ANALOG COMMUNICATION---EC51

1. Amplitude modulation: Introduction. Amplitude modulation: Time-Domain description, Frequency-Domain description. Generation of AM wave: square law modulator, switching modulator. Detection of AM waves: square law detector, envelope detector. Double side band suppressed carrier modulation (DSBSC): Time -Domain description, Frequency-Domain representation. Generation of DSBSC waves: balanced modulator, ring modulator. Coherent detection of DSBSC modulated waves. Costas loop. Quadrature carrier multiplexing, Hilbert transform, Properties of Hilbert transform, Pre-envelope, Canonical representation of band pass signals, Single side band modulation, Frequency-Domain description of SSB modulated signals, Frequency discrimination method for generating an SSB modulated wave, Time-Domain description. Phase discrimination method for generating an SSB modulated wave. Demodulation of SSB wave. Vestigial side band modulation, Frequency-Domain description, Generation of VSB modulated wave, Time domain description, Envelop detection of VSB wave plus carrier, Comparison of amplitude modulation techniques, Frequency translation, Frequency division multiplexing. Application: Radio broad casting, AM radio, Television, Color television, High-definition television.
Ch. 2, 2.10 to 2.12, 3Text 1, Ch.7 section, 7.1 to 7.9 Text 2) 20 Hrs.

2. Angle modulation: Basic definitions, frequency modulation, narrow band frequency modulation, wide band frequency modulation, transmission band width of FM waves, generation of FM Waves: indirect FM and direct FM, Demodulation of FM Waves, FM stereo multiplexing, Phase-locked loop, Nonlinear model the phase-locked loop. Linear model of phase-locked loop. Nonlinear effects in FM systems. (Ch 7, 7.10 to7.12, Text 2) 11 Hrs.

3. Random processes: Introduction, Probability theory: Relative-frequency approach Axioms of probability, Conditional probability. Random variables: Several random variables. Statistical averages: Function of Random variables, moments. Random Process Stationary. Mean, Correlation and Covariance functions: Properties of the autocorrelation function, Cross-correlation functions. Power spectral density: Properties of the spectral density. Gaussian Process: Central limit theorem, Properties of Gaussian process. (Chapter 4, 4.1 to 4.4, 4.6 to 4.8,4.11,4.12, Text 1) 06 Hrs

4. Noise: Introduction, Shot noise, thermal noise, White noise, Noise equivalent bandwidth, Narrowband noise, Noise figure, Equivalent noise temperature, Cascade connection of two-port networks.
06 Hrs

5. Noise in Continuous wave modulation Systems: Introduction, Receiver model, Noise in DSB-SC receivers, Noise in SSB receivers, Noise in AM Receivers, Threshold effect, Noise in FM receivers, FM threshold effect, Pre-emphasis and De-emphasis in FM, Summery and discussion. (Chapter 5,Section 5.1 to 5.8,Text 1) 09 Hrs

Text Books:

1. Communication Systems - Simon Haykin, 3e John Wiley, 1996.
2. An Introduction to Analog & Digital Communications - Simon Haykin, John Wiley 2003.

Reference Books*:*

1. Communication Systems - Harold. P.E, Stern Samy. A. Mahmond, Pearson Education, 2004.
2. Communication Systems - A. Bruce Carlson, Paul. B. Crilly, Janet.C. Ruteledge, 4e, MGH
3. Principle of Communication - Rodger. E. Ziemer, William. H. Tranter, 5e, John Wiley.

DIGITAL SIGNAL PROCESSING (EC/TC)

Subject Code: EC52 **Total Hrs: 52** **Exam Marks: 100**

1. The Discrete Fourier Transform: Its Properties And Applications 15 Hrs

Frequency Domain Sampling: The Discrete Fourier Transform Frequency-Domain Sampling and Reconstruction of Discrete-Time Signals. The Discrete Fourier Transform (DFT). The DFT as a linear Transformation. Relationship of the DFT to Other Transforms. Properties of the DFT. Periodicity, Linearity, and Symmetry Properties.

Multiplication of two DFTs and Circular Convolution. Additional DFT Properties.

Frequency analysis of signals using the DFT. (Text 1, Chapter 5, 5.1 to 5.4)

2. Efficient Computation of DFT: Fast Fourier Transform Algorithms 11 Hrs

Efficient Computation of the DFT: FFT Algorithms, Direct Computation of the DFT. Radix-2 FFT algorithms. Decimation-in-time FFT algorithm and in-place computations, Decimation-in-frequency FFT algorithm and in-place computations, Chirp Z-Transform, Gortezel Algorithm.

(Text 1, Chapter 6, 6.1.1, 6.1.3,6.2.1,6.2.2,6.3.1,6.3.2)

3. Frequency Transformations. 05 Hrs

Frequency Transformations in the Analog domain. Frequency Transformations in the digital domain. (Text 1,Chapter 8, 8.4.1 to 8.4.2)

4. Design of Digital Filters 16 Hrs

FIR Filter Design : Properties of FIR digital filters, Different types of windows;

Rectangular, Bartlett, Hanning, Hamming, Blackmann & Kaiser windows, Design of FIR filters using above windows, Frequency sampling design, Equiripple filter design (qualitative treatment only), A comparison of IIR & FIR digital filters.

