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## Other university B.E./B.Tech - G EEE Level 3 syllabus

### Probability Theory and Stochastic Processes

#### EC113 Probability Theory and Stochastic Processes

#### 3 Credits

1. Sets and set operations; Probability space; Conditional probability and Bayes theorem; Combinatorial probability and sampling models.
2. Discrete random variables, probability mass function, probability distribution function, example random variables and distributions; Continuous random variables, probability density function, probability distribution function, example distributions;
3. Joint distributions, functions of one and two random variables, moments of random variables; Conditional distribution, densities and moments; Characteristic functions of a random variable; Markov, Chebyshev and Chernoff bounds.
4. Random sequences and modes of convergence (everywhere, almost everywhere, probability, distribution and mean square); Limit theorems; Strong and weak laws of large numbers, central limit theorem.
5. Random process. Stationary processes. Mean and covariance functions. Ergodicity. Transmission of random process through LTI. Power spectral density, Markov chain and Markov processes.

#### Sl. No. Name of Authors / Books /Publishers

- 1 "Probability and Random Processes with Applications to Signal Processing," H. Stark and J. Woods, Third Edition, Pearson Education
- 2 "Probability, Random Variables and Stochastic Processes", A.Papoulis and S. Unnikrishnan Pillai, Fourth Edition, McGraw Hill.
- 3 "Introduction to Probability Theory with Stochastic Processes", K. L. Chung, Springer International

# **Microprocessors and Microcontrollers**

## **EC110 Microprocessors and Microcontrollers**

### **3 Credits**

1 Introduction to Microprocessor Systems: Architecture and Pin diagram of 8085, Timing Diagram, Memory organization, Addressing modes, Interrupts. Assembly Language Programming, 8085 interrupts, Additional I/O concepts and processes.

2 Interfacing of 8085 with 8255, 8254/ 8253, 8251, 8259: Introduction, Generation of I/O Ports, Programmable Peripheral Interface (PPI)-Intel 8255, Sample-and- Hold Circuit and Multiplexer, Keyboard and Display Interface, Keyboard and Display Controller (8279), Programmable Interval timers (Intel 8253/8254), USART (8251), PIC (8259), DAC, ADC, LCD, Stepper Motor.

3 Introduction to 8086, 80286, 80386 and 80486 Microprocessor: 8086 Architecture, Generation of physical address, Pin diagram of 8086, Minimum Mode and Maximum mode, Bus cycle, Memory Organization, Memory Interfacing, Addressing Modes, Assembler Directives, Instruction set of 8086, Assembly Language Programming, Hardware and Software Interrupts. Introduction of 80286, 80386, and 80486 microprocessor

4 Overview of Microcontroller 8051: Introduction to 8051 Microcontroller, Architecture, Memory organization, Special function registers, Port Operation, Memory Interfacing, I/O Interfacing, Programming 8051 resources, interrupts, Programmer's model of 8051, Operand types, Operand addressing, Data transfer instructions, Arithmetic instructions, Logic instructions, Control transfer instructions, Timer and Counter Programming, Interrupt Programming.

### **Name of Authors / Books /Publishers**

1 "Microprocessors and Microcontrollers", Muhammad Ali Mazidi, Pearson, 2006

2 "Microprocessors and Interfacing, Programming and Hardware", Douglas V Hall, Tata McGraw Hill, 2006

3 "MicroProcessor Architecture, Programming and Applications with the 8085", Ramesh Gaonkar, PHI

4 "The 8051 Microcontroller and Embedded Systems", Muhammad Ali Mazidi, Janice Gillispie Mazidi, Rolin D. MCKinlay, 2nd Edition,

Pearson Education, 2008

5 "The 8086 Microprocessor: Programming and Interfacing The PC", Kenneth J. Ayala, Delmar Publishers, 2007

6 "Advanced Microprocessors and Peripherals", A K Ray, K M Bhurchandi, Tata McGraw Hill, 2007

## **Computer Networks and Security**

### **EC114 Computer Networks and Security**

#### **3 Credits**

1 Data communication Components : Representation of data and its flow Networks , Various Connection Topology, Protocols and Standards, OSI model, Transmission Media, LAN: Wired LAN, Wireless LANs, Connecting LAN and Virtual LAN, Techniques for Bandwidth utilization: Multiplexing - Frequency division, Time division and Wave division, Concepts on spread spectrum

