RAJIV GANDHI PROUDYOGIKI VISHWAVIDYALAYA BHOPAL

Credit Based Grading System

Electronics and Instrumentation Engineering, VIII-Semester

EI-8001 Digital Image Processing

UNIT-I

Fundamentals of Image Processing and Image Perception

Two-dimensional systems - linear systems and shift invariance. Fourier transform - Z - transform -Block matrices, Toeplitz and Kronecker product. Luminance, brightness and contrast. Color representation, color matching and reproduction, color vision model. Image sampling and quantization. Two dimensional sampling theory, reconstructions of images from its samples. Image acquisition.

UNIT-II

Image Enhancement Spatial Domain Techniques

Image negative, contrast stretching, gray level and bit plane slicing, power law transformation, histogram equalization and histogram specification, local enhancement techniques, image subtraction, averaging and logical operations. Spatial filtering: low pass, high pass and derivative filters, median filtering. Frequency domain filters: low pass, high pass and Butterworth filters.

UNIT-III

Image Restoration

Noise degradation model, estimation of degradation model. Restoration in presence of noise-spatial filtering, frequency domain filtering, inverse filter and least mean square error (Wiener) filtering.

UNIT-IV

Image Transforms

2D FFT and its properties. Walsh transform, Hadamard transform, discrete cosine transform, Haar transform, Slant transform, K L transform.

UNIT-V

Image Analysis

Feature extraction, spatial features, amplitude and histogram features, transform features, edge detection: gradient, compass Laplace, Sobel, Prewitt operators, stochastic gradients. Line and spot detection. Boundary extraction: connectivity and contour following.

TEXT BOOKS

1. Jain Anil K, *Fundamentals of Digital Image Processing*, Prentice Hall, 1996.
2. B. Chanda, D. Majumder, *Digital Image Processing and Analysis*, PHI, 2011.

REFERENCES

1. Gonzalez Rafel C, Wintz Paul, *Digital Image Processing*, Addison Wesley, 1987.
2. Pratt William K, *Digital Image Processing*, John Wiley and Sons, 2006.

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Electronics and Instrumentation Engineering, VIII-Semester

EI-8002 Embedded Systems

UNIT-I

Introduction to Embedded Systems:

Definition of embedded system, embedded systems vs. general computing systems, history of embedded systems, classification, majorapplication areas, purpose of embedded systems, characteristics and quality attributes of embedded systems, common design metrics, and processor technology: general purpose processor, application specific processor, single purpose processor.

UNIT-II

Embedded System Architecture:

Von Neumann v/s Harvard architecture, instruction set architecture, CISC and RISC instructions set architecture, basic embedded processor, microcontroller architecture, CISC & RISC examples: 8051, ARM, DSP processors.

UNIT-III

Input Output and Peripheral Devices

Timers and counters, watchdog timers, interrupt controllers, PWM, keyboard controller, analog to digital converters, real time clock. Introduction to communication protocols: basic terminologies, concepts, serial protocol: I2C, CAN, firewire, USB. Parallel protocols: PCI bus, IrDA, bluetooth, IEEE 802.11, wireless protocols.

UNIT-IV

Memory System Architecture

Caches, virtual memory, MMU, address translation, memory and interfacing, memory write ability and storage performance. Memory types, composing memory – advance RAM interfacing, microprocessor interfacing I/O addressing, interrupts, direct memory access, arbitration multilevel bus architecture.

UNIT-V

Embedded System Supporting Technologies

Difference between normal OS and RTOS, scheduling algorithms. Case study: Tiny OS, VxWorks, QNX. Overview of VLSI technology, introduction to device drivers. Case studies: washing machine, air-conditioning, auto focus camera.

TEXT BOOKS

1. F Vahid, T Giogarvis, *Embedded systems: A unified hardware/software approach*, Wiley, 1999.
2. Raj Kamal, *Embedded Systems Introduction*, 2nd Ed., TMH publication, 2015.

REFERENCES

1. David E Simons, *An Embedded Software Primer*, Pearson, 1999.

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Credit Based Grading System

Electronics and Instrumentation Engineering, VIII-Semester

Elective-V EI-8003 (1) DATA COMMUNICATION & COMPUTER NETWORKS

Unit-1.

Introduction to computer network: Network uses, Hardware and software .Types of network .Structure and architecture. Seven layers OSI reference model & TCP-IP reference model. Services and interfaces. Circuit switching, packet switching and hybrid switching.

Unit-2.

Data transmission and its types, Wireless transmission, Characteristic, Capacity Speed & Delay of transmission, Bandwidth, Data rate, Throughput serial and parallel communication, Synchronous and Asynchronous communication. Simplex and Duplex communication.

Unit-3.

Physical layer: Transmission media, Terminals modems. Digital transmission, switching methods. Multiplexing, Medium access sub layers, Local area networks protocols. IEEE standards 802.3, 802.4 & 802.5.

Unit-4.