Symmetric and Anti-symmetric FIR Filters: Design of Linear-Phase FIR Filters Using Windows. Design of Linear-Phase FIR Filters by the Frequency Sampling Method

Design of FIR Differentiators. Design of Hilbert Transformers. (Text 1,Chapter 8, 8.2.1 to 8.2.6)

Design of IIR Filters from Analog Filters IIR Filter Design by Approximation of Derivatives IIR Filter Design by Impulse Invariance. IIR Filter Design by the Bilinear Transformation. The Matched—Transformation. Characteristics of Commonly Used Analog Filters. Application of above technique to the design of Butterworth & Chebyshev filters. (Text 1,Chapter 8, 8.3.1 to 8.3.6)

5. Digital Filter Structures 05 Hrs

Basic IIR Filter Structures: Direct forms (I & II), cascade and parallel realizations. signal flow graph ,Transposed structure , Basic FIR filter structures-. Direct form structure ,frequency sampling structure , Lattice structure ,Linear phase FIR structure . FIR structures.

(Text 1, Chapter 6.0 to 6.5)

***Text books*:**

1. Digital Signal Processing - Principles algorithm and application, 3e, Proakis and Manolakis Pearson/PHI, 2003.
2. Discrete Time Signal Processing, Oppenheim And Schaffer, Pearson/PHI, 2003

Reference Books

1. Digital Signal Processing - Sanjit K. Mitra, 2e, TMH, 2001
2. Modern Digital Signal Processing – Roberto Cristi, Thomson Learning, 2004

TRANSMISSION LINES AND WAVE GUIDES (EC/TC)

Subject Code: EC/TC53 **Total Hrs: 52** **Exam Marks: 100**

1. Transmission – Line Theory 10 Hrs

The transmission Line general solution, The distortion less Line, The telephone cable, Reflection on a Line not terminated in Z_0, Open and short circuited Lines, Reflection loss, Insertion loss, T and PI sections equivalent to Lines, Constant K LPF & HPF

Text-1, Chapter 6, Section 6.1 to 6.3,6.7,6.8,6.10,6.14 to 6.17, Chapter 4, Section 4.8,4.9

2. The Line at radio frequencies 25 Hrs

Parameters of open wire Line at high frequencies, parameters of the coaxial Line at high frequencies, Constants for the Line of zero dissipation, Standing waves; nodes; standing wave ratio, Input impedance of open and short circuited Lines, The quarter wave Line; impedance matching, The exponential Line for impedance transformation, single stub impedance matching on a Line, The smith circle diagram, Application of the Smith chart, Double stub impedance, Open and Short circuit impedances when considering dissipation, Quarter and Half wave Lines of small dissipation, The tapped voltage step up on the resonant Line, Q of a Line as a circuit element; bandwidth, Optimum design of the open wire resonant Line, design considerations for the coaxial Line

Text-1, Chapter 7, 7.1 to 7.8, 7.12 to 7.15, 7.18, 7.19, 7.21, 7.24 to 7.30

3. Guided waves 06 Hrs

Applications of restrictions to Maxwell's equation, types of propagation; TM, TE and TEM, Transmission of TM,TE and TEM waves in parallel planes.

Text-1, Chapter11, 11.1 11.2, 11.3 to11.5.

4. Wave guides 11 Hrs

Application of Maxwell's equations to the rectangular wave guides, The $TM_{m,n}$ wave in the rectangular guide, The $TE_{m,n}$ wave in the rectangular guide, Cylindrical wave guides, The TEM wave in the coaxial Line, Attenuation in the coaxial Line, Excitation of wave guides, Guide terminations, Resonant cavities

Text-1, Chapter 12, 12.1 to 12.6, 12.8,12.9, 12.10.

***Text Books*:**

1. Network Lines and Fields - John D Ryder, 2e, PHI, 2003

***Reference books*:**

1. Radio Engineering Handbook - Glazier and Lemont , Standard Publishers, New Delhi, 2003
2. Field and Wave Electromagnetics – David K Cheng, Pearson Education, 2e, New Delhi

ADVANCED MICROPROCESSORS (EC/TC)

Subject Code: EC/TC54 **Total Hrs: 52** **Exam Marks: 100**

1. Introduction: A Historical Background, The Microprocessor-Based Personal Computer System. (Text: Chapter 1, Section 1.1 and 1.2). 02 Hrs

2. Architecture of 8086: Internal Microprocessor Architecture, Real Mode Memory Addressing. (Text: Chapter 2, Section 2.1 and 2.2). 04 Hrs

3. Addressing Modes: Data Addressing Modes, Program Memory-Addressing Modes, Stack Memory Addressing Modes. (Text: Chapter 3, Section 3.1 to 3.4). 04 Hrs.

4. Data Movement Instructions & Assembler Detail: MOV Revisited, PUSH/POP, Load Effective Address, String Data Transfer, Miscellaneous Data Transfer Instruction, Segment Override Prefix, Assembler Detail. (Text: Chapter 4, Section 4.1 to 4.7). 05 Hrs.

5. Arithmetic and Logic Instructions, String Instructions & Program Control Instructions: Addition, Subtraction, and Comparison, Multiplication and Division, BCD and ASCII Arithmetic, Basic Logic Instructions, Shift and Rotate, String Comparisons. (Text: Chapter 5, Section 5.1 and 5.6).

The Jump Group, Controlling the Flow of an Assembly Language Program, Procedures, Machine Control and Miscellaneous Instructions, Programming Examples. (Text: Ch. 6.1 to 6.5).

10 Hrs.

6. Modular Programming, Data Conversion & Hardware Features of 8086: Modular Programming, Using the Keyboard and Video Display, Data Conversions. (Text: Chapter 7, Section 7.1 and 7.3). Pin Outs and the Pin Functions, Clock Generator (8284A), 9-3 Bus Buffering and Latching, 9-4 Bus Timing, READY and the Wait State, Minimum Mode Versus Maximum Mode. (Text: Chapter 9, Section 9.1 to 9.6). 08 Hrs.

