substances and chemical wastes.

LEARNING OBJECTIVES (LO)

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

1. Explain the management of chemical substances and chemical wastes.
2. Express the regulations on chemical substances and chemical wastes.
3. Adhere to chemical management process and wastes management process.

CONTENT

(LECTURE : PRACTICAL)

TOPIC **TIME ALLOCATION**

1.0 INTRODUCTION OF CHEMICAL MANAGEMENT (1.5 : 00)

This topic covers the discovery of chemicals, chemical used in industries, hazard in workplace, cause of accident in workplace, chemical health risk assessment and safe management of chemicals.

2.0 BASIC UNDERSTANDING OF REGULATIONS ON CHEMICAL SUBSTANCES (1.5 : 00)

The topic covers the general outlines of regulations relate to chemical substances

3.0 CHEMICAL MANAGEMENT (03 : 00)

The topic covers the introduction to management of chemicals and the concept of cradle to grave in chemical management.

4.0 INTRODUCTION OF CHEMICAL WASTES (1.5 : 00)

The topic covers the introduction of chemical wastes, the type of chemical wastes, environment issue caused by chemical wastes and characteristic of chemical wastes

5.0 BASIC UNDERSTANDING OF REGULATIONS ON CHEMICAL WASTES (1.5 : 00)

The topic covers the general outlines of regulations relate to chemical wastes.

6.0 CHEMICAL WASTES MANAGEMENT (03 : 00)

The topic covers the introduction to chemical waste management plan, wastes minimization, source reduction reuse and recycle, type of chemical wastes, storage of chemical wastes and waste disposal

SYLLABUS

1.0 OVERVIEW OF CHEMICAL MANAGEMENT

1.1 Discovery of chemicals and the usage of chemicals in industries/laboratory
1.2 Chemical Hazard
1.3 Cause of Accidents
1.4 Chemical Health Risk Assessment
1.5 Safe Chemical Management

2.0 BASIC UNDERSTANDING OF REGULATIONS ON CHEMICAL SUBSTANCES

2.1 General outline of regulations on chemical substances
  2.1.1 FMA 1967
  2.1.2 Pesticide Act 1994
  2.1.3 EQA 1974 and Regulations 2005
  2.1.4 Poison Act 1952 and Regulations
  2.1.5 OSHA 1994

3.0 CHEMICAL MANAGEMENT

3.1 Introduction to Chemical Management
3.2 Cradle to Grave Concept

4.0 OVERVIEW OF CHEMICAL WASTES

4.1 Type of Wastes
4.2 Environment Issues
4.3 Hazardous Wastes
4.4 Characteristic of Wastes

5.0 BASIC UNDERSTANDING OF REGULATIONS ON CHEMICAL WASTES

5.1 Waste Under Environmental Quality Act 1974
  5.1.1 Environmental Quality (Industrial Effluent) Regulations 2009
  5.1.2 Hazardous Waste Management Under Environmental Quality (Schedule Waste) Regulations 2005

6.0 CHEMICAL WASTES MANAGEMENT

6.1 Introduction to Waste Management Plan
6.2 Wastes Minimization
6.3 Storage of Chemical Wastes
6.4 Hazardous Waste Disposal

REFERENCES

Department of Occupational Safety and Health (2014). *Occupational Safety and Health Act 1994 (Act 514)*. Malaysia: International Law Book Services.

Department of Occupational Safety and Health (2014). *Factories and Machinery Act 1967 (Act 139)*. Malaysia: International Law Book Services.

Department of Environment (2014). *Environmental Quality Act 1974 (Act 127)*. Malaysia: International Law Book Services.

M.N. Rao, Razia Sultana, Sri Harsha Kota (2016) *Solid and Hazardous Waste Management: Science and Engineering.* Elsevier - Health Sciences Division.

Learning Objectives (LO) vs Delivery Method

Learning Objectives (LO)		Recommended Delivery Methods	Assessment
1.	Explain the management of chemical substances and chemical wastes.	Lecture, Discussion, Digital Presentation	Quiz and Final Exam
2.	Express the regulations on chemical substances and chemical wastes.		Quiz, Test and Final Exam
3.	Adhere to chemical management process and wastes management process.		Test and Final Exam

ASSESSMENT

The course is assessed through:

i. Coursework Assessment (CA) - 50%

Coursework assessments that measures knowledge and practical skills are carried out in the form of continuous assessment.

ii. Final Examination Assessment (FE) – 50%

Final examination is carried out at the end of the course.

