Department of Electronics and Communication Engineering
Syllabus of Communication stream for PhD Entrance Exam

1. **Basic Electronics and Circuits :**P-N Diodes, Zener Diodes, Transistors characteristics and uses, Amplifiers, Oscillators, BJTS, FETS, MOSFET, Filters, Timers,Clippers, Clampers, Rectifiers.
2. **Digital Circuits :** Number Systems, Logic Gates, Boolean Algebra, Combinatorial and Sequential circuits, A/D-D/A converters, semiconductor memories.
3. **Network Theory :**Node and mesh analysis, superposition, Thevenin's theorem, Norton's theorem,reciprocity, Sinusoidal steady state analysis,Time and frequency domain analysis of linear circuits, Linear 2-port network parameters, wye-delta transformation.
4. **Signal and System :** Continuous-time signals, Fourier series and Fourier transform, sampling theorem and applications, Discrete-time signals, DTFT, DFT, Z-transform, LTI systems, causality, stability, Impulse response, convolution, Frequency response.
5. **Analog Communication :**Random processes, Autocorrelation and power spectral density, properties of white noise, filtering of random signals through LTI systems, Inter-symbol interference, MAP, ML detection, Matched filter receiver, Noise, SNR and BER,Analog modulation and demodulation, AM, FM, PM Modulation Techniques, Coherent and Non-Coherent Detection, super heterodyne receiver.
6. **Digital Communication** :Digital modulation and demodulation, PCM, DPCM, ASK, FSK, PSK,BPSK, QPSK and QAM, Multiple Access techniques,Information Theory, Error Correction Codes.
7. **Wireless Communication** :Principles of Mobile Communication, Operation of cellular system, Trucking Efficiency, Concept of Frequency reuse, Multipath propagation, Fading, Signal Propagation Models, Co-Channel Interference and mitigation, Diversity Techniques, Other Interferences, Hand-off Techniques, MIMO, 5G Communications, Internet of things (IoT) for communication.
8. **Optical Communication** :Optical sources, LED, spontaneous and stimulated emission, Semiconductor Lasers, Detectors, PIN photodiodes, Avalanche photodiodes, Optical fibers, attenuation and dispersion characteristics, Bandwidth, Wavelength division multiplexing, Semiconductor laser amplifiers, Raman - and Brillouin - fiber amplifiers, Erbium doped fiber amplifiers, pumping phenomenon, Free space optical communication.
9. **Satellite and Radar Communication** :Kepler's law, Orbit and Description, Satellite subsystem, Satellite link, Satellite navigation and Global Positioning Systems, ALOHA, Basics of Radar, Radar Equation, FM-CW Radar, MTI and Pulse Dopplar Radar, Tracking Radar, Radar Receivers.
10. **Electromagnetics, Antenna and Microwave** :Elements of vector calculus, Maxwell's equations-basic concepts; Gauss', Stokes' theorems; Wave propagation through different media; Transmission Lines-different types, basics, Smith's chart, impedance matching/transformation, S-parameters, pulse excitation, uses; Waveguides-basics, rectangular types, modes, cut-off frequency, dispersion, dielectric types; Antennas-radiation pattern, monopoles/dipoles, gain, arrays-active/passive, theory, uses.
11. **Digital Signal Processing and Image Processing :**FFT and its implementation, Filter design techniques, FIR and IIR filters, Lattice Filter, Multi-rate Filter Bank, Power Spectrum Estimation, AR, MA and ARMA models, Adaptive Filter design,LMS Algorithm, Image fundamentals, Image acquisition,Image filtering andenhancement, restoration, segmentation, image classification.
12. **Artificial Intelligence and Machine Learning:**Fundamentals of Artificial Intelligence, Feature extraction,Artificial Neural Networks, Back Propagation, Support Vector Machine, Supervised

and unsupervised learning, Deep learning, CNN, LSTM, Fuzzy Logic, Defuzzification, Metaheuristic, Swarm Intelligence, Nature inspired optimization.