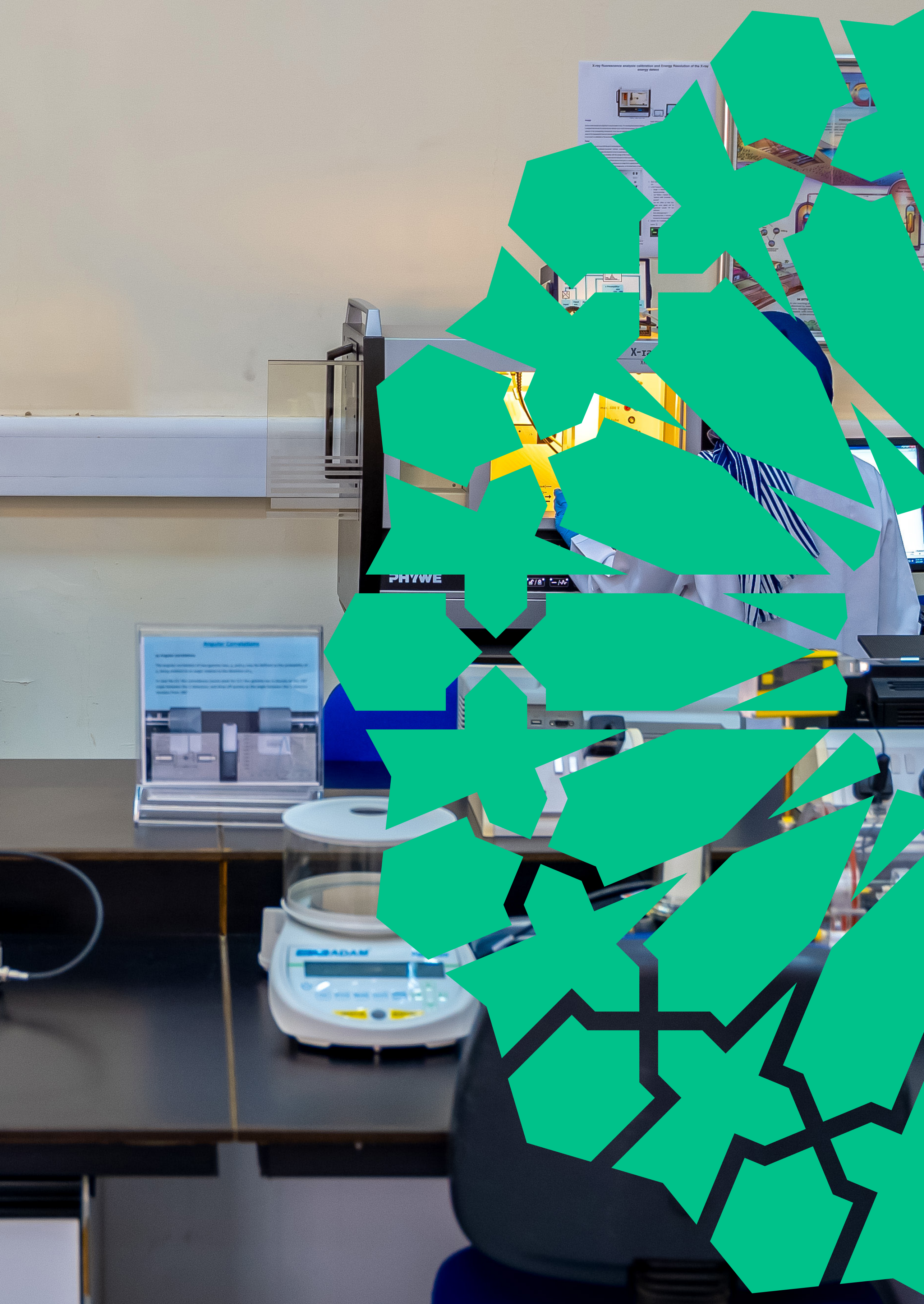
COLLEGE OF
ENGINEERING


PHYWE
ADAM

MECHANICAL & NUCLEAR ENGINEERING DEPARTMENT

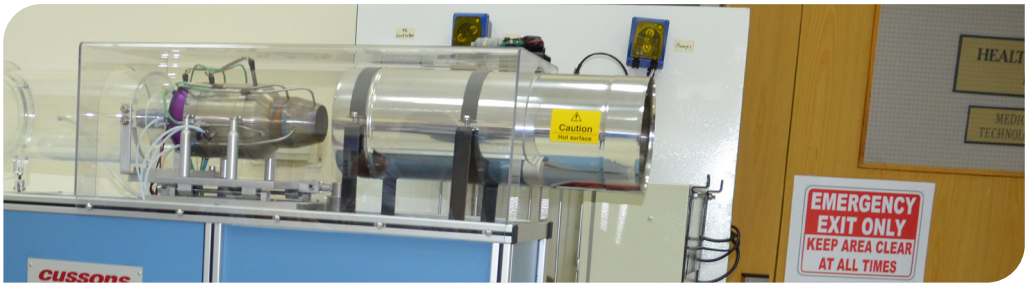
Mechanical & Nuclear Engineering Laboratories

