



**Jordan University of Science and Technology**  
**Faculty of Engineering**  
**Nuclear Engineering Department**

NE452 Nuclear Instrumentation & Control

Second Semester 2022-2023

**Course Catalog**

3 Credit Hours. Three credit hours ( 3 h lecture ) encompasses the principles of operation of various types of instruments in the nuclear industry to measure temperature, pressure, level, flow, position, and radiation. The student will gain a broad range of working knowledge of temperature, pressure, level, and flow sensors, position indicators, radiation detectors, and control systems. Component theory and design, system hardware, and integrated operation as applied to commercial nuclear systems will be explored.

**Text Book**

<b>Title</b>	DOE FUNDAMENTALS HANDBOOK INSTRUMENTATION AND CONTROL
<b>Author(s)</b>	U.S. Department of Energy Washington, D.C.
<b>Edition</b>	1st Edition
<b>Short Name</b>	Ref#2
<b>Other Information</b>	

**Course References**

Short name	Book name	Author(s)	Edition	Other Information
Ref#1	Lecture Notes	Dr. Salaheddin Malkawi	2nd Edition	
Ref#3	Fundamentals of Instrumentation and Process Control	William C. Dunn	1st Edition	
Ref#4	Radiation Detection and Measurement	Glenn F. Knoll	4th Edition	

**Instructor**

Name	<b>Dr. Salaheddin Malkawi</b>
Office Location	E2L2

Office Hours	
Email	salahm@just.edu.jo

Class Schedule & Room
Section 2: Lecture Time: Sun, Tue, Thu : 09:30 - 10:30 Room: E2113

Prerequisites		
Line Number	Course Name	Prerequisite Type
2003400	NE340 Nuclear Reactors Theory	Prerequisite / Study
2003510	NE351 Signals And Control Systems	Prerequisite / Study

Tentative List of Topics Covered		
Weeks	Topic	References
Weeks 1, 2	Temperature and Pressure Detectors	<b>chapters 1+2</b> From <b>Ref#2</b>
Weeks 3, 4	Level Detectors and Flow Detectors	<b>chapters 3+4</b> From <b>Ref#2</b>
Weeks 5, 6	Position Indicators	<b>chapter 5</b> From <b>Ref#2</b>
Weeks 7, 8, 9	Radiation Detection (Part 1 of 2)	<b>chapter 6</b> From <b>Ref#2</b>
Weeks 10, 11, 12	Radiation Detectors (Part 2 of 2); Principles of Control Systems (Part 1 of 2)	<b>chapters 6+7</b> From <b>Ref#2</b>
Weeks 13, 14, 15	Principles of Control Systems (Part 2 of 2)	<b>chapter 7</b> From <b>Ref#2</b>

Mapping of Course Outcomes to Program Student Outcomes	Course Outcome Weight (Out of 100%)	Assessment method
Ability to analyze and interpret pressure, temperature, level, flow, and radiation data from nuclear systems in order to identify corrective actions or improvements [11, 14, 17]	18%	
Ability to describe the operation and maintenance of standard pressure, temperature, flow, and level sensors including calibration, and explain how the data is electronically transformed into numerical readings in standard pressure, temperature and flow units [11, 17]	18%	
Ability to justify the components comprising a radiation detection system that convert the raw data into standard readings of exposure and dose [11, 12, 17]	17%	
Ability to select and locate the necessary pressure, temperature, and flow sensors in a coolant system loop of a commercial PWR [11, 14]	18%	

Ability to describe the electronic operation of a three-element level control system [11, 12]	14%	
Ability to describe a nuclear instrumentation system that is capable of covering the dynamic range such as for a radiation monitoring in a gaseous radioactive waste effluent line in a commercial nuclear power plant [11, 12, 14, 17]	15%	

Relationship to Program Student Outcomes (Out of 100%)						
1	2	3	4	5	6	7
40.42	16.42		18.75			24.42

Evaluation	
Assessment Tool	Weight
first exam	25%
second exam	25%
final exam	40%
Quizzes, Class Participation and Homework	10%

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