2 Data Link Layer and Medium Access Sub Layer : Error Detection and Error Correction Fundamentals, Block coding, Hamming Distance, CRC; Flow Control and Error control protocols - Stop and Wait, Go back - N ARQ, Se- lective Repeat ARQ, Sliding Window, Piggybacking, Random Access, Multiple access protocols -Pure ALOHA, Slotted ALOHA, CSMA/CD,CDMA/CA

3 Network Layer : Switching, Logical addressing - IPv4, IPv6; Address mapping -ARP, RARP, BOOTP and DHCP-Delivery, Forwarding and Unicast Routing protocols. Transport Layer: Process to Process Communication, User Datagram Protocol (UDP), Transmission Control Protocol (TCP), SCTP Congestion Control; Quality of Service, QoS improving techniques: Leaky Bucket and Token Bucket algorithm.

4 Application Layer: Domain Name Space (DNS), DDNS, TELNET, EMAIL, File Transfer Protocol (FTP), WWW, HTTP, SNMP, Bluetooth, Firewalls, Basic concepts of Cryptography

5 Network Security: Passive and Active Attacks, Symmetric Encryption, Encryption Algorithms, Key Distribution, Traffic Padding, Message Authen- tication, Hash function, Secure Hash function, Public-key Encryption, Digital Signature, RSA Public Key Encryption algorithm, Key Management, Secure Socket Layer and Transport layer Security, SSL Architecture, SSL Record Pro- tocol, Change

Cipher Spec Protocol, Alert Protocol, handshake Protocol, IP level security IPSEC, Application layer security PGP, Firewall, Virtual Private Networks.

### **Name of Authors / Books /Publishers**

- 1 "Data Communication and Networking", 4th Edition, Behrouz A. Forouzan, McGraw-Hill
- 2 "Data and Computer Communication", 8th Edition, William Stallings, Pearson Prentice Hall India
- 3 "Computer Networks", 8th Edition, Andrew S. Tanenbaum, Pearson New International Edition.
- 4 "Internetworking with TCP/IP", Volume 1, 6th Edition Douglas Comer, Prentice Hall of India.
- 5 "TCP/IP Illustrated", Volume 1, W. Richard Stevens, Addison-Wesley, United States of America
- 6 "Network Security Bible", by Cole, Krutz and Conley, Wiley dreamtech

## **Power Electronics**

### **Power Electronics**

**Credits - 03**

#### **Module 1: Power switching devices**

Diode, Thyristor, MOSFET, IGBT: I-V Characteristics; Firing circuit for thyristor; Voltage and current commutation of a thyristor; Gate drive circuits for MOSFET and IGBT.

#### **Module 2: Thyristor rectifiers**

Single-phase half-wave and full-wave rectifiers, Single-phase full-bridge thyristor rectifier with R- load and highly inductive load; Three-phase full-bridge thyristor rectifier with R-load and highly inductive load; Input current wave shape and power factor.

#### **Module 3: DC-DC buck converter**

Elementary chopper with an active switch and diode, concepts of duty ratio and average voltage, power circuit of a buck converter, analysis and waveforms at steady state, duty ratio control of output voltage.

#### **Module 4: DC-DC boost converter**

Power circuit of a boost converter, analysis and waveforms at steady state, relation between duty ratio and average output voltage.

#### **Module 5: Single-phase voltage source inverter**

Power circuit of single-phase voltage source inverter, switch states and instantaneous output voltage, square wave operation of the inverter, concept of average voltage over a switching cycle, bipolar sinusoidal modulation and unipolar sinusoidal modulation, modulation index and output voltage

#### **Module 6: Three-phase voltage source inverter**

Power circuit of a three-phase voltage source inverter, switch states, instantaneous output voltages, average output voltages over a sub-cycle, three-phase sinusoidal modulation

#### **Module 7: A.C. to A.C. Converter**

Classification, principle of operation of step up and step down cyclo-converter, single phase to single phase cyclo-converter with resistive and inductive load, three phase to single phase cyclo-converter, half wave and full wave, cosine wave crossing technique. three phase to three phase cyclo-converter. output voltage equation of cyclo-converter.

