

# Electronics & Communication Engineering

## Syllabus for PhD Qualifying Examination

### Part B

S.No.	Subject	Topics	Reference
1	Electronic Circuits	<p><b>Analog Electronics:</b> BJT and CMOS circuits and amplifiers, Operational amplifiers: Ideal opamp, practical opamp, inverting configuration, non-inverting configuration, differential configuration, practical opamp parameters, open-loop and closed-loop frequency response, gain-bandwidth product, slew rate, CMRR. Adder, integrators, differentiators, voltage comparators, Schmitt trigger, peak detector</p> <p><b>Digital electronics:</b> Variables and Functions , Inversion, Truth Tables , Logic gates and Networks, Boolean Algebra , Synthesis Using AND ,OR,NOT , NAND and NOR Gates. Design Examples – Karnaugh Map – Strategy for Minimization, Minimization of product of Sums forms, Combinational Circuits Building Blocks – Multiplexers, Decoders – Encoders Code Converters, Arithmetic Comparison Circuits – Flip flop, Registers, Counters</p>	<p>1. Adel S. Sedra and Kenneth C. Smith, “Microelectronic Circuits”, Fifth edition, Oxford University Press, 2004.</p> <p>2. Schilling, Belove, “Electronic Circuits”, Third edition, Tata McGraw-Hill, 2006.</p> <p>3. Stephen Brown , Zvonko Vranesic, “Fundamentals of Digital Logic with Verilog Design,” Tata McGraw Hill Publishing Company Limited, Special Indian Edition, 2007</p>
2	Transducers, Measurements and 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. Biomedical instruments, EEG, ECG and EMG. Clinical measurements. Ultrasonic transducers and Ultrasonography. Principles of Computer Assisted Tomography	<p>1. Ernest O. Doebelin, “Measurement Systems Application and Design”, McGraw Hill International Editions, 2006.</p> <p>2. A. K. Sawhney And P. Sawhney, “A Course In Mechanical Measurements And Instrumentation”, Dhanpat Rai, New Delhi, 2001.</p> <p>3. R.S. Khandpur, “Handbook of Biomedical Instrumentation”, Tata</p>

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			McGrawhill, New Delhi, 2003
3	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.	I.J.Nagrath and M.Gopal, "Control Systems Engineering", Wiley Eastern Limited, New Delhi, 2008.
4	Digital Signal Processing	<b>Discrete Fourier Transforms (DFT):</b> Frequency domain sampling and reconstruction of discrete time signals. Fourier Series and transform, DFT and its Properties, Circular convolution  <b>IIR filter design:</b> Characteristics of commonly used analog filters – Butterworth and Chebyshev filters, analog to analog frequency transformations. Design of IIR filters from analog filters (Butterworth and Chebyshev) - impulse invariance method, Bilinear transformation method  <b>FIR filter design:</b> Introduction to FIR filters, design of FIR filters using - Rectangular, Hamming, Barlet and Kaiser windows,  <b>Implementation of discrete-time systems:</b> Structures for IIR and FIR systems-direct form I and direct form II systems, cascade, and parallel realization.	Proakis & Monalakis, Digital signal processing – Principles Algorithms & Applications, Pearson education, 4 <sup>th</sup> Edition, New Delhi, 2007.

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5	Communication Engineering	<p><b>Electromagnetic fields:</b> Maxwell's equations, electromagnetic fields, S-parameters, basic Transmission line equations, impedance transformers, basics of antennas, antenna specifications</p> <p><b>Analog communications :</b> Analog modulation schemes – AM,FM, PM, spectrum analysis, superheterodyne receivers, Random process and Noise</p> <p><b>Digital communications :</b> sampling – quantization – encoding – aliasing – Nyquist rate - Modulation schemes PAM, PCM,PSK, FSK, QAM and higher order of modulation techniques and their error performance – pulse shaping, matched filter.</p>	<p>1.D. M. Pozar “Microwave Engineering”, Publisher: Wiley</p> <p>2. Symon Haykins “Principles of Communication systems”, John Wiley</p> <p>3. Proakis and Salehi “Fundamentals of Communication systems”, Pearson Ed</p>
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