Lab Name	Location	Person in Charge	Programs Served	Courses Served
Thermo-Fluids Lab	W12-131	Mohamed Ammar	Mechanical Eng.	- Thermodynamics - Advanced Thermodynamics - Advance Fluid Mechanics
Solid Mechanics Lab	W12-136	Abdel Rahman Amarneh	Mechanical Eng.	- Strength of Materials - Kinematics - Robotics
Electrospinning Lab	W12-136 B	Abdel Rahman Amarneh	Mechanical Eng.	- Senior Design Project - Research Project
Human Vibration Research Lab	W12-131 B	Prof. Naser Nawaysah	Mechanical Eng.	- Senior Design Project - Research Project
Radiation Detection Lab	M12-010	Ahmad Ababneh	Nuclear Eng.	- Nuclear Sci. Eng. Lab I - Nuclear Instrum. & Meas - Nuclear Engineering Materials - Reactor Thermal Hydraulics - Senior Design Project
Applied Radiation Measurement Lab	M12-009	Samar Ahmed	Nuclear Eng.	- Nuclear Sci. Eng. Lab II - Elements of NE and Rad. Science course - Senior Design Project
Advanced Nuclear Lab	M9-009	Ahmad Ababneh	Nuclear Eng.	- Advanced Nuclear Lab - Reactor Safety Analysis - Nuclear Power Reactors - Reactor Thermal Hydraulics

Mechanical & Nuclear Engineering Lab Staff

#	Name	Title	Ext.	Email
1	Abdel Rahman Amarneh	Lab Engineer	065053438	amarneh@sharjah.ac.ae
2	Mohamed Ammar	Lab Engineer	065052461	Mjouma@sharjah.ac.ae
3	Samar El-Sayed Ahmed	Lab Engineer	065052471	selsayed@sharjah.ac.ae
4	Osama Abdellatif Taqatqa	Radiation safety specialist	065052448	otaqatqa@sharjah.ac.ae
5	Ahmad Qasem Ababneh	Lab Engineer	065052413	aababneh@sharjah.ac.ae

THERMO-FLUIDS LABORATORY



Location	Lab Staff in Charge	Contacts
W12-131	Mohamed Ammar	065052461

INTRODUCTION

This is a state-of-the-art Laboratory which is fully equipped with the most modern and high-tech laboratory equipment and apparatuses. This laboratory is designed to meet the world-class experimentation and safety standards in academics and provide an opportunity to the students for analyzing the basics as well as advanced laws and principles of Thermodynamics, Heat transfer and Fluid Mechanics. It is also equipped with computers with the latest engineering software and networking facilities. This facilitates the learning process for students to analyze their basis understanding in the most effective manner. Students learn to understand the flow diagrams of thermal systems using various laboratory systems. Finally, this laboratory consists of setups that can be used for indoor and outdoor experimentation. Thermo-Fluids laboratory introduces students to basic principles of thermodynamics, fluid Mechanics, instrumentation; experimental verification and reinforcement of analytical concepts introduced in courses of: Analytical Methods in Engineering, Heat Transfer, Thermodynamics and Fluid Mechanics.
The students should be able to:

- Use Thermodynamics, Heat Transfer and Fluid Mechanics Measurements and Apparatus
- Demonstrate Understanding of Thermodynamics, Heat Transfer and Fluid Mechanics Principles
- Perform Basic Methodology in Designing Thermodynamics, Heat Transfer and Fluid Mechanics Systems
- Use Computerized Data Acquisition and Analysis Systems
- Verify Theoretical and Semi Empirical Results
- Providing the Students an Opportunity to Analyze the Basic Principles of Thermal Sciences and Fluid Mechanics
- Performing Advanced Research and Analysis of Thermal and Fluid Systems
- Providing an Understanding and Knowledge of Basic Engineering Software and Analysis
- Demonstration of Internal Structures of Mechanical Engineering Systems