7. **Interrupts:** Basic Interrupt Processing, Hardware Interrupts, Expanding the Interrupt Structure, Interrupt Examples. (Text: Chapter 12, Section 12.1 to 12.3 and 12.5). 04 Hrs.

8. Arithmetic Coprocessor (8087): Data Formats for the Arithmetic Coprocessor, The 80X87 Architecture, Instruction, Instruction Set, Programming with the Arithmetic Coprocessor. (Text: Chapter 14, Section 14.1 to 14.4).

07 Hrs.

9. Bus Interface: The Peripheral Component Interconnect (PCI) Bus, The Parallel Printer Interface (LPT), The Universal Serial Bus (USB). (Text: Chapter 15, Section 15.3 to 15.5). 04 Hrs.

10. The 80386, 80486 and Pentium Processors: Introduction to the 80386 Microprocessor, Special 80386 Registers, Introduction to the 80486 Microprocessor, Introduction to the Pentium Microprocessor. (Text: Chapter 17 & 18, Section 17.1, 17.2, 17.7 and 18.1). 04 Hrs.

***Text book*:**

1. The Intel Microprocessors, Architecture, Programming and Interfacing – Barry B. Brey, 6e, Pearson Education / PHI, 2003

Reference books:

1. Advanced Microprocessors and Peripherals – A.K. Ray and K.M. Bhurchandi, TMH, 2001
2. Microcomputer Systems – The 8086/8088 Family – Y.C. Liu and G.A. Gibson, 2E, PHI – 2003

TELECOMMUNICATION AND SWITCHING (EC/TC)

Subject Code: EC/TC55 **Total Hrs: 52** **Exam Marks: 100**

1. **Introduction to Telecommunication Switching** 10 Hrs.
   Evolution of Telecommunication, Simple Telephone Communication, Basics of Switching Systems, Functions of a System Switching. The Strowger Step-by-step system, Register-translator-senders, Distribution frames, Crossbar systems, A general trunking, Electronic Switching, Reed-electronic systems, Digital Switching Systems.

   (Reference 1: Chapter 1: 1.1.,1.2, 1.3, Text 1: Chapter 3)

2. **Telecommunication Traffic.** 10 Hrs.
   The unit of traffic, Congestion, Traffic measurements, Mathematical Model, Lost call systems, Theory, Traffic performance, Loss systems in tandem, Queuing systems, Second Erlang distribution, Probability of delay, Finite queue capacity, System with a single server, Queue in tandem, Delay tables, Application of delay formulae. (Text 1: Chapter 4)

3. **Switching Networks** 08 Hrs.
   The single-stage network, Grading, Principle, Design of progressive grading, Other forms of grading, Traffic capacity of grading, Application of grading, Link systems, General, Two-stages networks, Three-stages networks, Four stage networks, Discussion, Grades of service of link systems, Applications of graph theory to link systems.(Text 1: Chapter 5 : 5.1 to 5.6)

4. **Time-Division Switching** 09 Hrs.
   Space & time switching, General, Space switches, Time switches, Time-divisions switching networks, Basic networks, Bi-directional pass, Complex switching network, Concentrators, PBX switchers, Digital cross connect units, Grades of services of Time-division switching networks, Non-blocking networks, Synchronization, Frame alignment, Synchronization network. (Text 1: Chapter 6)

5. **Control of Switching Systems** 04 Hrs.
   Call processing functions, Sequence of operations, Signal exchanges, State transition diagrams, Common control, Reliability, Availability & Security, Stored – program control, Processor, Architecture, Distributed processing, Software, Overload control, case study of ESS 4. (Text 1: Chapter 7)

6. **Signaling** 07 Hrs.
   Introduction, Customer line signaling, Audio-frequency junctions and trunk circuits, FDM carrier systems, Out-band signaling, In-band (VF) signaling, PCM signaling, Inter0register signaling, Common-channel signaling principles, general, Signaling networks, CCRIT signaling system No.6, CCNT signaling system No. 7, General, The high-level, Data-link control protocol, Signal units, the signaling information field, Digital customer line signaling.(Text 1 : Chapter 8)

7. **Networks** 04 Hrs.
   Introduction, Analog networks, Integrated digital networks, ISDN, Cellular Radio networks, Intelligent networks and private networks, Public data networks (Text 1: Chapter 10 :10.1 to 10.7 and 10.8.4)

Text book

1. Telecommunication Switching, Traffic and Networks – J E Flood, Pearson Education, 2003

Reference book

1. Telecommunications Switching systems & networks – Thiagarajan Vishvanathan, PHI-2003
2. Digital Telephony – John C Bellamy, 3e, John Wiley, 2002

SOLID STATE DEVICES AND TECHNOLOGY (EC/TC)

Subject Code: EC/TC56 **Total Hrs: 52** **Exam Marks: 100**

1. **The PN Junction Diode:** Introduction, Space Charge Region: Formation of Region, Barrier Voltage and Energy Bands, Drift and Diffusion Currents, Analytical Relations of Equilibrium: Electrostatics of the Space Charge Region, Constancy of the Fermi Level, Built-In Voltage in Terms of Fermi Potential, Built-in Voltage in Terms of Doping Densities, Electric Field and Potential in the Space Charge Region, Width of the Space Charge Region, Conditions in the Diode with Voltage Applied, Currents in Diode: Motion of Carriers with Bias Applied, Conditions with Forward Bias, Conditions with Reverse Bias, Assumptions for Ideal Diode Equation, Solution of Continuity Equation, Currents Crossing Junction, The Current Loop, Saturation Current, Boundary Condition at Junction, General Equation for Hole Distribution in the N-Region of P-N Junction Diode. (Text: Chapter 5).
09Hrs

