

4th Class Power Engineering (PEN) Curriculum Mapping

Program Curriculum

A collection of 25 CTS courses have been developed to align with the revised (2017) 4th Class Power Engineering course outline. These courses, when combined, cover the technical training content.

Alberta Training Profile		CTS Course Alignment to Training Topics	Assessment
Unit	Topic	CTS Course ID and Name	
4A TOPICS			
Applied Mathematics	SI Units	PEN3020: Preparatory Math	
	Basic Arithmetic Operations		
	Fractions, Decimals and Percentages		
	Ratio and Proportion		
	Equations and Transposition		
	Length, Lines and Simple Plane Figures		
	Areas and Volumes of Solids		
Elementary Mechanics and Dynamics	Introduction to Basic Mechanics	PEN3021: Elementary Mechanics and Dynamics	
	Forces and Moments		
	Simple Machines		
	Scalars and Vectors		
	Linear Velocity and Acceleration		
	Force, Work, Pressure, Power and Energy		
	Friction		
	Stress and Strain		
	Power Transmission		
Elementary Chemistry and Thermodynamics	Introduction to Matter and Chemistry	PEN3022: Chemistry and Thermodynamics	
	Introduction to Thermodynamics		
	Introduction to Heat Transfer and Heat Exchangers		
	Thermodynamics of Steam		



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Jurisdictional Legislation, Codes and Standards for Power Engineers	Introduction to Power Engineering	PEN3023: Power Engineering Governance	
	Jurisdictional Legislation for Power Engineers		
	Codes and Standards for Power Engineers and Pressure Vessels		
Power Plant/Heating Plant Safety	Introduction to Plant Safety	PEN3024: Plant and Fire Safety	
	Plant Safety Programs		
	Handling of Dangerous Materials		
	Plant Fire Safety		
	Fire Extinguishing Methods and Equipment		
Environment	Introduction to the Environment	PEN3025: Environmental Impact	
	Gas and Noise Emissions		
	Liquid and Solid Emissions		
Material and Welding	Energy Plant Construction and Operation Materials	PEN3026: Material Science and Welding	
	Introduction to Welding		
	Boiler and Pressure Vessel Weld Inspection		
Piping and Valves	Introduction to Energy Plant Piping Systems	PEN3027: Fluid-handling Technology	
	Introduction to Energy Plant Valves		
Electricity	Introduction to Basic Electricity	PEN3028: Electrotechnology	
	Magnetism and Electromagnetism		
	Electrical Metering Devices		
	Motor and Generators		
	Transformers		
	Electrical Distribution Systems		



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Energy Plant Instrumentation and Controls	Introduction to Energy Plant Controls and Instrumentation	PEN3029: Instrumentation and Controls	
	Introduction to Process Measurement		
	Basic Control and Instrumentation Components		
	Introduction to Programmable Controllers		
	Electronic Control Systems and Computer Applications		
	Electric Control Systems		
Plant Communication	Energy Plant Sketching	PEN3030: Industrial Communication	
	Plant Diagrams and Drawings		
	Plant Communications		
Boilers	Introduction to Boilers	PEN3031: Boiler Designs	
	Fire-tube Boilers		
	Water-tube Boilers		
	Electric Boilers		
	Special Boiler Designs for Heating Plants		
	Differences Between Power and Heating Boilers		
Boiler Systems	Combustion	PEN3032: Boiler Systems	
	Fuel Delivery and Firing Systems		
	Draft		
	Feedwater Systems		
	Blowoff and Blowdown Systems		
	Boiler Fireside Cleaning Systems		
Lubrication	Lubrication Principles	PEN3033: Lubrication and Bearings	
	Types of Bearings and Lubrication		



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4B TOPICS			
Pumps and Compressors	Types of Pumps	PEN3034: Pumps and Compressors	
	Pump Operation and Maintenance		
	Introduction to Compressors		
	Compressor Operation and Maintenance		
Boiler Safety Devices	Pressure Relief Valves	PEN3035: Boiler Safety Devices	
	Combustion Safety		
	Water Level Safety Controls		
	Boiler Fittings		
	Operating and Safety Circuits		
Plant (Boiler) Operations	Boiler Plant Startup	PEN3036: Boiler Plant Operation and Management	
	Boiler Startup		
	Boiler Operation		
	Operational Checks		
	Shutdown Procedures		
	Boiler Plant Monitoring and Reporting		
Power Plant/Heating Plant Maintenance	Energy Plant Maintenance I	PEN3037: Energy Plant Maintenance	
	Energy Plant Maintenance II		
	Boiler Maintenance		
	Boiler Cleaning		



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Water Treatment	External Boiler Water Treatment	PEN3038: In-Plant Water Treatment	
	Internal Boiler Water Treatment		
	Condensate Treatment		
	Tower/Condenser Water Treatment		
	Recirculating System Water Treatment		
Prime Movers and Engines	Heat Engines and Prime Movers	PEN3039: Prime Movers and Heat Engines	
	Steam Turbines		
	Condensers and Cooling Towers		
	Gas Turbines		
	Internal Combustion Engines		
Auxiliary Building Systems	Lighting Systems	PEN3040: Auxiliary Building Systems	
	Building Water Systems		
	Drainage Systems		
Refrigeration	Refrigeration Basics	PEN3041: Refrigeration	
	Compression Refrigeration Systems		
	Refrigeration Control and Operation		
	Absorption Refrigeration Systems		
Heating, Ventilating and Air Conditioning	Conditioning the Air	PEN3042: Heating, Ventilating and Air Conditioning	
	Humidification		
	Fans for Air-distribution Systems		
	Ventilation and Air Filters		
	HVAC Duct Systems		
	Types of Coils and Operation		



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Heating and Cooling Systems	Steam Heating	PEN3043: Environmental and Control Systems	
	Hot-water Heating		
	Other Heating Systems		
	Cooling Systems and Combination Systems		
	Heat Gains and Losses, Heat Recovery Methods		
	HVAC Control Strategy		
Types of Plants	Common Plant Configurations in Hydrocarbon Centric Industries	PEN3044: Industrial Plant Configurations	
	Other Plant Configurations		
CTS COURSES THAT ALLOW STUDENTS ADDITIONAL PRACTICAL TIME. THE HOURS REPRESENTED BY THESE FOUR COURSES ARE OVER AND ABOVE THE 625 HOURS.			
		PEN3605: PEN Practicum 4A	
		PEN3610: PEN Practicum 4B	
		PEN3615: PEN Practicum 4C	
		PEN3620: PEN Practicum 4D	