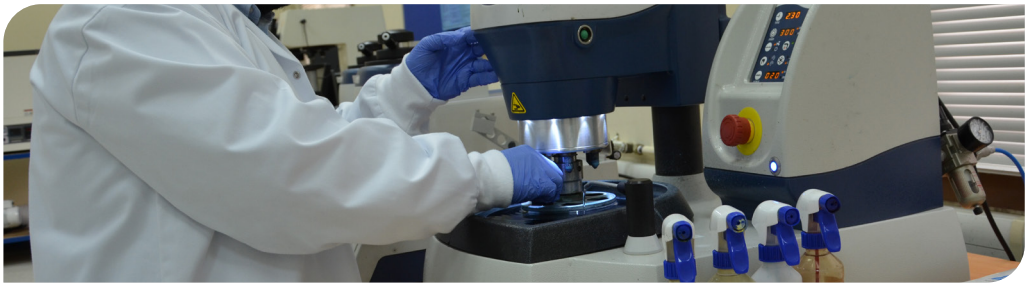
EQUIPMENT AND INSTRUMENTS

- Pumps, Valves and Engine Demonstration Units
- Simple Hydraulic Apparatus
- Boyle`s Law
- Sterling Engine
- Thermo-Electric Convertor
- Vapor Compression Refrigeration Cycle Experiment
- Fiat Engine Demonstration Unit
- Turbo Jet Engine Test Stand
- Steam Motor and Energy Conversion Test Set
- Air Flow Bench
- Flow Visualization Tunnel
- Solar Energy Heater
- Temperature Measurement and Calibration Unit
- Gasoline Engine Test Bed with Data Acquisition
- Diesel Engine Test Bed with Data Acquisition
- Mechanical Heat Pump Unit
- Air-Conditioning Test and Analysis Unit
- Fluid Friction and Pipe Friction Losses Analysis Unit
- Cavitation Demonstration Unit
- Flow Meter Analysis Unit
- Network of Pipe Apparatus
- Horizontal Shaker with Seat (Sound and Vibration Measurement)

EXPERIMENTS

- Basic Laws of Thermodynamics, Fluid Mechanics and Heat Transfer
- Demonstration of Rankin Cycle/ Steam Engine Cycle
- Demonstration and Analysis of Refrigeration and Heat Pump Cycle
- Performance Analysis of Air-Conditioning Cycle
- Sterling Cycle / Hot Air Engine Demonstration
- Internal Combustion Engine Performance Analysis/ Otto and Diesel Cycle
- Boyle's Law/ Pascal's Law Analysis
- Gas Turbine System/ Turbo Jet Engine
- Numerical Methods in Thermodynamics
- Temperature Measuring Instrument Calibration Analysis
- Fluid Friction and Cavitation in Flow
- Solar Energy Boiler Analysis & Thermo-Electric Convertor Analysis and Demonstration
- Fluid Flow Visualization and Analysis Techniques

SOLID MECHANICS LABORATORY



Location	Lab Staff in Charge	Contacts
W12-136	Abdel Rahman Amarneh	065053438

INTRODUCTION

This Laboratory was established to analyze and study the basic principles and laws in Solid Mechanics, Material Testing and kinematics. This is a state-of-the-art laboratory fully equipped with the most modern and high-tech laboratory equipment and apparatuses. It is designed to meet world-class experimentation and safety standards in academics. The lab is divided into two distinct sections. Material Testing and Kinematics of Machine elements. This facilitates the students to analyze their basis understanding in the most effective manner. Finally, this laboratory has facilities for preparing the samples to be used in advance research and analysis.

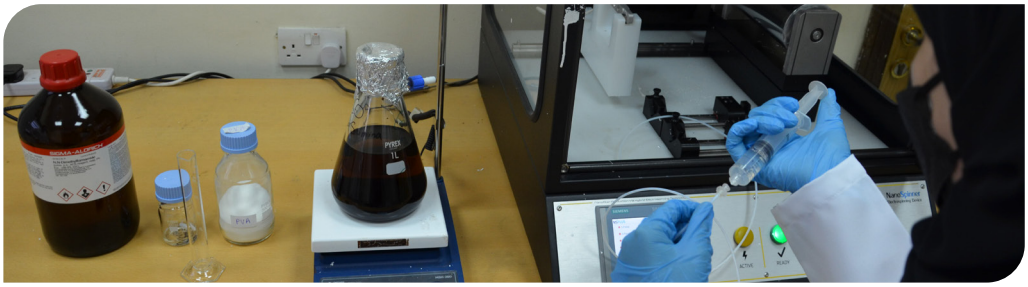
EQUIPMENT AND INSTRUMENTS

- Universal Testing Machine (UTM)
- Charpy Impact Testing Machine
- Torsion Testing Machine
- Fatigue Testing Machine
- Creep Testing Machine
- Vickers-MicroHardness Tester
- Precision Cutting Saw
- Abrasive Cutter
- Sample Mounting Press Machine
- Polishing and Grinding Machine
- Strain Gauge Trainer with VIDAS Data Acquisition System
- Demonstration Models for Machine Dynamics and Kinematics
- Flashforge FDM 3D printer (Guider 2s)
- Flashforge FDM 3D printer (inventor 2s)
- 3D systems 3D printer (Figure 4 Model)
- Artec Space spider 3D scanner
- Tube furnace up to 1500 °C