2. **Fabrication Technology:** Introduction, Why Silicon, The Purity of Silicon: Silicon From Sand, The Czochralski Growing Process: The Melt and the Dopant, Seed Crystal, Ingot Slicing and Wafer Preparation, Fabrication Processes: Thermal Oxidation, Etching Techniques, Diffusion, Expressions for the Diffusion of Dopant Concentration, Ion Implantation, Photomask Generation, Photolithography, Epitaxial Growth, Matallization and Interconnections, Ohmic Contacts, Planar PN Junction Diode Fabrication, Fabrication of Resistors and Capacitors in IC's: Resistors, Capacitors. (Text: Chapter 6).
06Hrs

3. **Bipolar Transistors I: Characteristics and First Order Model:** Introduction, Structure and Basic Operation, Fabrication of the Bipolar Integrated Circuit Transistor, Terminology, Symbols and Regions of Operation: Terminology and Symbols, Modes of Operation, Circuit Arrangements, Transistor Currents in the Active Region: Emitter Current, Collector Current, Base Current, The BJT as a Current Amplifier: Approximations to Base Current, Base Current as the Control Current, Fixing I_B or V_{BE}, Transistor Parameters, Graphical Characteristics and Modes of Operation: Modes of Operation, CE Active Mode, CE Saturation Mode, CE Cutoff Mode, CE Inverse Active Mode, CB Active Mode, CB Saturation Mode, CB Cutoff, Analytical Relations for the Currents: Assumptions and Procedure, Emitter Current, Collector Current, Relations for the NPN Transistor, Recombination Current in the Base, Expression for Alpha and Beta, Ebers-Moll Model. (Text: Chapter 8).
10 Hrs

4. **Bipolar Transistors II: Limitations, Switching and Models:** Introduction, Effects of Limitations on Static Characteristics: Increase of Collector Current with V_{CE} in Forward Active Region, Carrier Multiplication and Breakdown, Punchthrough. Effects at Very Low and High Injection: Very Low Injection and Current Gain, High Level Injection and the Kirk Effect at the Base Collector Junction, High Level Injection at the Emitter Base Junction. Transistor Switching: Stored Charge and Transit Time, Charge Control Relations, Turn-ON time, Turn-OFF Time. Small Signal Equivalent Circuit: Effects of Charges in V_{EB}, Carrier Processes, Small Signal Currents and Circuit Elements, Capacitance Effects, Effects of Changes in Magnitude of V_{CB}: Carrier Processes, Collector Current Change, Recombination Current Change, Complete Equivalent Circuit, Figure of Merit, NPN Transistors, The Gummel-Poon Model. (Text: Chapter 9). 10 Hrs

5. **Junction Field Effect Transistors:** Introduction, Construction and Operation: Construction and the Basic Functions of the Terminals, Operation, Curren Voltoge Characteristic Equation: Preliminary Conditions, Derivation of Current Voltage Relationship, Additional Remarks, Channel Conductance and JFET Transconductance, Secondary Effects: Channel Length Modulation, Breakdown, Variation in Mobility, Temperature Effects, Small Signal Equivalent Circuit, Figure of Merit to the JFET, High Frequency Limitations. (Text: Chapter 10). 05 Hrs.

6. **Metal Semiconductor Junctions and Devices:** Introduction, Energy Band Diagrams of Metal and N-Semiconductor: Before Contact, Thermal Equilibrium Conditions of Metal and N-Semiconductor after Contact-Schottky Barrier, Schottky Barrier Diode: Rectifying Metal-N Semiconductor Contact, Properties of Depletion Layer, Rectifying Metal-P Semiconductor Junction, (Text: Chapter 11).
03Hrs

7. **Metal Oxide Silicon Systems:** Introduction, Energy Band Diagrams, Band Bending and the Effect of Bias Voltages: The Effects of Bias Voltage, Analytical Relations for the Charge Densities: Depletion Region Thickness and Charge Density, (Text: Chapter 12). 03 Hrs

8. **Metal Oxide Semiconductor Field Effect Transistor:** Introduction, Construction and Basic Operation, Fabrication of N-Type MOSDET (NMOS) on an Integrated Circuit Chip: Isolation Process, Poly silicon, The Deposition of Silicon Dioxide, Silicon Nitride and Polysilicon, Basic Steps in Fabrication, Regions of Operation: Cutoff Region, Linear Region – $V_D=V_{DV}=V_{D1}$, Linear Region – $V_D=V_{D2}>V_{DV}$, Saturation Region – $V_{D3}>V_{SAT}$ and $I_D=I_{SAT}$, Types of MOSFETs, Control of the Threshold Voltage, Measurement of MOS Transistor Parameters, MOSFET Small Signal Equivalent Circuits: Low Frequency Circuit, High Frequency Circuit, High Frequency Performance: The f_T of the MOSFET, Comparing the MOSFET and the BJT, The MOSFET Switch and the CMOS Inverter: The Inverter, Resistor Inverter, Enhancement Load Inverter, The CMOS Inverter, Switching of Inverters.
(Text: Chapter 13 except 13.4 and 13.5). 06 Hrs

***Text book*:**

1. Kanaan Kano – Semiconductor Devices – Pearson Education, 2004

***Reference book*:**

1. Semiconductor Devices – Physics and Technology, 2e, S.M. Sze, John Wiley 2001.
2. Semiconductor Physics & Devices – Basic Principles, Donald A Neamen, 3e, TMH 2003.

ADVANCED MICROPROCESSOR LAB
(EC/TC)

Subject Code: EC/TC-L57 **IA marks: 25**
Hours per week: 03 **Exam Hours: 03**
Total Hrs: 42 **Exam Marks: 50**

Part – I : 8086 Software Experiments.