Data link layer & network layer .Design issues. Elementary data link protocol, Sliding window protocol. Routing algorithms. Traffic monitoring, Bridge and gateways. ATM.

Unit-5.

Design and Performance issues and protocols of Transport layer, Session layer, Presentation layer & Application layer. DNS, SNMP (Simple network management protocol) .Network security.

BOOKS AND REFERENCES RECOMMENDED:

1.Tanenbaum A S., Computer networks, 4th Edition, Pearson Education
2. Martin James, Computer Network & Distributed processing, Pearson Education .
3. Gallo, Hancock, Computer Communications and Networking Technologies.
4. Behrouz A. Forouzen, Data communication and Networking.

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Electronics and Instrumentation Engineering, VIII-Semester

Elective-V EI-8003 (2) ADVANCE INDUSTRIAL ELECTRONICS

Unit-I
Introduction to modern power conductor devices: Gate turn off thyristor (GTO), Insulated Gate Bipolar Junction Transistor (IGBT), Power BJT, Power MOSFET, MOS controlled thyristor (MCT), Reverse conducting thyristor (RCT), Smart Power Devices (Power ICs) Rating, Static and dynamic characteristics, Safe operating areas, Protections of devices, Devices selection.

Unit-II
DC to DC conversion, Buck Boost and Buck Boost converters (Circuit Configuration and analysis with different types of loads) Power factor, Harmonics and effect of source inductance in converter circuits. Resonant DC, DC converters. Switched mode power supply (SMPS).

Unit-III
Concept of PWM in converters, Unity power factor converters, Voltage source inverters (VSI), Current source inverters (CSI). Application of VSI and CSI in induction motor control.

Unit-IV
Non Drive applications of power electronics inverters, Uninterrupted power supply (UPS), Induction heating, Metal cutting, Active power line conditioning.

Unit-V
Vector controlled and slip power controlled induction motor drives, Application of microprocessor, Micro controllers and DSP in Machine drives.\

References :

- MH Rashid, Power Elex, PHI
- J.G. Kassakian, MF Schlecht and G.C. Verghese "Principle of Power Electronics", Reading, MA, Addison Wesley.
- Dubey G.K., " Power Semiconductor Controlled Drives", Engle Wood Cliffe NJ, Prentice Hall.
- DC Griffith, " Uninterruptible power supply", Marcell Dekker, NY.
- P. Vas, "Vector control of AC motors", Oxford Press.

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Electronics and Instrumentation Engineering, VIII-Semester

Elective-V EI-8003 (3) DIGITAL SYSTEM DESIGN

Unit-1.
Design of Combinational Circuit Building Blocks: Synthesis of logic functions using Multiplexers, Demultiplexers, Binary encoders, Shift registers, Synchronous and Asynchronous Counters.

Unit-2.
Top down Approach to Design, Case Study, Data path, Control Path, Controller behavior and Design, Mealy and Moore Machines, Timing of sequential circuits,Pipeling, Resource sharing.

Unit.3.
Basis concepts of hardware descriptive languages(HDLs), Syntax and Semantics of VHDL, Variable and Signal types, arrays and attributes, Operators, expressions and signal assignments, simulation cycles, delay models, Structural, Data-flow and Behavioral styles of HDL, Examples of design using VHDL.

Unit.4.
Overview of PLDs, Introduction to FPGA, Logic Block Architecture, Routing Architecture, Programmable

Interconnections, Design Flow. Xilinx Spartan Architecture, Xilinx Vertex Architecture.

Unit-5
Testing of logic circuits: Difference between Verification and Testing, Need of Testing Fault models, BIST, JTAG Interface

Books & References Recommended:

1. Digital Logic: Applications and Design, John M. Yarbrousgh, Thomson Learning.

2. Digitla System Design using VHDL Third Edition, Charles H Roath,Thomson Learning .

3. VHDL Primer – J Bhasker – Pearson Education.

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Electronics and Instrumentation Engineering, VIII-Semester

Elective-VI EI-8004 (1) OPERATING SYSTEM

Unit1:
Introduction to operating systems: functions, evolution, different types: batch, interactive, timesharing,multitasking, network, distributed, multiprocessor and real-time. Desirable characteristics and features of anoperating system. Operating systems services: types of services, different ways of providing these services:utility programs, system calls.

Unit2:
File systems: file concept, user's and system programmer's view of file system. Disk organization: tapeorganization. Different Modules of a file system. Disk-space allocation methods : contiguous, linked, indexed.Directory structures. File protection. System calls for file management. Disk scheduling algorithms. Casestudies MSDOS, UNIX, Windows, Linux etc.

Unit3:
Processes and threads: process concept, scheduling concepts, types of schedulers, process state diagram,scheduling algorithms, algorithm evaluation. System calls for process management. Multiple processorscheduling. Threads, threads v/s processes, advantages of threads, implementation of threads: ULT and KLT.Deadlocks: problem, characterization, prevention, avoidance, recovery. Process synchronization: concurrentprocesses, mutual exclusion, synchronization, inter process communication, critical sections, locks,synchronization hardware, semaphores. Classic problems of synchronization: producer consumer problem,dining philosopher's problem, reader and writer's problem, monitors. Case studies Windows, Linux, Solarisetc.

