REFERENCE SYLLABUS

For

Power Engineer (4th Class)
Introduction

This Syllabus is intended to assist candidates studying for the Power Engineer (4th Class) 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 Power Engineer (4th Class) Examination Candidates

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

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 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: **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: **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: 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