EC-801 Computer Networks

Unit I

Computer Networks

Introduction, applications, types of networks, network software, reference models- OSI model, TCP/IP model, comparison of OSI and TCP/IP models, example networks.

The Physical layer

Design Issues, review of data communication concepts (configuration, topology, transmission mode, media guided and unguided, types of switching etc).

Unit II

The Data Link layer

Design issues, error detection and correction, data link protocols- stop and wait and sliding window ARQ, utilization of ARQ techniques, example of data link protocol- HDLC.

The Medium Access Control Layer

Static and dynamic channel allocation, multiple access protocols- Pure and slotted ALOHA, CSMA, Collision free protocols, limited contention protocols, CSMA/CD (ETHERNET), fast Ethernet, Gigabit Ethernet.

Unit III

Wireless Protocols

The 802.11, the 802.16, Bluetooth, RFID, Data link layer switching- uses of repeaters, hubs, bridges, switches, routers and gateways.

The Network Layer

Design Issues, Virtual Circuit and datagram networks, routing algorithms- adaptive and non-adaptive algorithms, congestion control algorithms, quality of service, internetworking, Network layer in the Internet- IPv4 protocol, IP addresses, IPv6 protocol, Internet control protocols, Mobile IP.

Unit IV

The Transport Layer

Design issues and services, Transport protocols, congestion control, UDP and TCP protocols, performance issues.

Unit V

The Application Layer

The Domain Name System, E-mail, World Wide Web, streaming audio and video, content delivery.

References:

1. Tanenbaum: Computer Networks, Pearson Education.
2. Bertsekas and Gallager: Data Networks, PHI Learning.
3. Black: Computer Networks, PHI Learning.
4. Forouzan: Computer Networks, TMH.
5. Stallings: Computer Networking and Internet Protocol, Pearson Education.
6. Keiser: Local Area Network, TMH.
7. Forouzan: Data Communication and Networking, TMH..

List of Experiments:

Practical should be performed using Scilab/ Matlab simulation software based on the above contents.

EC-802 TV and Radar Engineering

Unit I

Basic Television System

Introduction: Scanning principles: sound and picture transmission, scanning process, camera pick-up devices, video signal, transmission and reception of video signals, brightness perception and photometric quantities, aspect ratio and rectangular scanning, persistence of vision and flicker, vertical resolution, the Kell factor, horizontal resolution and video bandwidth, interlaced scanning.

Composite Video Signal: Lines and scanning, video signal components, horizontal sync and blanking standards, vertical sync and blanking standards, video modulation and vestigial side band signal, sound modulation and inter-carrier system.

Television Standards: Standard channel characteristics, reception of the vestigial side band signals, television broadcast channel, consolidated CCIR system-B standard, various television broadcast systems.

Television Pick-up devices and Cameras: Camera lenses, auto-focus systems, television camera pick-ups, Silicon Vidicon, CCD image sensors, video processing of camera pick-up signal.

Unit II

Colour Television

Colour fundamentals: mixing of colours and colour perception, chromaticity diagram, colour television camera, colour TV signals and transmission, NTSC, SECAM and PAL system, Trinitron picture tube, automatic degaussing, plasma, LCD displays.

Television transmission and reception: requirement of TV broadcast transmission, design principle of TV transmitters, IF modulation, power output stages, block diagram of TV transmitter, co-channel interference and ghost images during propagation of television signals, antenna requirements for television system, block schematic and function requirements for television receivers, trends in circuit design, colour television receiver.

Unit III

Digital Television Technology

Merits of digital technology, fully digital television system, digital television signals, digitized video parameters, digital video hardware, transmission of digital TV signals, bit rate reduction, digital TV receivers, video processor unit, audio processor unit.

Other television systems: Closed Circuit television system (CCTV), Cable television system (CATV), multiplexed analog component encoding television system (MAC TV), High definition television system (HDTV), High definition multiplexed analog component television (HD-MAC TV), High Performance Computer Controlled TV (HPCC TV), 3-D stereoscopic television techniques..

Unit IV

RADAR

The Radar range equation, block diagram and operation, performance factors: prediction of range performance, minimum detectable signal, receiver noise, probability density functions, signal to noise ratios. Radar cross section of targets, transmitter power, pulse repetition frequency and range ambiguities, antenna parameters.

The CW radar: the Doppler effect, FM-CW radar.
The Moving Target Indicator (MTI) Radar: delay line cancellers.

Unit V
Radar Receivers
The radar receiver, noise figure, mixers, low noise front ends, displays- type A and PPI representations, duplexer and receiver protectors.
Other Radar systems: Synthetic aperture radar, HF over the horizon radar, Air Surveillance Radar (ASR),
Bistatic radar.

