REFERENCE SYLLABUS

For

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