Draft Syllabus for Ph.D Entrance Examination

Amrita Center for Wireless Networks & Applications

Wireless Communication


Foundations for Signal Processing


Advanced Computer Programming

Programming in C, Basic Computer Organization and Architecture, Build and Compilation process, Debugging concepts, Data Types and Variables, Input/Output implementation and usage, Control flow, Modular Programming with functions, Stack Frames and Activation Records, Arrays, Pointers, Strings, Structures, Implementation of Structures, Memory, Stacks, Recursion, Dynamic Memory Allocation, Heap, Program Runtime Analysis, Big-Oh Notation.
Computer Networks


Design and Analysis of Algorithms


Antenna Theory and Design

Block diagram of pulse radar. Radar equation. Signal-to-noise ratio, probability density function and range, ambiguities, radar cross-section of target, target models, PRF, system losses.
CW and frequency-modulated radar Doppler effect, CW radar, FMCW radar. MTI and pulse Doppler radar-delay line cancellers and characteristics, blind speeds, douplet cancellation. MTI radars with power amplifier and power oscillators, transmitters. MTI from moving platform, pulse Doppler radars. Tracking radars. Tracking techniques-sequential lobing, conical scan monopulse. Tracking in range, acquisition. Tracking performance. Electronic scanning radar system, beam forming and steering methods, fire controlled radar. SAR. Radar transmitters, magnetron oscillators, hard tube and line-type pulser. Radar receivers, mixer amplifier, receiver noise, duplexers, displays, clutters, weather and interferences, system engineering and design. Pulse compression radar.

Fundamentals of radiation mechanism, vector potentials, radiation from current elements, radiation pattern, superposition and reciprocity theorems.

Small antennas, images, small antenna above ground, different types of linear arrays, multiplication of patterns, binomial arrays, antenna gain, effective area, antenna impedance, beam width, self and mutual impedance, folded dipole, Yaginda antennas. Mathematical theories of antennas, aperture antennas, slot antennas, cavity back slot antennas, horn antennas, waveguide radiator, parabolic reflectors, Cassegrain antennas. Broadband antennas, microstrip antennas, noise consideration, antenna measurements.

**Wireless Sensor Networks**


**Embedded Systems**


Mobile Communication Networks


Machine Learning

Role of learning in intelligent behavior, general structure of a learning system; learning from example; concept learning, Introduction to machine learning and machine /earning applications. Supervised learning, Bayesian decision theory, Parametric methods, multivariate methods, dimensionality reduction, clustering, non-parametric methods, decision trees, linear discrimination, multilayer Perceptrons, local models, hidden Markov models, assessing and comparing classification algorithms, combining multiple learners, and reinforcement learning.