1. Programs involving Data Transfer instructions like:
   i) Byte and Word data transfer in different addressing modes.
   ii) Block move (with and without overlapping)
   iii) Block interchange

2. Programs involving Arithmetic and Logical operations like:
   i) Addition and Subtraction of Multi precision nos.
   ii) Multiplication and Division of signed and unsigned Hexadecimal numbers iii) ASCII adjustment instructions
   iv) Code conversions (Binary to BCD and Vice-versa on 8/16 bit data)
   v) Arithmetic programs to find square, cube, LCM, GCD and factorial

3. Programs involving Bit manipulation instructions like checking:
   i) If given data is positive or negative ii)If given data is odd or even
   iii) logical 1's and 0's in a given data iv) 2 out of 5 code
   iv) bitwise and nibble wise palindrome

2. Programs involving Branch/LOOP instructions like:
   iii) Programs on arrays: addition/subtraction of N nos., finding largest/smallest no., ascending / descending order, etc.
   iv) Near and Far Conditional and Unconditional jumps, Calls and Returns

3. Programs on String manipulations like string transfer, string reversing, searching for a character in a string, palindrome etc.

4. Programs involving Software Interrupts.

5. Programs to use DOS interrupt INT 21H Function Calls for:
   Reading a Character from Keyboard , Buffered Keyboard input, Display of character / String on Console, Creation of a new file, read / write from a file, , read system date, set system date, read system time, set system time.

(Experiments 1 to 6 above can be conducted on IBM Compatible PCs using suitable software tools like Assemblers, Linkers and Debuggers or 8086 Microcomputer Training kit. Experiment 7 on IBM Compatible PC)

Part – II: Interfacing Experiments:
(Interfacing Standard interfacing modules to either PC or 8086 Microcomputer Training kit)

8. Experiments on interfacing 8086 with the following modules through 8255 PPI
   i) Matrix keyboard interface
   ii) Seven segment display interface
   iii) Logical controller interface
   iv) Stepper Motor interface
   v) Real Time Clock using PIT 8253/8254

9. Interfacing a Printer to an 8086 Microcomputer kit.

Part III:Study/Demonstration Experiment:

Familiarity with Microprocessor Development system,ICE,Debugging tools & signature analyzers.

COMMUNICATION LAB (EC/TC)

Subject Code: EC/TC-L58 Total Hrs: 42 Exam Marks: 50

Exam Hours: 03
Total Hrs: 42 Exam Marks: 50

1. Active low-pass and High-pass filters - second order.
2. Active band pass and band elimination filters - second order
3. Class C tuned amplifier
4. Collector AM and demodulation using envelope detector (narrow band)
5. Balanced modulation and SSB generation. (using diodes or using IC 1496)
6. Attenuators: T, π, 0-pad & Lattice types.
7. Frequency modulation and demodulation. (using IC 8038 and PLL)
8. Radio receiver characteristics : sensitivity, Selectivity and fidelity
9. Pre-emphasis and de-emphasis circuits
10. AM-IC circuit (modulation and demodulation using IC)
11. PAM (modulation and demodulation)
12. PPM (modulation and demodulation)
13. PWM (modulation and demodulation)
14. Transistor mixer – up/down conversions.

DIGITAL COMMUNICATION
(EC/TC/BM/ML)

Subject Code: EC/TC/BM/ML61 **IA marks: 25**
Hours per week: 04 **Exam Hours: 03**
Total Hrs: 52 **Exam Marks: 100**

1. **Introduction** 02 Hrs.
   Sources and signals, basic signal processing operations in digital communication, channels for digital communication

   Text 1: Chapter 1

2. **Sampling Process** 07 Hrs.
   Sampling Theorem, quadrature sampling of BP signal, reconstruction of a message from its samples, signal distortion in sampling, practical aspects of sampling and signal recovery, PAM, TDM

   Text 1: Chapter 4

3. **Waveform Coding Techniques** 08 Hrs
   PCM, Channel noise and error probability, quantization noise and SNR, robust quantization, DPCM, DM, coding speech at low bit rates, applications

   Text 1: Chapter 5

4. **Base-band shaping for Data Transmission** 08 Hrs.
   Discrete PAM signals, power spectra of discrete PAM signals, ISI, Nyquist's criterion for distortionless base-band binary transmission, correlative coding, eye pattern, base-band M-ary PAM systems, adaptive equalization for data transmission

   Text 1: Chapter 6

5. **Digital Modulation Techniques** 08 Hrs.
   Digital Modulation Formats, Coherent Binary Modulation Techniques, Coherent Quadrature Modulation Techniques, Non-Coherent Binary Modulation Techniques& Quaternary Modulation techniques, M-Aray Modulation techniques, Effect of ISI, Bit Versus Symbol error Probability, Synchronization & Applications

   Text 2: Chapter 8

6. **Detection and Estimation** 10 Hrs.
   Gram-Schmidt Orthogonalization procedure, geometric interpretation of signals, response of bank of correlators to noisy input, detection of known signals in noise, probability of error, correlation receiver, matched filter receiver, detection of signals with unknown phase in noise, estimation: concept and criteria, maximum likelihood estimation

   Text 1: Chapter 3: 3.2 to 3.11

7. Spread Spectrum Modulation 09 Hrs.

Pseudo noise sequences, notion of spread spectrum, direct sequence spread coherent binary PSK, signal space dimensionality and processing gain, probability of error, frequency hop spread spectrum, applications

Text 1: Chapter 9

Text Books:

1. Digital Communications – Simon Haykin, John Wiley, 2003
2. Digital and Analog Communication Systems – K. Sam Shanmugham, John Wiley, 1996

Reference Books: 1) An introduction to Analog and Digital Communication – Simon Haykin, John Wiley, 2003

MICROWAVE COMMUNICATION
(EC/TC)

Subject Code: EC/TC 62 **IA marks: 25**
Hours per week: 04 **Exam Hours: 03**
Total Hrs: 52 **Exam Marks: 100**

1. Microwave transmission lines, Coaxial lines, Planar transmission lines, Power handling capability of microwave transmission lines.

