![APEGGA logo] The Association of Professional Engineers, Geologists and Geophysicists of Alberta

ELECTRICAL ENGINEERING SYLLABUS OF EXAMINATIONS
1998 EDITION

> For textbook information please refer to the **Textbooks** section on page 3 of the document entitled **Information for Students and Examinations Candidates**.

GROUP A
COMPULSORY EXAMINATIONS (seven required)

98-Elec-A1   Circuits

Nodal and mesh analysis of linear, finite, passive circuits; equivalent networks. Steady state AC response of lumped constant, time-invariant networks. Time and frequency response of linear systems: impulse response and transfer functions, Laplace transform analysis, frequency response, including steady-state sinusoidal circuits.

98-Elec-A2   Control
Models, transfer functions, and system response. Root locus analysis and design. Feedback and stability: Bodes diagrams. Nyquist criterion, frequency domain design. State variable representation. Simple PID control systems.

98-Elec-A3   Communications
Amplitude and frequency modulation systems: signals, spectra, implementation. Sampling of continuous signals and the Nyquist sampling theorem. Fourier series and transforms, spectral concepts. Discrete signals and systems: the sampling theorem, time and frequency response, the Z-transform. PCM and simple baseband pulse code modulation systems.

98-Elec-A4   Digital Systems and Computers
Combinatorial and sequential switching circuits. Register level design of digital systems. Computer memories. Computer architecture, assembly language programming, interrupts, and interfacing.

98-Elec-A5   Electronics
Semiconductor devices; diodes and thyristors. Bipolar and field effect transistors as linear devices and switches. Small signal amplifiers. Operational amplifiers and comparators. Digital circuits and logic families.

98-Elec-A6   Electromagnetic Energy Conversion
Magnetic circuits. Three - phase circuits. Transformer equivalent circuit at both low frequency and high frequency. Electromagnetic and electrostatic force calculations. AC machines and stepper motors. Permanent magnet DC machines.

98-Elec-A7   Electromagnetics
Field concepts. Maxwell's equations. Free space and guided wave propagation, transmission lines. Radiation from current elements.

GROUP B
ELECTIVE EXAMINATIONS (two required)

98-Elec-B1   Advanced Circuits Analysis and Design
Network equilibrium equations. Two port analysis. Classical passive filter design. Non linear operational amplifier applications and active filters. Principles of computer aided design tools: frequency and time domain analysis; transmission line effects; sensitivity analysis. Scattering matrix description of microwave devices.

98-Elec-B2   Digital Signal Processing
Discrete system theory: convolution, Z-transforms, transfer functions. Design and implementation of digital filters. Spectral analysis, DFT and FFT implementations. Implementation; DSP chips architecture and programming.

98-Elec-B3   Advanced Control Systems
Modelling of engineering systems; state variables and transfer function representations. Analytical and numerical solutions of state variable equations. Observability, controllability, stability; classical design, stabilization by pole assignment. Systems with delay. Systems with noise. Computer control, discrete systems. System identification; least squares.

98-Elec-B4   Communications Systems
Sampling, A/D conversion, source coding; signal sets, line codes, modulation, optimal reception, demodulation, performance in noisy channels, error detecting and correcting codes. Public Switch Telephone Networks, television standards. Radio communications; link analysis and performance, terrestrial and satellite communications; personal communication networks; cellular telephone networks.

98-Elec-B5   Advanced Electronics
Device models and implementation in computer aided analysis packages. Multi-stage amplifiers, oscillators, non-linear circuits. Power amplifiers and linear regulators. Communication circuits; phase locked loops, filters, modulator/demodulators. Electronic instrumentation and measurement. Microwave circuits; properties of microwave tubes and semi-conductor devices.

98-Elec-B6   Integrated Circuit Engineering
Integrated Circuit Design: MOS circuit design methods; specification; use of CAD design tools. Non-ideal effects. Mask level layout. Integrated Circuit Fabrication: basic knowledge of IC processing techniques. Digital and analog IC's: basic building blocks. Design considerations for submicron CMOS and bipolar devices.

98-Elec-B7   Power Systems Engineering
Power system representation and analysis. Components: transmission lines, transformers, synchronous machines. Distribution: loads, power flow, operations, and control. Fault analysis: short circuits, balanced and unbalanced operation. System stability.

98-Elec-B8   Switched Mode Power Supply Design

Control of electrical power with semiconductor devices -- Specifications and requirements. Design of high frequency magnetic devices. Power supply models and control methods. Harmonic analysis. Filter design and EMC issues. Heatsink calculations.

98-Elec-B9   Power Electronics and Drives

Construction and modelling of electric machines; induction, synchronous, permanent magnet DC, stepper motors. Electronic power converters; choppers, DC link inverters, cycloconverters, current source inverters. Torque and speed controllers. Vector oriented control techniques.

98-Elec-B10   Electromagnetic Field, Transmission Lines, Antennas, and Radiation

Field radiation equations. Distributed circuits: steady-state transmission line equations; impedance transformation, Smith charts, matching. Transients. Coaxial lines, waveguides. Antennas: infinitesimal elements, linear antennas, radiation resistance, antenna patterns, gain. Other types of antennas.

98-Elec-B11   Electro-Optical Engineering

Optical transmission: waveguide modes, fibre optic propagation characteristics. Optoelectronics: lasers, sources and detectors, couplers, modulators, guided wave devices. Applications.

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