Learning Objectives	**TOPICS**						**ASSESSMENT METHODS FOR COURSEWORK (CA)**		**FINAL ASSESSMENT (FE)**
							Test	**Quiz**	**Final Exam**
	1	**2**	**3**	**4**	**5**	**6**	**20% (1)**	**30% (2)**	**50% (1)**
Explain the management of chemical substances and chemical wastes.	●			●				/	/
Express the regulations on chemical substances and chemical wastes.		●			●		/	/	/
Adhere to chemical management process and wastes management process.			●			●	/		/

No.	DISTRIBUTION OF LEARNING TIME	LT
	FACE TO FACE LEARNING	
1.0	**Delivery Method**	
1.1	Lecture	12
2.0	**Coursework Assessment (CA)**	
2.1	Lecture-hour-assessment - Test [1] - Quiz [2]	
	TOTAL	**12**

CHEMICAL PROCESS CERTIFICATION

POLITEKNIK TUN SYED NASIR SYED ISMAIL

COURSE **:** CPE108 SEPARATION PROCESS

DURATION : 12 HOURS

SYNOPSIS

SEPARATION PROCESS provides knowledge regarding on concept and method that converts a mixture of solid, liquid, gases or solution of chemical substances into two or more distinct product mixtures. Therefore, it will emphasize in various equipment for separation process at industry, namely filtration, stripping, distillation and liquid-liquid extraction. By completing the course, the student will understand the basic mechanisms of the equipment in chemical engineering fields focusing in seprataion process and will be able to make a selection of the most suitable unit to be use in a process depending on certain factors .

LEARNING OBJECTIVES (LO)

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

1. Carry out the principles and methods of separation process
2. Apply specific methods to find efficiency of process unit
3. Describe the suitable equipment and unit for process based on efficiency and safety

CONTENT

(LECTURE : PRACTICAL)

TOPIC	**TIME ALLOCATION**
1.0 FILTRATION PROCESS	**(02 : 00)**
This topic provides knowledge of filtration theory and the parametes that determine the filtration rate and the working principle of filtration equipment.	
2.0 STRIPPING PROCESS	**(02 : 00)**
The topic covers on overview of stripping process and the basic operation of stripping equipment. This topic will expose students to demonstration of Ethyl Acetate – Water stripping process.	
3.0 DISTILLATION PROCESS	**(04 : 00)**
This topic demonstrate knowledge and undertanding of flash distillation principle. This topic will expose to the theoretical stages and refux ratio.	
4.0 LIQUID-LIQUID EXTRACTION PROCESS	**(04 : 00)**
This topic provide general principles of extraction process. The topic will cover the selection of the extractor, the number of stages and the material balance of extraction process.	

SYLLABUS

1.0 FILTRATION PROCESS

1.1 Describe basic theory of filtration
- 1.1.1 Identify driving of Filtration process
- 1.1.2 Study the parameters that influence Filtration Performance

1.2 Discuss the types of filtration operation
- 1.2.1 Elaborate cross flow filtration
- 1.2.2 Elaborate clarifying filtration
- 1.2.3 Elaborate cake filtration

1.3 Carry out the classification of filtration equipment
- 1.3.1 Figure out the working principle of bed filters
- 1.3.2 Figure out the working principle of plate and frame filter presses
- 1.3.3 Figure out the working principle of continues rotary filters

2.0 STRIPPING PROCESS

2.1 Study the overview of stripping process
- 2.1.1 List the application of stripping process
- 2.1.2 Identify stripping gas selection factor

2.2 Discuss the basic operation of stripping equipment
- 2.2.1 Compare stripping vs absorption
- 2.2.2 Compare steam stripping vs air stripping

3.0 DISTILLATION PROCESS

3.1 Discuss the principles of distillation process

3.2 Compare the type of distillation process

- 3.2.1 Discuss flash distillation
- 3.2.2 Discuss fractional distillation

3.3 Discuss the factors affecting distillation column

3.4 Discuss vapor- liquid equilibrium relation

- 3.4.1 Interpret boiling-point and equilibrium diagram
- 3.4.2 Interpret the ideal Equilibrium Stage / The Feed Line (q- line)