Text 2: Chapter 4: 4.1 to 4.3.5, 4.8 to 4.8.3 05 Hrs

2. Impedance transformation for matching – Narrow band matching, Broad band matching,

Text 2: Chapter 5: 5.1 to 5.4.5, 5.5.2 05 Hrs

3. Microwave network theory and passive devices, Symmetrical Z and Y matrices for reciprocal network, S matrix representation of multi-port network, Microwave passive devices, Coaxial connectors and adopters, Matched termination, Wave guide corners & bends, Coaxial to wave guide adopters, Coupling loops, Phase shifters, Attenuators, Wave guide Tees, Magic Tees, Isolators, Circulators, Directional couplers, Microwave filters.

Text 2: Chapter.6: 6.1 to 6.3.3,6.4 to6.4.2,6.4.7, 6.4.8, 6.4.10 to 6.4.12, 6.4.14, 6.4.15, 6.4.16 to 6.4.17.2, 6.4.18, 6.4.18.1, Chapter 8: 8.1, 8.2, 8.4, 8.6, 8.7, 8.8 10 Hrs

4. Microwave vacuum tube devices, Klystron, Magnetrons, TWT, Reflex Klystron.

Text 2: Chapter 9: 9.1 to 9.2.16, 9.2.2 to 9.2.2.4, 9.2.3, 9.3 to 9.4.6 08 Hrs

5. Microwave solid state devices, Crystal diode, Schottky diode, PIN diode, GUNN diode, IMPATT & TRAPATT diodes, Tunnel diode, Parametric amplifiers, microwave transistors

Text 2: Chapter 10, 10.1 to10.2.2,10.2.6,10.3 to10.4.3,10.5 to10.5.3,10.7,10.7.4,10.8 to 10.8.3

09 Hrs

6. System aspects of antennas, microwave communication systems, RADAR systems, radiometry, microwave propagation, applications

Text 1: Chapter 12 09 Hrs

7. Microwave measurements, introduction tunable detector, slotted line carriage, VSWR meter, spectrum analyzer, network analyzer, power measurements, insertion loss and attenuation measurements, VSWR measurements, return loss measurements by reflectometer, impedance measurement, frequency measurement

06 Hrs

Text 2: Chapter 13.1 to 13.12

Text Books:

1. Microwave Engineering - David M Pozar, John Wiley, 2e, 2004
2. Microwave engineering - Annapurna Das, Sisir K Das, TMH publications, 2001

Reference Book:

1. Microwave Devices and Circuits- Liao, PHI/Pearson Education,

INFORMATION THEORY AND CODING
(EC/TC)

Subject Code: EC/TC 63 **IA marks: 25**
Hours per week: 04 **Exam Hours: 03**
Total Hrs: 52 **Exam Marks: 100**

1. Information Theory and Channel Capacity*: Introduction, Measure of Information, Average Information Content of Symbols in Long Independent Sequences, Average Information Content of Symbols in Long Dependent Sequences, Mark-off Statistical Model for Information Sources, Entropy and Information Rate of Mark-off Sources, Encoding of the Source Output, Shannon's Encoding Algorithm, Communication Channels, Discrete Communication Channels, Rate of Information Transmission Over a Discrete Channel, Capacity of a Discrete Memory less Channel, Discrete Channels with Memory Continuous Channels, Shannon-Hartley Law and its Implications.* *21 Hrs*

Text 1: Chapter 4: Section 4.1 to 4.6

2. Fundamental Limits on Performance: Some Properties of Entropy, Extension of a DMS, Prefix Coding, Source Coding Theorem, Huffman Coding, Mutual Information, Properties of Mutual Information, Differential Entropy and Mutual Information for Continuous Ensembles. Text 2, Chapter 2: Section 2.1 to 2.9

10 Hrs

3. Error Control Coding: Rationale for Coding and Types of Codes, Discrete Memory less Channels, Examples of Error Control Coding, Methods of Controlling Errors, Types of Errors, Types of Codes, Linear Block Codes, Matrix Description of Linear Block Codes, Error Detection and Error Correction Capabilities of Linear Block Codes, Single Error Correcting Hamming Codes, Lookup Table (or Syndrome) Decoding using Standard Array, Binary Cyclic Codes, Algebraic Structures of Cyclic Codes, Encoding using an (n-k) Bit Shift Register, Syndrome Calculation, Error Detection and Error Correction, BCH Codes, RS Codes, Golay Codes, Shortened Cyclic Codes, Burst Error Correcting Codes,(Text 1, Chapter 9, Section 9.1 to 9.4)

Convolution Codes, Time Domain Approach, Transfer Domain Approach, State, Tree and Trellis diagrams, Encoders and Decoders (using Viterbi algorithm only) for (n, k, 1) Convolution Codes. Text 2, Chapter 8: Section 8.5 to 8.6
21 Hrs

***Text Books*:**

1. Digital and Analog Communication Systems – K. Sam Shanmugam, John Wiley, 1996
2. Digital Communications – Simon Haykin, John Wiley, 2003

***Reference books*:**

1. Digital Communication Fundamentals and Applications – Bernard Sklar, 2e, Pearson Education, 2002

DIGITAL SYSTEMS DESIGN USING VHDL
(EC/TC)

