**APGENCO AE ELECTRONICS SYLLABUS**

**1.  Basics of Circuits and Measurement Systems:**   
Kirchoff’s  laws, mesh and nodal Analysis, Circuit  theorems.   One-port and  two-port Network Function.   Static and dynamic characteristics of Measurement Systems. Error and uncertainty analysis.  Statistical analysis of data and curve fitting.

**2.  Transducers, Mechanical Measurement and Industrial Instrumentation:**   
Resistive,  Capacitive,  Inductive  and  piezoelectric  transducers  and  their  signal conditioning.   Measurement  of  displacement,  velocity  and  acceleration  (translational and  rotational),  force,  torque,  vibration  and  shock.   Measurement  of  pressure,  flow, temperature and liquid level.  Measurement of pH, conductivity, viscosity and humidity.

**3.  Analog Electronics:**   
Characteristics of diode, BJT, JFET and MOSFET.   Diode circuits.   Transistors at  low and high  frequencies, Amplifiers, single and multi-stage.   Feedback amplifiers. Operational  amplifiers,  characteristics  and  circuit  configurations,  Instrumentation amplifier.  Precision rectifier.  V-to-I and I-to-V converter.   Op-Amp based active filters.  Oscillators and signal generators.

**4.  Digital Electronics:**   
Combinational  logic  circuits,  minimization  of  Boolean  functions.    IC  families, TTL, MOS  and CMOS.   Arithmetic  circuits, Comparators, Schmitt  trigger,  timers and mono-stable  multi  vibrator.    Sequential  circuits,  flip-flops,  counters  ,  shift  registers, Multiplexer, S/H  circuit, Analog-to-Digital  and Digital-to-Analog  converters.   Basics  of number  system.    Microprocessor  applications,  memory  and  input-output  interfacing.  Microcontrollers.

**5.  Signals, Systems and Communications:**   
Periodic  and  aperiodic  signals.    Impulse  response,  transfer  function  and frequency  response  of  first and  second  order  systems.   Convolution,  correlation  and characteristics  of  linear  time  invariant  systems.    Discrete  time  system,  impulse  and frequency  response.    Pulse  transfer  function.    IIR  and  FIR  filters.    Amplitude  and frequency modulation and demodulation.   Sampling  theorem, pulse  code modulation.  Frequency  and  time  division  multiplexing.    Amplitude  shift  keying,  frequency  shift keying and pulse shift keying for digital modulation.

**6.  Electrical and Electronic Measurements:**   
Bridges  and  potentiometers, measurement  of  R,  L  and C.   Measurements  of voltage,  current,  power,  power  factor  and  energy.    A.C  &  D.C  current  probes.  Extension  of  instrument  ranges.   Q-meter  and waveform  analyzer.   Digital  voltmeter and  multi-meter.    Time,  phase  and  frequency  measurements.    Cathode  ray oscilloscope.  Serial and parallel communication.  Shielding and grounding.

**7.  Control Systems and Process Control:**   
Feedback  principles.    Signal  flow  graphs.    Transient Response,  steady-state-errors.   Routh and Nyquist criteria.   Bode plot, root  loci.   Time delay systems.   Phase and gain margin.   State space  representation of systems.   Mechanical, hydraulic and pneumatic  system  components.    Synchro  pair,  servo  and  step  motors.    On-off, cascade, P, P-I, P-I-D, feed forward and derivative controller, Fuzzy controllers.

**8.  Analytical, Optical Instrumentation:**   
Mass spectrometry, UV, visible and IR spectrometry, X-ray and nuclear radiation measurements.  Optical sources and detectors, LED, laser, Photo-diode, photo-resistor and  their  characteristics.    Interferometers,  applications  in metrology.   Basics  of  fiber optics.