# M.E. WCC Syllabus

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<tr>
<th>PG-WCC2-01</th>
<th>Advances in Algorithms</th>
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**Algorithmic paradigms**: Dynamic Programming, Greedy, Branch-and-Bound, Asymptotic complexity, Amortized analysis, Graph Algorithms, Shortest paths, Flow networks, NP-completeness, Approximation algorithms, Randomized algorithms, Linear programming, Special topics, Geometric algorithms (range searching, convex hulls, segment intersections, closest pairs), Numerical algorithms (integer, matrix and polynomial multiplication, FFT, extended Euclid's algorithm, modular exponentiation, primarily testing, cryptographic computations), Internet algorithms (text pattern matching, tries, information retrieval, data compression, Web caching).

* Practical based on above syllabus as a part of Computer System Lab-II.

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<tr>
<th>PG-WCC2-02</th>
<th>Network Security &amp; Cryptography</th>
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**UNIT I**: Overview: Services, Mechanisms and attacks, OSI security architecture, Model for network security.

**UNIT II**: Classical Encryption Techniques: Symmetric cipher model, Substitution techniques, Transposition techniques, Rotor machine, Steganography, Problems. **Block Ciphers and DES (Data Encryption Standards)**: Simplified DES, Block cipher principles, DES, Strength of DES, Block cipher design principles, Block cipher modes of operation, Problems.


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**Text Books:**


PG-WCC2-03  Real Time Operating Systems for Embedded Systems

UNIT-1: Introduction to Unix, Overview of commands, File I/O. (open, create, close, iseek, read, write), Process Control (fork, vfork, exit, wait, waitpid, exec), Signals, Interprocess Communication (pipes, fifos, message queues, semaphores, shared memory).


UNIT-3: Commonly used approaches to Real Time Scheduling: Clock driven, Weighted Round Robin, priority driven, Dynamic Vs State Systems, Effective release times and Dead lines, offline Vs online scheduling.

UNIT - 4: Operating Systems : Overview, Time Services and Scheduling mechanisms, other basic operating system function, processor reserves and resource kernel. Capabilities of commercial Real time Operating Systems.


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SUGGESTED BOOKS:

1. Advanced Unix Programming - Richard Stevens
2. Real Time Systems - Jane W.S. Liu - Pearson Education
3. Real Time Systems - C.M.Krishna, KANG G. Shin - M.G.Hill
4. VxWorks Programmers Guide

PG-WCC2-04-01  DSP PROCESSORS AND ARCHITECTURES (Elective 3)

UNIT I:- INTRODUCTION TO DIGITAL SIGNAL PROCESSING

Introduction, A Digital signal-processing system, The sampling process, Discrete time sequences. Discrete Fourier Transform (DFT) and Fast Fourier Transform (FFT), Linear time-invariant systems, Digital filters, Decimation and interpolation, Analysis and Design tool for DSP Systems MATLAB, DSP using MATLAB.

UNIT II:- COMPUTATIONAL ACCURACY IN DSP IMPLEMENTATIONS

Number formats for signals and coefficients in DSP systems, Dynamic Range and Precision, Sources of error in DSP implementations, A/D Conversion errors, DSP Computational errors, D/A Conversion Errors, Compensating filter.

UNIT III :- ARCHITECTURES FOR PROGRAMMABLE DSP DEVICES

Basic Architectural features, DSP Computational Building Blocks, Bus Architecture and Memory, Data Addressing Capabilities, Address Generation Unit, Programmability and Program Execution, Speed Issues,
Features for External interfacing. EXECUTION CONTROL AND PIPELINING Hardware looping, Interrupts, Stacks, Relative Branch support, Pipelining and Performance, Pipeline Depth, Interlocking, Branching effects, Interrupt effects, Pipeline Programming models.

UNIT IV:- PROGRAMMABLE DIGITAL SIGNAL PROCESSORS

Commercial Digital signal-processing Devices, Data Addressing modes of TMS320C54XX DSPs, Data Addressing modes of TMS320C54XX Processors, Memory space of TMS320C54XX Processors, Program Control, TMS320C54XX instructions and Programming, On-Chip Peripherals, Interrupts of TMS320C54XX processors, Pipeline Operation of TMS320C54XX Processors. IMPLEMENTATIONS OF BASIC DSP ALGORITHMS The Q-notation, FIR Filters, IIR Filters, Interpolation Filters, Decimation Filters, PID Controller, Adaptive Filters, 2-D Signal Processing.

UNIT V:- IMPLEMENTATION OF FFT ALGORITHMS

An FFT Algorithm for DFT Computation, A Butterfly Computation, Overflow and scaling, Bit-Reversed index generation, An 8-Point FFT implementation on the TMS320C54XX, Computation of the signal spectrum.

UNIT VI:- INTERFACING MEMORY AND I/O PERIPHERALS TO PROGRAMMABLE DSP DEVICES

Memory space organization, External bus interfacing signals, Memory interface, Parallel I/O interface, Programmed I/O, Interrupts and I/O, Direct memory access (DMA). A Multichannel buffered serial port (McBSP), McBSP Programming, a CODEC interface circuit, CODEC programming, A CODEC-DSP interface example.

TEXT BOOKS:


UNIT I:- Overview of wireless and mobile: Cellular system concepts, standards and Evolution of mobile & wireless communication technologies.

UNIT II:- Wireless channel characterization: Attenuation, Shadowing, Fading, Doppler Shift, Delays Spread, Co-channel, Adjacent Channel and other forms of interferences. Modulation techniques: QAM, Multitone, MSK, OMSK, CPM, TFM and OFDM.


