REFERENCE SYLLABUS

For

Facility Operator Certification Series
Introduction

This Syllabus is intended to assist candidates studying for the NIULPE Facility Operator Certification Series Examination.

Recommended Study Program:
It is recommended that, before undertaking this examination, the candidate completes Power Engineering Course of study, offered through a recognized and approved technical institute or training provider which addresses the Syllabus Outline.
Reference Syllabus for Facility Operator Certification Series Examination Candidates

Major Topic: Preparatory Math Topics for Power Engineering

Topic 1 Numerical Unit Systems
Topic 2 Basic Arithmetic Operations
Topic 3 Fractions, Decimals, and Percentages
Topic 4 Ratio and Proportion
Topic 5 Equations and Transposition
Topic 6 Length, Lines, and Simple Plane Figures
Topic 7 Length, Lines, and Simple Plane Figures

Major Topic: Elementary Physical, Chemical, and Thermodynamic Principles

Topic 1 Introduction to Matter and Chemistry
Topic 2 Introduction to Thermodynamics
Topic 3 Introduction to Heat Transfer and Heat Exchangers
Topic 4 Thermodynamics of Steam

Major Topic: Introduction to Power Engineering and its Governance

Topic 1 Introduction to Power Engineering
Topic 2 Jurisdictional Legislation for Power Engineers
Topic 3 Codes and Standards for Power Engineers and Pressure Vessels

Major Topic: Introduction to Plant and Fire Safety

Topic 1 Introduction to Plant Safety
Topic 2 Plant Safety Programs
Topic 3 Handling of Dangerous Materials
Topic 4 Plant Fire Safety
Topic 5 Fire Extinguishing Methods and Equipment

Major Topic: Introduction to Plant Operations and the Environment

Topic 1 Introduction to the Environment
Topic 2 Gas and Noise Emissions
Topic 3 Liquid and Solid Emissions
Major Topic: Elements of Material Science and Welding Technology

Topic 1 Energy Plant Construction and Operation Materials
Topic 2 Introduction to Welding
Topic 3 Boiler and Pressure Vessel Inspection

Major Topic: Introductory Fluid Handling Technology

Topic 1 Introduction to Energy Plant Piping Systems
Topic 2 Introduction to Energy Plant Valves

Major Topic: Basic Concepts in Electrotechnology

Topic 1 Basic Electricity
Topic 2 Magnetism and Electromagnetism
Topic 3 Electrical Metering Devices
Topic 4 Motors and Generators
Topic 5 Transformers
Topic 6 Electrical Distribution Circuits

Major Topic: Energy Plant Instrumentation and Controls

Topic 1 Introduction to Energy Plant Controls and Instrumentation
Topic 2 Introduction to Process Measurement
Topic 3 Basic Control and Instrumentation Components
Topic 4 Introduction to Programmable Controllers
Topic 5 Electronic Control Systems and Computer Applications
Topic 6 Electrical Control Systems

Major Topic: Fundamental Industrial Communication Skills

Topic 1 Energy Plant Sketching
Topic 2 Plant Diagrams and Drawings
Topic 3 Plant Communications
Major Topic: **Introduction to Boiler Designs**

**Topic 1 Introduction to Boilers**
**Topic 2 Firetube Boilers**
**Topic 3 Watertube Boilers**
**Topic 4 Electric Boilers**
**Topic 5 Special Boiler Designs for Heating Plants**
**Topic 6 Differences between Power and Heating Boilers**

Major Topic: **Elements of Boiler Systems**

**Topic 1 Combustion**
**Topic 2 Fuel Delivery and Firing Systems**
**Topic 3 Draft**
**Topic 4 Feedwater Systems**
**Topic 5 Blowoff and Blowdown Systems**
**Topic 6 Boiler Fireside Cleaning Systems**

Major Topic: **Lubrication and Bearings**

**Topic 1 Lubrication Principles**
**Topic 2 Types of Bearings and Lubrication**

Major Topic: **Pumps and Compressors**

**Topic 1 Types of Pumps**
**Topic 2 Pump Operation and Maintenance**
**Topic 3 Introduction to Compressors**
**Topic 4 Compressor Operation and Maintenance**

Major Topic: **Boiler Safety Devices**

**Topic 1 Pressure Relief Valves**
**Topic 2 Combustion Safety**
**Topic 3 Water Level Safety Controls**
**Topic 4 Boiler Fittings**
**Topic 5 Firing Rate Controls**
Major Topic: **Boiler Plant Operation and Management**

- **Topic 1** Boiler Plant Startup
- **Topic 2** Boiler Startup
- **Topic 3** Boiler Operation
- **Topic 4** Operational Checks
- **Topic 5** Shutdown Procedures
- **Topic 6** Boiler Plant Monitoring and Reporting

Major Topic: **Energy Plant Maintenance**

- **Topic 1** Energy Plant Maintenance I
- **Topic 2** Energy Plant Maintenance II
- **Topic 3** Boiler Maintenance
- **Topic 4** Boiler Cleaning

Major Topic: **Water Treatment**

- **Topic 1** External Boiler Water Treatment
- **Topic 2** Internal Boiler Water Treatment
- **Topic 3** Condensate Treatment
- **Topic 4** Cooling Tower and Condenser Water Treatment
- **Topic 5** Recirculating System Water Treatment

Major Topic: **Types of Prime Movers and Heat Engines**

- **Topic 1** Heat Engines and Prime Movers
- **Topic 2** Steam Turbines
- **Topic 3** Condensers and Cooling Towers
- **Topic 4** Gas Turbines
- **Topic 5** Internal Combustion Engines

Major Topic: **Plant Auxiliary Systems**

- **Topic 1** Lighting Systems
- **Topic 2** Building Water Systems
- **Topic 3** Drainage Systems
Major Topic: **Basic Concepts of Compression and Absorption Refrigeration**

- **Topic 1 Refrigeration Basics**
- **Topic 2 Compression Refrigeration Systems**
- **Topic 3 Refrigeration System Control and Operation**
- **Topic 4 Refrigeration System Operation and Maintenance**
- **Topic 5 Absorption Refrigeration Systems**
- **Topic 6 Refrigeration Plant Safety**

Major Topic: **HVAC Fundamentals for Facility Operators**

- **Topic 1 Conditioning the Air**
- **Topic 2 Humidification**
- **Topic 3 Fans for Air Distribution Systems**
- **Topic 4 Ventilation and Air Filters**
- **Topic 5 HVAC Duct Systems**
- **Topic 6 Types of Coils and Operation**

Major Topic: **Building Environmental Systems and Control**

- **Topic 1 Steam Heating**
- **Topic 2 Hot Water Heating**
- **Topic 3 Other Heating Systems**
- **Topic 4 Cooling Systems and Combination Systems**
- **Topic 5 Heat Gains and Losses, and Heat Recovery Methods**
- **Topic 6 HVAC Control Strategy**

Major Topic: **Typical Industrial Plant Configurations**

- **Topic 1 Common Plant Configurations in Hydrocarbon Centric Industries**
- **Topic 2 Common Plant Configurations in Energy Intensive Industries**
Major Topic: Elementary Mechanics and Dynamics

Topic 1 Introduction to Basic Mechanics
Topic 2 Forces and Moments
Topic 3 Simple Machines
Topic 4 Scalars and Vectors
Topic 5 Linear Velocity and Acceleration
Topic 6 Force, Work, Pressure, Power, and Energy
Topic 7 Friction
Topic 8 Stress and Strain
Topic 9 Power Transmission