Subject Code: EC/TC 64 **IA marks: 25**

1. Introduction to VHDL: 06 Hrs

VHDL Description of Combinational Networks, Modeling Flip-flops using VHDL, VHDL Models for a Multiplexer, Compilation and Simulation of VHDL code, Modeling a Sequential Machine, Variables, Signals and Constants, Arrays, VHDL operators, VHDL Functions, VHDL Procedures, Packages and Libraries, VHDL Model for a Counter. (Text: Ch.2, 2.1 to 2.12)

2. Designing with Programmable Logic Devices: 05 Hrs

Read-only Memories, Programmable Logic Arrays (PLAs), Programmable Array Logic(PALs), Other Sequential Programmable Logic Devices(PLDs), Design of a Keypad Scanner.
Text: Chapter 3, Section 3.1 to 3.5

3. Design of Networks for Arithmetic Operations: 05 Hrs

Design of a Serial Adder with Accumulator, State Graphs for Control Networks, Design of a Binary Multiplier, Multiplication of Signed Binary Numbers, Design of a Binary Divider.
Text: Chapter 4, Section 4.1 to 4.5

4. Digital Design with SM Charts: 06 Hrs

State Machine Charts, Derivation of SM Charts, Realization of SM Charts, Implementation of the Dice Game, Alternative Realization for SM Charts using Microprogramming, Linked State Machines Text: Chapter 5, Section 5.1 to 5.6

5. Designing with Programmable Gate Arrays and Complex Programmable Logic Devices: 06 Hrs.

Xlinx 3000 series FPGAs, Designing with FPGAs, Xlinx 4000 series FPGAs, Using a One-Hot State Assignment, Altera Complex Programmable Logic Devices(CPLDs), Altera FLEX 10K Series CPLDs.
Text: Chapter 6, Section 6.1 to 6.6

6. Floating-Point Arithmetic: 04 Hrs.

Representation of Floating-point Numbers, Floating-point Multiplication, Other Floating-point Operations Text: Chapter 7, Section 7.1 to 7.3

7. Additional Topics in VHDL: 07 Hrs

Attributes, Transport and Inertial Delays, Operator Overloading, Multivalued Logic and Signal Resolution, IEEE-1164 Standard Logic, Generics, Generate Statements, Synthesis of VHDL code, Synthesis Examples, Files and TEXTIO Text: Chapter 8, Section 8.1 to 8.10

8. VHDL Models for Memories and Buses: 05 Hrs.

Static RAM, A Simplified 486 Bus model, Interfacing Memory to a Microprocessor Bus.
Text: Chapter 9, Section 9.1 to 9.3

9. Design Examples: 08 Hrs

UART Design, Description of MC68HC05 Microcontroller, Design of Microcontroller CPU, Complete Microcontroller Design. Text: Chapter 11, Section 11.1 to 11.4.

Text Book:

Charles H. Roth, Jr : *Digital Systems Design Using VHDL*, Thomson Learning, Inc, 2002

Reference book:

1. Stephen Brown & Zvonko Vranesic : *Fundametals of Digital Logic with VHDL Design*, TMH 03
2. Digital Fundamentals using VHDL- Floyd, Pearson Edn.2003
3. J Bhaskar VHDL Primer, Pearson / PHI, New Delhi, 2003

ANTENNAS AND PROPAGATION
(EC/TC)

Subject Code: EC/TC 65 **IA marks: 25**
Hours per week: 04 **Exam Hours: 03**
Total Hrs: 52 **Exam Marks: 100**

1. Antenna Basics : Basic antenna parameters, patterns, beam area, Radiation Intensity, Beam efficiency, Directivity and Gain, Antenna aperture, Effective height, Radio communication link, Fields from oscillating dipole, Antenna field zones, Shape-Impedance considerations
Text 1: Chapter 2, 2.1 to 2.7, 2.9 to 2.14 06 Hrs

2. Point Sources: Introduction, Power patterns, Power pattern theorem and applications, Radiation intensity, Power patterns, Field patterns, phase patterns 02 Hrs.
Text 1: Chapter 4, 4.1 to 4.7

3. **Antenna arrays :** Arrays of two isotropic point sources, Non-isotropic similar point sources, pattern multiplication, pattern synthesis, Non-isotropic dissimilar point sources, array of n -isotropic sources of equal amplitude and spacing, null directions, Array of two driven $\lambda/2$ elements (broadside case, end-fire case and general case with equal currents of any phase)
Text 1: Chapter 5, 5.2 to 5.7, Chapter 16, 16.1 to 16.4 07 Hrs.

4. Electric dipole and Thin linear antennas : The short electric dipole, the fields of short dipole, radiation resistance, thin linear antenna, radiation resistance of $\lambda/2$ antenna, fields of thin linear antenna
04 Hrs.
Text 1 : Chapter 6, 6.1 to 6.6 and 6.8

5. Loop antenna : Loop antenna(general case), field comparison of short dipole and small loop, field pattern, radiation resistance, directivity, radiation efficiency, Q, Bandwidth and SNR

04 Hrs
Text 1 : Chapter 7, 7.1 to 7.7 and 7.10

6. Helical Antenna and Yagi-Uda array : Helical antenna, Helical geometry, Design considerations of Monofilar axial-mode helical antenna, dipole arrays with parasitic elements, the Yagi-Uda array, Axial-Mode pattern and phase velocity of wave propagation on Monofilar Helices, Axial-Mode patterns, Axial ratio and conditions for circular polarization of Monofilar axial-mode Helical antenna and wide band characteristics of Monofilar axial-mode helical antenna
06 Hrs.
Text 1 : Chapter 8, 8.1 to 8.3, 8.5 to 8.6, 8.8, 8.10 to 8.12

7. **Antenna Types :** Slot antenna, Complementary antenna, Horn antenna, Reflect antenna(Flat sheet reflector, Corner reflector, Parabolic reflector), Broadband frequency Independent antenna, Rumsey's principle, The log-periodic antennas. 06 Hrs.
Text 1 : Chapter 11, 11.1, 11.4, 11.5, 11.7

8.Antennas for special applications : Antennas for terrestrial mobile communication systems, Antennas for Ground Penetrating Radar (GPR), Embedded antennas, Ultra-wide band antennas for digital applications, The plasma antennas, 08 Hrs.