#### **Text/References:**

1. M. H. Rashid, "Power electronics: circuits, devices, and applications", Pearson Education India, 2009.
2. N. Mohan and T. M. Undeland, "Power Electronics: Converters, Applications and Design", John Wiley & Sons, 2007.
3. R. W. Erickson and D. Maksimovic, "Fundamentals of Power Electronics", Springer Science & Business Media, 2007.
4. L. Umanand, "Power Electronics: Essentials and Applications", Wiley India, 2009.

## **Microwave Engineering**

### **MICROWAVE ENGINEERING**

**Rectangular & circular waveguides:** Introduction to microwave communication and EM spectrum, Rectangular wave guide: Field Components, TE, TM Modes, Dominant TE<sub>10</sub> mode, Field Distribution,

Power, Attenuation. Circular waveguides: TE, TM modes. Wave velocities,  
Microstrip transmission line (TL), Coupled TL, Strip TL, Coupled strip line,  
Coplanar TL, Microwave cavities

**Passive microwave devices:** Scattering matrix, Passive microwave devices:

Microwave hybrid circuits, Terminations, Attenuators, Phase Shifters, Directional couplers: Two-hole directional couplers, S- Matrix of a directional coupler, Hybrid couplers, Microwave propagation in ferrites,  
Faraday rotation, Isolators, Circulators. S-parameter analysis of all components.

**Microwave tubes :** Microwave tubes: Limitations of conventional active devices at microwave frequency, Two cavity Klystron, Reflex Klystron, Magnetron, Traveling wave tube, Backward wave oscillators, Gyro Devices: Their schematic, Principle of operation, Performance characteristic and their applications.

**Solid state amplifiers and oscillators:** Transferred electron devices: Gunn-effect diodes & modes of operation. Avalanche transit - time devices: IMPATT diode, TRAPPAT diode, BARITT diode.

**Microwave Measurements:** VSWR meter, Frequency meter, Spectrum analyser, Network analyser, Tunable detector, Slotted line carriage, Power meter, Microwave power measurement, Insertion loss and attenuation measurement, VSWR measurement, Return loss measurement by a reflectometer, Frequency measurement, measurement of cavity Q, Dielectric constant measurement of a solid, EM radiation & measurement.

**Cyber Security**

**Cyber Security**

**Introduction-** Introduction to Information Systems, Types of Information Systems, Development of Information Systems, Introduction to Information Security, Need for Information Security, Threats to Information Systems, Information Assurance, Cyber Security, and Security Risk Analysis.

**Application Security-** (Database, E-mail and Internet), Data Security Considerations-Backups, Archival Storage and Disposal of Data, Security Technology-Firewall and VPNs, Intrusion Detection, Access Control. Security Threats -Viruses, Worms, Trojan Horse, Bombs, Trapdoors, Spoofs, E-mail Viruses, Macro Viruses, Malicious Software, Network and Denial of Services Attack, Security Threats to E-Commerce- Electronic Payment System, e- Cash, Credit/Debit Cards. Digital Signature, Public Key Cryptography

**Developing Secure Information Systems-** Application Development Security, Information Security Governance & Risk Management, Security Architecture & Design Security Issues in Hardware, Data Storage & Downloadable Devices, Physical Security of IT Assets, Access Control, CCTV and Intrusion Detection Systems, Backup Security Measures.

**Security Policies-** Development of Policies, WWW Policies, Email Security Policies, Policy Review Process-Corporate Policies-Sample Security Policies, Publishing and Notification Requirement of the Policies. Evolving Technology Security - Mobile, Cloud, Outsourcing, SCM.

**Information Security Standards-**ISO, IT Act, Copyright Act, Patent Law, IPR. Cyber Laws in India; IT Act 2000 Provisions, Intellectual Property Law: Copy Right Law, Software License, Semiconductor Law and Patent Law.

# Micro-controller for Embedded Systems

## REC602 MICROCONTROLLER FOR EMBEDDED SYSTEMS

**I** Introduction , Microcontrollers and Embedded systems, Overview of the 8051,

Inside the 8051, Addressing modes, assembly programming, 8051 data types and

directives, Interfacing with 8051, Programming the 8051 timers

**II** MSP430x5x series block diagram, address space, on-chip peripherals (analog and digital), and Register sets. Instruction set, instruction formats, and various

addressing modes of 16-bit microcontroller; Sample embedded system on MSP430

microcontroller. Memory Mapped Peripherals, programming System registers, I/O

pin multiplexing, pull up/down registers, GPIO control. Interrupts and interrupt programming.