4.0 LIQUID-LIQUID EXTRACTION PROCESS

4.1 Study the basic theory of extraction process

- 4.1.1 Define extraction process
- 4.1.2 Identify the operating condition of extraction process
- 4.1.3 Describe equilibrium and Phase Compositions
- 4.1.4 Describe emulsion Problem
- 4.1.5 Identify solvent selection criteria
- 4.1.6 Identify factors influencing solvent extraction
- 4.1.7 List the application of extraction process

4.2 Carry out the basic operation of Liquid-liquid extraction process

4.3 Carry out the working principle of extraction equipment

- 4.3.1 Mixer settler
- 4.3.2 Plate and agitated contractor
- 4.3.3 Packed and spray extraction tower

REFERENCES

Geankoplis, C.A., Hersel A.A., Lepek, Daniel H. (2018) *Transport Process and Separation Process Principles*, *5th*. Prentice Hall International

Theodore, L., Dupont, R. R., & Ganesan, K. (2017). *Unit Operations in Environmental Engineering*. John Wiley & Sons.

Saravacos, G. D., & Kostaropoulos, A. E. (2012). *Handbook of Food Processing Equipment*. Springer.

Ortega-Rivas, E. (2016). *Unit Operations of Particulate s\Solids: Theory and Practice*. CRC Press.

Murphy, R. M. (2007*). Introduction to Chemical Processes: Principles, Analysis, Synthesis.* McGraw-Hill Science/Engineering/Math.

McCabe, W., Smith, J., & Harriott, P. (2005). *Unit Operations of Chemical Engineering.* McGraw-Hill Professional

Learning Objectives (LO) vs Delivery method

Learning Objectives (LO)		Recommended Delivery Methods	Assessment
1.	Carry out the principles and methods of separation process	Lecture, Discussion and Demonstration	Quizes, Test and Final Exam.
2.	Apply specific methods to find efficiency of processing unit.		
3.	Describe the suitable equipment and unit for process based on efficiency and safety		

ASSESSMENT

The course is assessed through:

i. Coursework Assessment (CA) - 50%

Coursework assessments that measures knowledge and practical skills are carried out in the form of continuous assessment.

ii. Final Examination Assessment (FE) – 50%

Final examination is carried out at the end of the course.

Learning Objectives	TOPICS				ASSESSMENT METHODS FOR COURSEWORK (CA)		FINAL ASSESSMENT (FE)
	1	2	3	4	Test	Quiz	Final Exam
					20%(1)	30%(2)	*(1)50%
Carry out the principles and methods of separation	●	●				/	/
	●				/		
Apply specific methods to find efficiency of processing unit.			●	●		/	/
			●	●	/		
Describe the suitable equipment and unit for process based on efficiency and safety		●			/		

No.	DISTRIBUTION OF LEARNING TIME	LT
	FACE TO FACE LEARNING	
1.0	**Delivery Method**	
1.1	Lecture	12
2.0	**Coursework Assessment (CA)**	
2.1	Lecture-hour-assessment	
	- Test [1]	
	- Quiz [2]	
	TOTAL	**12**

CHEMICAL PROCESS CERTIFICATION

POLITEKNIK TUN SYED NASIR SYED ISMAIL

COURSE : CPE 109 OPERATION OF PROCESS PLANT

DURATION : 15 HOURS

SYNOPSIS

OPERATION OF PROCESS PLANT provides the operation of the integrated operation unit which is commonly used in process industries. This course also covers maintenance the integrated operation unit that contains distillation unit, extraction unit, stripping unit and waste water treatment unit.

LEARNING OBJECTIVES (LO)

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

1. Interpret the P&ID in the integrated plant
2. Explain the processes in the integrated plant
3. Demonstrate the integrated plant by using control system

CONTENT

(LECTURE : PRACTICAL)

TOPIC **TIME ALLOCATION**

1.0 PREHEAT AND BOILER UNITS IN THE PLANT **(00 : 03)**

This topic covers the operation of preheat and boiler units in the plant. This topic also cover the maintenance of preheat and boiler units.

2.0 WASTE WATER TREATMENT UNIT IN THE PLANT **(00 : 03)**

This topic covers the operation of waste water treatment unit in the plant including the neutralizer unit, reverse osmosis unit and ion exchange unit.