References:
1. Dhake: Television and Video Engineering, TMH.
2. Skolnik: Introduction to Radar Systems, TMH, New Delhi.
3. Gupta: Television Engineering and Video Systems, TMH, New Delhi.
4. Gulati: Monochrome and Colour Television, New Age International.
5. Grob and Herndon: Basic Television and Video Systems, McGraw Hill International.
6. Peebles, Jr.: Radar Principles, Wiley India Pvt. LTD.
7. Edde: Radar- Principles, Technology Applications, Pearson Education.

List of Experiments:
Section A: Television Engineering
1. (a) To Study the Circuit Description of RF Tuner Section.
(b) To Study the RF Section by Measuring Voltages at Various Test Points.
(c) To Study the Fault Simulation and Step-by-Step Fault Finding Procedure for RF Section.
2. (a) To Study the Circuit Description of VIF Tuner Section.
(b) To Study the VIF Section by Measuring Voltages at Various Test Points.
(c) To Study the Fault Simulation and Step-by-Step Fault Finding Procedure for VIF Section.
3. (a) To Study the Circuit Description of Video and Chroma Section Tuner Section.
(b) To Study the Video and Chroma Section by Measuring Voltages at Various Test Points
(c) To Study the Fault Simulation and Step-by-Step Fault Finding Procedure for Video and Chroma
Section.
4. (a) To Observe the Horizontal Oscillator and Horizontal Output Section through Various Test Point.
(b) To Study the Fault Simulation and Step-by-Step Fault Finding Procedure for Horizontal Oscillator
and
Horizontal Output Section.
5. (a) To Observe the Vertical Oscillator and Vertical Output Section through Various Test Point.
(b) To Study the Fault Simulation and Step-by-Step Fault Finding Procedure for Vertical Oscillator and
Vertical Output Section.
6. To Study the Fault Simulation and Step-by-Step Fault Finding Procedure for Sound Output Section.

7. To Study the Circuit Description of Audio and Video Section Tuner Section.
8. (a) To Study the System Control Section by Measuring Voltages at Various Test Points.
(b) To Study the Fault Simulation and Step-by-Step Fault Finding Procedure for System Control Section.

Section B: RADAR

1. Study of Doppler Effect.
2. To Measure Speed of a fan and various Other Objects (Pendulum, Tuning Fork, Plate etc.)
3. To Simulate the Variable Speed of Moving Objects using Velocity Simulator.

Elective–II
EC-803(A) Advanced Data Network

Unit-I

Principles of Wireless Networks

Network Planning: Introduction, wireless network topologies, cellular topology. Wireless network operation: introduction, mobility management, radio resources and power management, security in wireless networks.

Unit-II

Mobile Data Networks

Introduction, the data-oriented CDPD network, GPRS and higher data rates, short messaging services in GSM,mobile application protocols.

Wireless LANs (WLAN)

Introduction, historical overview of the LAN industry, evolution of the WLAN industry, new interest from militaryand service providers, a new explosion of market and technology, wireless home networking.

Unit-III

IEEE 802.11 WLANs

Introduction, what is IEEE 802.11? The PHY layer, MAC sublayer, MAC management sublayer.

HIPERLAN

Introduction HIPERLAN, HIPERLAN-2

Wireless Geolocation Systems

Introduction, Wireless geo location system architecture, technologies for wireless geolocation, geolocation standards for E-911 services, performance measures for geo location systems.

Unit-IV

Wireless Personal Area Network (WPAN)

Introduction- IEEE 802.15 WPAN, Home RF, Bluetooth? Interference between Bluetooth and 802.11.

Satellite Networks

Satellite navigation and global positioning system: Introduction, radio and satellite navigation, GPS position location principles, GPS time, GPS receivers and codes, the C/A code, Satellite signal acquisition, GPS signal levels, timing accuracy, GPS receiver operation, GPS C/A code accuracy, differential GPS.

Unit-V

Optical Networks

Network Concepts: terminology, categories, layers. Network topologies: performance of passive linear buses, performance of star architectures. SONET/SDH: transmission formats and speeds, optical interfaces, SONET/SDH rings, SONET/SDH networks.

High speed light-wave links: links operating at 10, 40 and 160 Gbps. Optical add/drop multiplexing (OADM): OADM configurations, reconfigurable OADM.

Optical switching: optical cross-connect, wavelength conversion, wavelength routing, optical packet switching,
optical burst switching. WDM network examples: wideband long-haul WDM networks, narrowband metro WDM networks, passive optical network. Mitigation of transmission impairments: chromatic dispersion compensating fiber, bragg grating dispersion compensators, polarization mode dispersion compensation, optical amplifier gain transients.

References:

1. Pahlavan and Krishnamurthy: Principles of Wireless Networks, PHI Learning.
2. Stallings: Wireless Communications and Networks, Pearson Education.
3. Keiser: Optical Fiber Communications, TMH.
4. Pratt, Bostian and Allnut: Satellite Communications, Wiley India.
5. Upena Dalal: Wireless Communications, Oxford University Press.