**III** Watch dog timer, system clocks, Timer & Real Time Clock (RTC), PWM control,

timing generation and measurements. Analog interfacing and data acquisition ADC

and Comparator in MSP430, data transfer using DMA.

**IV** Serial communication basics, Synchronous/Asynchronous interfaces (like UART,

USB, SPI, and I2C). UART protocol, I2C protocol, SPI protocol.

Implementing

and programming UART, I2C, SPI interface using MSP430,

Interfacing external devices.

**V** Internet of Things (IoT) overview and architecture, Overview of wireless sensor

networks and design examples. Various wireless connectivity: NFC, ZigBee,

Bluetooth, Bluetooth Low Energy, Wi-Fi. Adding Wi-Fi capability to the



Microcontroller, Embedded Wi-Fi, User APIs for Wireless and Networking applications, Building IoT applications using CC3100 user API for connecting sensors.

### **Text Book:**

1. Mazidi Ali Muhammad, Mazidi Gillispie Janice, and McKinlay Rolin D " The 8051 Microcontroller and Embedded Systems using Assembly and C", Pearson Publication.
2. John H Davies, "MSP430 Microcontroller Basics" Newnes Publication.

### **Reference Book:**

1. TI MSP430x5xx and MSP430x6xx Family User's Guide.

## **Digital Communication**

### **EC115 Digital Communication**

#### **3 Credits**

**1 Introduction:** Block Diagram of Digital Communication System, Advantages of Digital communication system over Analog communication systems, Sampling theorem, Signal reconstruction in time domain, Practical and Flat Top Sampling, Sampling of Band-pass Signal, Aliasing Problem, Uniform and Non-uniform quantization. Signal to Quantization ratio of Quantized Signal.

**2 Baseband Transmission:** Line Coding and its properties, Various types of PCM waveforms. Attributes of PCM waveforms, Mary Pulse Modulation waveforms, Differential Pulse Code Modulation, Multiplexing of PCM signals, Delta modulation, Idling noise and slope overload, Adaptive Delta Modulation, Adaptive DPCM, Comparison of PCM and DM

**3 Baseband Detection:** Error performance degradation in communication systems,  $E_b/N_0$  parameter, Matched filter and its derivation, Inter-Symbol Interference (ISI), Nyquist criterion for zero ISI and raised cosine spectrum, Correlation detector : Decision threshold and Error probability for Binary, Unipolar (on-off ) signalling

**4 Band-pass Modulation and Demodulation:** Types of digital modulation, Waveforms for Amplitude, Frequency and Phase Shift

Keying, Method of generation and detection of coherent and non-coherent binary ASK, FSK and PSK, Differential phase shift keying, Quadrature modulation techniques, M-ary FSK, Minimum Shift Keying (MSK), Probability of error and comparison of various digital modulation techniques

**5 Error:** A base band signal receiver, Probability of error, The Optimum filter, Matched Filter, Probability of error in Matched filter, Coherent reception, Coherent reception of ASK, PSK and FSK, Non-Coherent reception of ASK, FSK, PSK and QPSK, Calculation of bit error probability of BPSK and BFSK, Error probability for QPSK

**6 Multiple Access Techniques:** Time division multiplexing, Frequency division multiplexing, Code division multiplexing, Introduction to upcoming techniques of transmission

**Sl. No. Name of Authors / Books /Publishers**

1. "Communication Systems", Simon Haykin, Wiley publication, 4th Edition, 2004
2. "Digital Communication Fundamentals and Applications", Bernard Sklar, Pearson Education India, 2nd Edition, 2009
3. "Modern Electronic Communication", Miller Gary M, Prentice-Hall, 6th Edition, 1999
4. "Digital Communications", John Proakis, Tata Mc Graw Hill, 5th Edition, 2007
5. "Electronic Communication Systems, Fundamentals Through Advanced", Wayne Toms, Pearson Education, 4th Edition, 2001