UNIT IV:- Smart Antennas systems: Generalized array signal processing, Beam forming concepts: DOB, TRB & SSBF, Switched beam antennas, spatial diversity, and fully adaptive antennas for enhanced coverage, range extension & improvement in frequency reuse, interference Nulling for LOS & Multipath systems.

UNIT V:- SDMA concepts and Smart antennas implementation issues.

UNIT VI:- RF Ics: LNA, IQ Lodulator, Mixers, DSPs & Micro-controllers in wireless communications, ASICs and FPGAs.

Texts/ References:


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<th>PG-WCC2-04-03</th>
<th>Principles of Embedded Networked System Design (ELECTIVE -3)</th>
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<tr>
<td><strong>UNIT II:</strong> Digital Communication, Multiple source estimation and multiple access communication Networking, Network position &amp; Synchronization services.</td>
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<td><strong>UNIT III:</strong> Energy Management, Data Management, Articulation, Mobility, &amp; infrastructure</td>
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<td><strong>UNIT IV:</strong> Node Architecture, Network data integrity.</td>
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<td><strong>UNIT V:</strong> Experimental system design, Ethical, legal and social implications of ENS. Design Principles of ENS.</td>
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<td><strong>UNIT VI:</strong> Application A: Gaussian Q function Application B: Optimization * Practical based on above syllabus as part of Computer System Lab-II</td>
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<tr>
<td><strong>TEXT BOOK:</strong> Principles of Embedded Networked System Design By Gregorg Politic, William Kaiser PG-WCC2-05-01</td>
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<tr>
<th>PG-WCC2-04-04</th>
<th>EMBEDDED SOFTWARE DESIGN (Elective 4)</th>
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<td><strong>UNIT 1:</strong> Pentium Processor: Introduction to the Pentium Microprocessor, Special Pentium Registers, Pentium Memory management.</td>
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<td><strong>UNIT 3:</strong> Development Environment: The Execution Environment, Memory Organization, System Startup. Special Software Techniques: Manipulating the Hardware, Interrupts and Interrupt service Routines (ISRs),Watchdog Times, Flash Memory, Design Methodology. Basic Tool Set: Host - Based Debugging, Remote Debuggers and Debug Kernels, ROM Emulator, Logic Analyzer.</td>
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<td><strong>UNIT 6:</strong> Buffering and Other Data Structures: What is a buffer? Linear Buffers, Directional Buffers, Double Buffering, Buffer Exchange, Linked Lists, FIFOs, Circular Buffers, Buffer Under run and Overrun, Allocating Buffer Memory, Memory Leakage. Memory and Performance Trade-offs.</td>
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* Practical based on above syllabus as a part of Computer System Lab-II
TEXTBOOKS

1. Intel Microporcessors by Barry B Brey PHI
3. Embedded Systems Design by Steve Heath, Newnes

UNIT I: Introduction: Origin and brief history of satellite communications, an overview of satellite system engineering, satellite frequency bands for communication. **Orbital theory**: Orbital mechanics look angle determinations, numerical examples, orbital perturbations, orbit determination, launches and launch vehicles, orbital effects in communication system performance, Azimuth & elevation calculations **Spacecraft systems**: Attitude and orbit control system(AOCS), telemetry, tracking, command (TT&C) and monitoring, power systems, communications subsystems, transponders, spacecraft antennas, Equipment reliability and space qualification.

UNIT II: Satellite link design: Basic transmission theory, noise figure and noise temperature, and G/T ratio, Satellite down link design, Satellite systems using small earth stations satellite uplink design, design for specified C/N ratio, Combining C/N and C/I values in Satellite links, System design examples.

UNIT III: Modulation, Multiplexing, Multiple access Techniques: Analog telephone transmission, Fm theory, FM Detector theory, analog TV transmission, S/N ratio Calculation for satellite TV linking, Digital transmission, base band and band pass transmission of digital data, BPSK, QPSK, FDM, TDM, Access techniques: FDMA, TDMA, CDMA and Random access.

UNIT IV: Encoding & FEC for Digital satellite links: Channel capacity, error detection coding, linear block, binary cyclic codes, and convolution codes, Implementation of error detection on satellite links.

UNIT V: Propagation on satellites - earth paths and its influence on link design: propagation effects, rain and ice effects, elimination of the above effects.

UNIT VI: Earth station technology - Design of large antennas, equipments for earth stations video receiver, frequency coordination, VSAT technology, Direct Broadcast by satellite (DBS), Intelsat and Imarsat.

Text Books:


References:

1. Tom Logs Don, "Mobile communication satellites: theory and applications", McGraw Hill,1 995


UNIT-IV : -Image Enhancement in the frequency Domain : Filtering in the Frequency Domain, Correspondence between Filtering in the Spatial and Frequency Domain, Smoothing Frequency-Domain Filters, Sharpening Frequency-Domain Filters, Homomorphism Filtering, Implementation.

UNIT-V : -Morphological : Preliminaries, Dilation and Erosion, Opening and Closing, hit-or-miss Transformation, Some Basic Morphological Algorithms, Extension to Gray-Scale Images

UNIT VI:- Image Segmentation : Point Detection, Line Detection, Edge Detection, Gradient Operator, Edge Linking and Boundary Detection, Thresholding, Region-oriented Segmentation, Representation : Chain Codes, Polygonal Approximations, Signatures, Boundary Segments, Skeleton of a Region.

Assignments : Implementation of Image Processing in 'C/C++/MATLAB'.

* Practical based on above syllabus as apart of Computer System Lab-II