EC-803(B) Microwave Circuits

Unit I

Transmission lines: Impedance matching and transformation

Plane Electromagnetic waves, Transmission Lines: Line Equations and analysis, Smith Chart, Impedance Matching and transformation single stub, double stub matching, triple –stub tuner, impedance mismatch factor, quarter wave transformer, theory of small reflections, binomial and Chebyshev transformer, tapered transmission lines, triangular, exponential and Klopfenstein taper.

Unit II

Field analysis of transmission lines:

Analysis of general transmission line and terminated transmission line circuits, Planar Transmission lines, Micro strip lines. Strip lines: Characteristic Impedance, conductor losses, Dielectric losses, Radiation Losses, Higher order modes and dispersion, Micro strip attenuation ,high frequency properties , suspended and inverted micro strip lines, coplanar lines, slot lines, Fin-lines, Coupled Lines. Substrates for microwave printed circuits

Unit III

Microwave (solid state) Amplifiers:

BJT and FET, Power gains: definitions, Stability: stability circles, tests for unconditional stability, Constant Power Gain Circles, Constant Mismatch Circles, Single stage and multi stage transistor Amplifier design, Broadband transistor Amplifier Design, Power amplifiers. Basic Noise theory, Low noise amplifier designs, Microwave amplifier designs using S-parameters.

Unit IV

Microwave oscillators and mixers:

RF oscillators, Microwave oscillators, Oscillators Phase Noise, Frequency Multipliers, Gunn oscillators and circuits, Transistor oscillators, Oscillator circuits and design.

Mixers: Mixer characteristics, linear and non-linear mixer operation, Mixer noise figure, Balanced mixers, Single ended diode mixer, single ended FET mixer, image reject mixers, other mixers, Mixer analysis using Harmonic Balancing.

Unit V

Microwave Filters:

Periodic structures: analysis, Filter design : image parameter and insertion loss method. specification of power loss ratio, Filter transformations, Filter Implementations, Stepped-Impedance low –pass filters, coupled line filters, Filters using coupled resonators, Impedance and Admittance inverters, micro strip half-wave filter, Quarter –wave coupled cavity filters, direct –coupled cavity filters, Low-Pass filter designs, Frequency transformations and expansions, Narrowband and wideband microwave filters.

References:

1. Collin: Foundations for Microwave Engineering, Wiley India.
2. Rizzi: Microwave Engineering- Passive Circuits, PHI Learning.
3. Pozar: Microwave Engineering, Wiley India.

4. Vendelin, Pavid and Rohde, Microwave Circuit Design, Wiley India.
5. Srivastava and Gupta: Microwave Devices and Circuit Design, PHI

Elective–III

EC-804(A) Principles of Management and Managerial Economics

Unit I

Management Concept: Management, Administration and Organization Difference and Relationship between Organization Management and Administration. Importance of Management, Characteristics of Management.

Unit II

Management: Scientific Management, Principles of Management, Process of Management, Functions of Management, Levels of Management, Project Management.

Unit III

Decision Making: Introduction and Definition, Types of Decisions, Techniques of Decision Making, Decision making under certainty Decision making under uncertainty, Decision Making under risk.

Unit IV

Managerial Economics: Introduction, Factors Influencing Manager, Micro and Macro-economics, Theory of the Cost, Theory of the Firm, Theory of Production Function.

Unit V

Productivity: Input-Output Analysis, Micro-economics Applied to Plants and Industrial Undertakings, Production and Production system, Productivity, Factors affecting Productivity, Increasing Productivity of Resources.

References:

1. Peter Drucker, Harper and Row: The Practice of Management.
2. Koontz: Essentials of Management, PHI Learning.
3. Staner: Management, PHI Learning.
4. Daft: Principles of Management, Cengage Learning.
5. T. N. Chhabra: Principle and Practice of Management, Dhanpat Rai, New Delhi.
6. Hirschey: Managerial Economics, Cengage Learning.
7. T. R. Banga and S.C. Sharma: Industrial Organisation and Engineering Economics, Khanna Publishers.
8. O.P. Khanna: Industrial Engineering and Management, Dhanpat Rai.
9. Joel Dean: Managerial Economics, PHI learning.
10. V. L. Mote, Samuel Paul and G.S. Gupta: Managerial Economics Concepts & Cases, TMH, New Delhi.
11. V. L. Mote: Managerial Economics, TMH, New Delhi.