EXPERIMENTS

- Determination of Mechanical Properties of Materials using Tensile, Compression and Bending Tests
- Sample preparation for Hardness testing
- Determination of materials Hardness using Vickers Harness Test
- Determination of materials Toughness using Charpy Impact Test
- Strain and deformation in Torsion Test
- Strain and deformation in Bending Test
- Creep: Comparison Between Different Materials
- Creep: Effect of Temperature
- Fatigue: Effect of Surface Roughness and Sharp Edges
- Fatigue Testing of Various Materials
- Demonstrating Various Kinematics and Dynamics Mechanisms used in Mechanical Systems

ELECTROSPINNING LABORATORY



Location	Lab Staff in Charge	Contacts
W12-136 B	Abdel Rahman Amarneh	065053438

INTRODUCTION

The Electrospinning lab is equipped with all the required devices to create nano fiber materials using electrospinning process. The nanofibers produced by electrospinning have unique properties. Electrospinning has a wide range of applications including but not limited to filtration and membrane fabrication, wound dressing, drug delivery, sensors and electronics, and energy. The process requires the preparation of the solution using various sample preparation protocols depending on the selected material for the fibers. The solution can then be electro-spined by using high voltage source, a syringe, and a fiber collector. All of the relevant equipment listed below are available in the research room located in W12-136-b

EQUIPMENT:

- Inovenso NS plus electrospinning equipment
- 2 high voltage power supply
- 2 drum collectors
- 2 syringe pumps
- Humidifier
- Analytical balance
- Temperature controlled hot plate
- Fume hood
- Safety cabinet and refrigerator for storing chemicals
- Various size of needle diameters

HUMAN VIBRATION RESEARCH LABORATORY

Location	Lab Staff in Charge	Contacts
W12-131 B	Prof. Naser Nawayseh	065053947

INTRODUCTION

This laboratory has been established to conduct fundamental and applied research on human responses to vibration, including comfort/perception of vibration, biodynamic responses to vibration, postural stability, and seating dynamics and performance. The lab is equipped with facilities that allow measurement of whole-body vibration as well as hand-arm vibration.

EQUIPMENT AND INSTRUMENTS

- Whole-body vertical vibration machine
- Whole-body horizontal vibration shaker
- Tri-axial force and moment platform
- Tri-axial force platform
- Single-axis force platform
- Human vibration measurement and analysis meter
- Single-axis accelerometers
- Tri-axial accelerometers
- 4-Channel, 8-Channel and 16-Channel Data Acquisition systems

EXPERIMENTS

- Apparent mass of the human body under vertical vibration
- Apparent mass of the human body under horizontal vibration
- Transmission of vibration through the human body when exposed to vertical vibration
- Transmission of vibration through the human body when exposed to horizontal vibration
- Effect of whole-body vibration training on postural stability
- Effect of whole-body vibration training on muscle strength and activity
- Effect of vertical and horizontal vibration on comfort
- Biodynamic response of the hand-arm system to vibration
- Measurement of vibration emission from power tools
- Effect of the seating condition on the vibration transmitted through the seat pan and backrest.

RADIATION DETECTION LABORATORY

Location	Lab Staff in Charge	Contacts
M12-010	Ahmad Ababneh	065052413

INTRODUCTION

This Laboratory introduces measurements common in Nuclear Engineering. Students will learn the operation of gas-filled and solid-state detectors; scintillation detectors for gamma, neutron radiation and charged particles. Counting techniques and nuclear statistics, pulse shaping and spectroscopic analysis of radiation. Students will become skilled at connecting the different components of a nuclear system. The laboratory also includes advanced equipment for radiation detection and material properties.