3.0 DISTILLATION UNIT IN THE PLANT **(00 : 03)**

This topic covers the operation of distillation unit by separating acetic acid and ethyl acetate using heating. This topic covers the maintenance of distillation unit and boiler.

4.0 EXTRACTION UNIT IN THE PLANT **(00 : 03)**

This topic covers the operation of extraction unit by separating acetic acid and ethyl acetate using liquid-liquid absorption concept. This topic covers the maintenance of extraction unit.

5.0 STRIPPING UNIT IN THE PLANT **(00 : 03)**

This topic covers the operation of stripping unit by separating acetic acid and ethyl acetate using steam absorption concept. This topic covers the maintenance of stripping unit and boiler.

SYLLABUS

1.0 PREHEAT UNIT AND BOILER UNIT IN THE PLANT

1.1 Determine preheat unit
- 1.1.1 Operate preheat unit
- 1.1.2 Maintenance preheat unit

1.2 Determine boiler unit
- 1.2.1 Operate boiler unit
- 1.2.2 Maintenance boiler unit

2.0 WASTE WATER TREATMENT UNIT IN THE PLANT

2.1 Determine neutralizer unit
- 2.1.1 Operate neutralizer unit
- 2.1.2Maintenance neutralizer unit

2.2. Determine reverse osmosis unit
- 2.2.1 Operate reverse osmosis unit
- 2.2.2 Maintenance reverse osmosis unit

2.3 Determine ion exchange unit
- 2.3.1 Operate ion exchange unit
- 2.3.2 Maintenance ion exchange unit

3.0 DISTILLATION UNIT IN THE PLANT

3.1 Determine distillation unit
- 3.1.1 Operate distillation unit
- 3.1.2 Maintenance distillation unit

4.0 EXTRACTION UNIT IN THE PLANT

4.1 Determine extraction unit
- 4.1.1 Operate extraction unit
- 4.1.2 Maintenance extraction unit

5.0 STRIPPING UNIT IN THE PLANT

5.1 Determine stripping unit
- 5.1.1 Operate stripping unit
- 5.1.2 Maintenance stripping unit

REFERENCES

Lutz Glathea and Sven Kempfb (2013). *Efficient Plant Operation in Process Industries Using a User-Centric Design.* Chemical Engineering Transactions Vol. 31, 2013. ISBN 978-88-95608-22-8; ISSN 1974-979.

Michael D. Holloway (2012). *Process Plant Equipment: Operation, Control, and Reliability.* ISBN:9781118022641 |Online ISBN:9781118162569 |DOI:10.1002/9781118162569. John Wiley & Sons, Inc.

J. R. Backhurst J. H. Harker (2014). *Process Plant Design*. Heinemann Chemical Engineering Series. eBook ISBN: 9781483162386.

Ajay S. Satpute (2020). *Process Plant Design & Simulation Handbook Kindle Edition.*

Learning Objectives (LO) vs Delivery method

Learning Objectives (LO)		Recommended Delivery Methods	Assessment
1.	Interpret the P&ID in the integrated plant	Practical and Demostrate	Lab Report, Practical Test, Practical Work
2.	Explain the processes in the integrated plant		Lab Report, Practical Test, Practical Work
3.	Demonstrate the integrated plant by using control system		Lab Report, Practical Test, Practical Work

ASSESSMENT

The course is assessed through:

i. Coursework Assessment (CA) – 100%

Coursework assessments that measures knowledge and practical skills are carried out in the form of continuous assessment.

Learning Objectives	**TOPICS**					**ASSESSMENT METHODS FOR COURSEWORK (CA)**		
	1	**2**	**3**	**4**	**5**	**Lab Report**	**Practical Test**	**Practical Work**
						50%(5)	**20% (2)**	**30% (3)**
Interpret the P&ID in the integrated plant	●					/		
		●				/		
			●			/		
				●		/		
					●	/		
Explain the processes in the integrated plant	●							
			●					/
					●			/
								/
Demonstrate the integrated plant by using control system		●					/	
				●			/	

No.	DISTRIBUTION OF LEARNING TIME	LT
	FACE TO FACE LEARNING	
1.0	**Delivery Method**	
1.1	Practical	15
2.0	**Coursework Assessment (CA)**	
2.1	Practical-hour-assessment - Lab report [5] - Practical work [3] - Practical test [2]	
	TOTAL	**15**