Unit4:
Memory management: Different memory management techniques: partitioning, swapping, segmentation, paging, segmented paging and paged segmentation, comparison of these techniques. Techniques for supporting the execution of large programs: overlays, dynamic linking and loading. Virtual memory:concept, implementation by demand paging. Case studies of Linux, Solaris, Windows etc.

Unit5:
Input/Output, protection and security: principles and programming I/O, input/output problem, asynchronous operation, speed gap, format conversion, I/O interfaces. Program controlled I/O, interrupt driven I/O, concurrent I/O. Protection and security in operating systems.

Text Books
1. Abraham Silberschatz, Peter Galvin, and Greg Gagne, "Operating System Concepts", Eighth Edition, John Wiley & Sons.
2. William Stallings, "Operating Systems", 7th Edition, Prentice Hall.
3. Andrew Tannenbaum, "Modern Operating Systems", 3nd Edition, Prentice Hall.

Reference Books
1. Gary Nutt, "Operating Systems", 3rd Edition, Addison-Wesley.
2. Deitel, "Operating Systems", 2nd Edition , Addison-Wesley.

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Credit Based Grading System

Electronics and Instrumentation Engineering, VIII-Semester

Elective-VI EI-8004 (2) WIRELESS SENSOR NETWORKS

Unit 1

Review of Cellular Networks

Mobile telephony, GSM, CDMA, Universal Mobile Telecommunication System (UMTS). Advancement and migrations. WLAN- PHY Layer and MAC Layer-IEEE 802.11, HIPERLAN, Wireless ATM

Unit 2

LTE systems

LTE & LTE-A, E-UTRAN architecture-Mobility and resource management, services, UTRAN-Architecture , HSDPA, HSUPA. Introduction to OFDM and various types of MIMO systems

Unit 3

Wireless Sensor Networks

Wireless sensor Network- Architecture, Applications, Technology for sensor nodes & networks, operating environment, MAC, Routing and Transport protocols for WSN

Unit 4

Wireless routing Protocols

Mobile network layer-Mobile IP, Data forwarding procedure in Mobile IP (IPv4 and IPv6), Mobility management, Mobile transport layer- Traditional TCP and mobile TCP, Indirect TCP

Unit 5

Internet of things (IoT) and GPS systems

IoT architecture, Main design principles and needed capabilities, IoT Devices and gateways, IoT Local and wide area networking, IEEE 802.15 WPAN, Bluetooth-pico net, scatter net, Protocol stack, Interface between 802.11 and Bluetooth. Geolocation service techniques and standards. Introduction to GPS-aided GEO augmented navigation (GAGAN), E.911, ZigBee, UWB and RFID

Text Books:

1. Kaveh Pahlavan, Prashant Krishnamoorthy – *Principle of wireless networks- A united approach*- Pearson Education, 2002
2. Vijay K. Garg – *Wireless communication and networking* – Morgan-Kaufmann series in networking- Elsevier publication
3. Feng Zhao and Leonidas Guibas – *Wireless Sensor Networks, An information processing approach* - Morgan Kaufmann publication

Reference Books:

1. Kazem Sohraby, Daniel Minoli and TaiebZnati- *Wireless Sensor Networks: Technology, Protocols and Applications* -Wiley publication
2. Jan Holler, VlasiosTsiatsis, Catherine Mulligan, Stefan Avesand, Stamatis Karnouskos, David Boyle, "*From Machine-to-Machine to the Internet of Things: Introduction to a New Age of Intelligence*", 1st Edition, Academic Press, 2014.
3. Ramji Prasad "*OFDM for wireless communication*"
4. Steve Rackley "*Wireless Networking Technology*"

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Electronics and Instrumentation Engineering, VIII-Semester

Elective-VI EI-8004 (3) STANDARDS & CALIBERATION

UNIT1:
Testing & Calibration of measurement setup: Dynamic Characteristics: Dynamic response; Transient response; speed of response, fidelity, measuring lag etc.

UNIT2:
Linear approximation, compensation techniques. Significance of testing and calibration, Calibration curve, Standards for calibration,

UNIT3:
Different calibration procedures-primary, secondary, direct, indirect, routine calibration, Calibration setup:-pressure gauge, level etc. Calibration of Ammeter, Voltmeter and Wattmeter, Energy meter.

UNIT4:
Analysis of Errors: Definition; Types of errors; Calculation methods of different errors; Gaussian curve; Precision Index; Variance; Standard deviation; Uncertainty in measurement, Chi-Square Test

UNIT5:
Curve fitting methods. Galvanometers: D'Arsonaval Galvanometer— construction, Torque equation, Dynamic characteristic, Balastic Galvanometer