Elective–III

EC-804(B) New (Introduction to Microcontrollers for Embedded systems)

UNIT-I: Introduction to Embedded systems
Embedded system overview and applications, features and architecture considerations-ROM, RAM, timers, data and address bus, Memory and I/O interfacing concepts, memory mapped I/O. CISC Vs RISC design philosophy, Von-Neumann Vs Harvard architecture, instruction set, instruction formats, and various addressing modes of 32-bit. Fixed point and floating point arithmetic operations. Introduction ARM architecture and Cortex – M series, Introduction to the Tiva family viz. TM4C123x & TM4C129x and its targeted applications, Tiva block diagram, address space, on-chip peripherals (analog and digital) Register sets, Addressing modes and instruction set basics.

UNIT-II: Microcontroller Fundamentals for Basic Programming
I/O pin multiplexing, pull up/down registers, GPIO control, Memory Mapped Peripherals, programming System registers, Watchdog Timer, need of low power for embedded systems, System Clocks and control, Hibernation Module on Tiva, Active vs Standby current consumption. Introduction to Interrupts, Interrupt vector table, interrupt programming. Case Study: Tiva based embedded system application bringing up the salient features of GPIO, Watchdog timer, etc.

UNIT- IIITimers, PWM and Mixed Signals Processing Timer, Basic Timer, Real Time Clock (RTC), Timing generation and measurements, Analog interfacing and data acquisition: ADC, Analog Comparators, DMA, Motion Control Peripherals: PWM Module & Quadrature Encoder Interface (QEI). Case Study: Tiva based embedded system application using ADC & PWM.

UNIT-IV Communication protocols and Interfacing with external devices
Synchronous/Asynchronous interfaces (like UART, SPI, I2C, USB), serial communication basics, baud rate concepts, Interfacing digital and analog external device, I2C protocol, SPI protocol & UART protocol. Implementing and programming I2C, SPI & UART interface using Tiva. CAN & USB interfaces on Tiva platform. Case Study: Tiva based embedded system application using the interface protocols for communication with external devices "Sensor Hub BoosterPack"

UNIT V Embedded networking and Internet of Things
Embedded Networking fundamentals, Ethernet, TCP/IP introduction IoT overview and architecture, Overview of wireless sensor networks and design examples. Various wireless protocols and its applications: NFC, ZigBee , Bluetooth, Bluetooth Low Energy, Wi-Fi. Adding Wi-Fi capability to the Microcontroller, Embedded Wi-Fi, User APIs for Wireless andNetworking applications Building IoT applications using CC3100 user API: connecting sensor devices using Tivaware sensor library. Case Study: Tiva based Embedded Networking Application: "Smart Plug with Remote Disconnect and Wi- Fi Connectivity"

Lab

1.Interfacing and programming GPIO ports in C using Tiva (blinking LEDs , push buttons)
2.Interrupt programming examples through GPIOs
3.Use Hibernation mode and wake on RTC interrupt
4.PWM generation using PWM Module on Tiva
5.Interfacing potentiometer with Tiva GPIO
6.PWM based Speed Control of Motor controlled by potentiometer connected to Tiva GPIO
7.Connect the Tiva to terminal on PC and echo back the data using UART
8.Interfacing an accelerometer with Tiva using I2C
9.Experiment on USB (Sending data back and forth across a bulk transfer-mode USB connection.)
10.Using IQmath Library for implementing Low pass FIR filter
11.Review of User APIs for TI CC3100 & Initialization and Setting of IP addresses
12.A basic Wi-Fi application – Communication between two Tiva based sensor nodes using TIVA sensor library in
TivaWare
13.Setting up the CC3100 as a HTTP server

TEXT Books:
1. John Davies, “MSP430 Microcontroller Basics”, Newnes, 1st Edition
2. Ajit Pal, “Microcontrollers Principles and applications”, PHI
3. B. Kanta Rao, “Embedded Systems”, PHI
4. Rajkamal, “Embedded Systems Architecture Programming and design”, McGraw Hill,

EC-805 Major Project-II

The student should prepare a working system or some design or understanding of a complex system
that he has selected from the previous semesters using system analysis tools and submit the same in
the form of a write-up i.e. detail project report. The student should maintain proper documentation of
different stages of project such as need analysis, market analysis, concept evaluation, requirement
specification, objectives, work plan, analysis, design, implementation and test plan wherever applicable.
Each student is required to prepare a project report based on the above points and present the same at
the final examination with a demonstration of the working system.

EC-806

Software Lab – III

Xilinx ISE (Integrated Software Environment) is a software tool produced by Xilinx for synthesis and analysis of HDL designs, enabling the developer to synthesize ("compile") their designs, perform timing analysis, examine RTL diagrams, simulate a design's reaction to different stimuli, and configure the target device with the programmer. The Web Edition is a free version of Xilinx ISE that can be downloaded at no charge. It provides synthesis and programming for a limited number of Xilinx devices. In particular, devices with a large number of I/O pins and large gate matrices are disabled. The low-cost Spartan family of FPGAs is fully supported by this edition, as well as the family of CPLDs, meaning small developers and educational institutions have no overheads from the cost of development software.

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