EQUIPMENT AND INSTRUMENTS

- Detectors:
  - Gieger Muller
  - Sodium Iodide
  - Ion Implanted Detector
  - Silicon Surface Barrier Detector
  - High Purity Germanium
  - Silicon (Li)
- NIM Modules
  - Amplifier
  - Gate and Delay Generator
  - Time-to-Amplitude Converter
  - Analog to Digital Converter
  - Single Channel Analyzer
  - Pulse Inverter
  - Counter and Timer
  - Universal Coincidence
  - Preamplifier

- Liquid Scintillation Counter with Sample Oxidizer
- Alpha Beta Counter System
- Thermal Gravimetric Analysis System
- Metallurgical Optical Microscope
- Multichannel Analyzer and Spectroscopy Software
- Oscilloscope
- Radioisotopes

EXPERIMENTS

- Introduction to Electronic Signal Analysis in Nuclear Radiation Measurements
- Geiger Counting
- Gamma-Ray Spectroscopy Using NaI (Tl)
- Alpha Spectroscopy with Surface Barrier Detectors
- Energy Loss of Charged Particles (Alphas)
- Beta Spectroscopy
- High-Resolution Gamma-Ray Spectroscopy
- High-Resolution X-Ray Spectroscopy
- Gamma-Gamma Coincidence
- Air Monitoring
- Determination of the Tritium Concentration in Soil Samples
- Determination of Gross Alpha and Gross Beta Activities in Different Water and Food Samples
- TGA Oxidization/ Heating-Cooling Effect on Samples

APPLIED RADIATION MEASUREMENT LABORATORY

Location	Lab Staff in Charge	Contacts
M12-009	Samar Ahmed	065052471

INTRODUCTION

This Laboratory enhances the laboratory skills pertinent to Nuclear Engineering through performing experiments related to X-Ray Fluorescence, Gamma- Gamma Coincidence, half-life measurements, scattering of alpha particles, Compton scattering and pair production. The students will learn how to use the integrated detection systems that are practically used in engineering applications.

EQUIPMENT AND INSTRUMENTS

- Integrated Digital Signal Processing-Based Instrument with the Following Detectors
  - Sodium Iodide Detector (2x2 inch)
  - Sodium Iodide Detector (3x3 inch)
  - Sodium Iodide Detector (6x6 inch)
  - Sodium Iodide Detector (3x5x16 inch)
  - Sodium Iodide Detector (Well Detector)
  - Alpha Detector
  - Broad Energy Germanium Detectors (BEGe)
  - Reverse Electrode Coaxial Ge Detectors (REGe)
  - X-Ray Energy Detector
  - BF3 Neutron Detector
  - He3 Neutron Detector
- DD Neutron Generator

The DD generator uses the D-D fusion reaction and driven by an ion beam supplied by a high current microwave ion source. The generator enclosed in a radiation shielding/moderator structure designed for high thermal neutron flux with adequate public safety from gamma and neutron radiation. The generator can be operated in both pulsed or continuous mode and Neutron yields of up to 109 n/s can be produced by the generator.

- Thermal Hydraulic Loop

The Experiment test facility is a closed two-phase flow loop that is 4m height.

- Prospect (Basic Gamma Spectroscopy Software)
- Genie 2000 (Advance Gamma Spectroscopy Software)
- ISOCS (Efficiency Calibration Software)
- Lynx (Digital Signal Analyzer)
- Osprey (Universal Digital MCA Tube Base)
- Oscilloscope
- Radioisotopes

EXPERIMENTS

- Time Coincidence Techniques and Absolute Activity Measurements
- X-Ray Fluorescence Analysis Calibration and Energy Resolution
- Qualitative X-Ray Fluorescence Spectroscopy for Unknown Sample
- Gamma-Gamma Coincidence
- Alpha-Gamma Coincidence
- Rutherford Scattering of Alphas from Thin Gold Foil
- Compton Scattering
- Pair Production
- Half Life Measurement
- Gamma Ray Efficiency Calibration
- Prompt Gamma Neutron Activation Analysis (PGNAA)
- Neutron Activation Analysis (NAA)
- Inelastic Neutron Activation Analysis (INAA)
- Fast and Thermal Neutron Radiography
- Prompt Gamma Coincidence Measurements

ADVANCED NUCLEAR LABORATORY

Location	Lab Staff in Charge	Contacts
M9-009	Ahmad Ababneh	2413

INTRODUCTION

In the Advanced Nuclear lab Lab; Generic Training Simulators allow students to perform complete plant startups, shutdowns, and load maneuvers, as well as realistically replicate normal and abnormal plant transients, including malfunction scenarios

EQUIPMENT AND INSTRUMENTS

Generic Pressurized Water Reactor Simulator (APR-1400)

TESTS AND SERVICES

Measurement of nuclear performance, control rod worth, critical rod location, power and flux distributions and feedback coefficients of reactivity.