



# Bhartiya Skill Development University

## Syllabus for Ph.D. Entrance Test

### Electronics

**Basic Electronics:** Energy bands in intrinsic and extrinsic silicon; Carrier transport current, drift current, mobility and resistivity; Generation and recombination of carriers; Poisson and continuity equations, PN junction, Zener Diode, Simple diode circuits: clipping, clamping and rectifiers, BJT, Common Emitter (CE), Common Base (CB) and Common Collector (CC) configuration, Darlington pair, Transistor biasing, Transistor as switch and amplifier, Feedback amplifier, RC coupled amplifier, Push Pull amplifier, FET, MOSFET, MOS capacitor, Common Source, Common Drain amplifier

**Digital Electronics:** Number systems; Combinatorial circuits: Boolean algebra, minimization of functions using Boolean identities and Karnaugh map, logic gates, arithmetic circuits, code converters, multiplexers, decoders; Sequential circuits: latches and flip flops.

**Basics of VLSI:** PROM, PLA, PAL: Architectures and applications. Software Design Flow, CPLD and FPGA Architecture, MOSFET equivalent circuits and analysis, CMOS Technologies, Layout Design Rules: Design Rules Background, Static, dynamic and short circuit power dissipations; Propagation delay; Power delay product, BiCMOS Circuits, Low Power Logic Design, Small-Signal Model for MOS Transistor, Analog CMOS Sub circuits: MOS Switch, MOS Diode, Current Sinks and Sources, Current mirrors. Types of fault, Need of Design for Testability (DFT), Testability, Fault models, Path sensitizing, Sequential circuit test, BIST, Test pattern generation, JTAG & Boundary scan, TAP controller.

**Communications:** Amplitude modulation and demodulation, angle modulation and demodulation, Digital communications; Pulse Amplitude and Pulse code modulation (PCM), Differential pulse code modulation. Delta modulation, Noise considerations in PCM, Time Division multiplexing, Digital Multiplexers, Baseband Pulse Transmission- Inter Symbol Interference and Nyquist criterion. Pass band Digital Modulation schemes- Phase Shift Keying, Frequency Shift Keying, Quadrature Amplitude Modulation, Principles of light transmission in optical fiber, modes and configurations, Single-mode fibers, Multimode fibers, Numerical aperture, Mode field diameter, V- number, fiber materials, Fiber fabrication techniques. Attenuation, Signal dispersion in fiber. Photonic crystal fibers. Optical sources, LED, LASER diodes, PIN, Avalanche detector, photo detector noise, optical connectors, Wavelength division multiplexing, optical amplifiers, Nonlinear effects, Optical Networks.



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### Electronics

#### Reference Books:

1. Millman and Halkias, 'Integrated Electronics', TM Hill Pubs, 2017
2. Donald A. Neamen, 'Semiconductor Physics and Devices', Mcgraw Hill Edu, 2012
3. Behzad Razavi, 'Design of Analog CMOS Integrated Circuits', Mcgraw Hill Edu, 2016
4. M. Morris Mano, 'Digital Logic and Computer Design', Prentice Hall, 2018
5. Simon Haykin, 'Communication systems, 4<sup>th</sup> Edition, Wiley Pubs. 2006.
6. BP Lathi, 'Modern Analog and Digital communications system', Oxford series, 2018
7. R.P. Khare, 'Fiber Optics & Optoelectronics"', Oxford Publications, 2014