Text 1 : Chapter 21, 21.25 to 21.29

Note : No derivations for topics in this Section .

9.Wave propagation : Ground wave propagation, plain-earth reflections, space wave and surface waves, elevated dipole antenna above plain earth, wave tilt, spherical earth propagations, Tropospheric waves
07 Hrs.

Text 2 : Chapter 16, 16.01 to 16.07

10. **Ionospheric propagation :** The Ionosphere, Relection and Refraction of waves by Ionosphere, Regular and Irregular variations of Ionosphere, Attenuation factor, Sky wave transmission, Effect of earths magnitude field, Wave propagation in Ionosphere, Faraday rotation and measurement of total electron content
08 Hrs.

Text 2 : Chapter 17, 17.01 to 17.10

Text books :

1. Antennas – John D Kraus, Ronald J Marhefka, 3e, TMH, 2003
2. Electromagnetic Waves and Radiating Systems – Jordan & Balmain, 2e, PHI, 2003

Refernce Books :

1. Antennas – John D Kraus, Mc GrawHill, 2e, 1988
2. Electronic Communication Systems – Kennedy,3e, TMH, 1997

ADVANCED COMMUNICATION LAB
(EC/TC)

Subject Code: EC/TC-L 67 **IA marks: 25**
Hours per week: 03 **Exam Hours: 03**
Total Hrs: 42 **Exam Marks: 50**

1. Verification of sampling theorem using flat top samples.
2. TDM and recovery of two band limited signals of PAM signals.
3. ASK generation and detection (binary)
4. FSK generation and detection (binary)
5. PSK generation and detection (binary)
6. DPSK encoder and decoder
7. QPSK modulator.
8. Measurement of Directivity, beam width & Gain of any two types of antennas
9. Determination of modes, transit time, electronic tuning range and sensitivity of a reflex klystron
10. Determination of V-I curve of a Gunn diode, measurement of guide wave length (λg), frequency and VSWR
11. Determination of coupling coefficient and insertion loss of Directional coupler and Magic Tee.
12. Characterization of optical Fibers : Launching angle, different types of losses, signal propagation of analog and digital signals (Relevant theory to be dealt in a tutorial class)

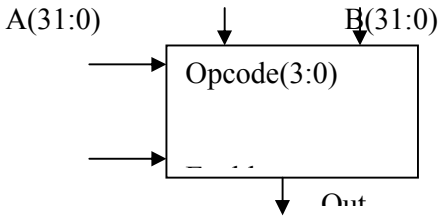
V H D L LAB
(EC/TC)

Subject Code: EC/TC-L 68 **IA marks: 25**
Hours per week: 03 **Exam Hours: 03**
Total Hrs: 42 **Exam Marks: 50**

Note: Programming can be done using any VHDL compiler. Download the programs on a FPGA/CPLD board and test performance using 16/32 channel pattern generator and logic analyzer apart from verification by simulation. Use the pattern generator to generate input signal and truth tables.

PROGRAMMING

1. Write VHDL code to realize all the logic gates
2. Write a VHDL program for the following combinational designs
   a. 2 to 4 decoder
   b. 8 to 3 (encoder without priority & with priority)
   c. 8 to 1 multiplexer
   d. 4 bit binary to gray converter
   e. Multiplexer, demultiplexer, comparator
3. Write a VHDL code to describe the functions of a Full Adder Using following modeling styles,
4. Write a model for 32 bit ALU using the schematic diagram shown below.(example only)



- ALU should use combinational logic to calculate an output based on the four bit op-code input
- ALU should pass the result to the out bus when enable line in high, and tri-state the out bus when the enable line is low.
- ALU should decode the 4 bit op-code according to the given in example below

OPCODE	ALU OPERATION
1.	A + B
2.	A - B
3.	A Complement
4.	A * B
5.	A AND B
6.	A OR B
7.	A NAND B
8.	A XOR B

5. Develop the VHDL codes for the following flip-flops,
   SR, D, JK, T.
6. Design 4 bit binary, BCD counters (Synchronous reset and Asynchronous reset) and "any sequence" counters

INTERFACING (at least three of the following must be covered)

7. Write VHDL code to display messages on the given seven segment display interface
8. Write VHDL codes to display messages on the given LCD panel
9. Write codes to operate the given stepper motor
10. Write a VHDL code to read analog signals through the given ADC interface and display the values on the LCD panel

Elective I

EC/TC-EL 66X

PROGRAMMING IN C++
(EC/TC)

Subject Code: EC/TC/BM-EL661 **IA marks: 25**
Hours per week: 04 **Exam Hours: 03**
Total Hrs: 52 **Exam Marks:100**

1. Getting Started: general format, data types, variable declaration, operators, miscellaneous topics, keyboard input and screen output
Text: Chapter 2: 2.2, 2, 5 to 2.9 08 Hrs

2. Control statements and loops: relational & logical operators, if & switch statements, loops in general, for, while and do while loops
Text: Chapter 3: 3.1 to 3.9 05 Hrs

3. Pointers, addresses & indirection operator: importance of pointers, data variables and memory, address operators, pointers
Text: Chapter 4: 4.1 to 4.4 03 Hrs

4. Functions Basics: functions in C++, basic format, requirement for writing functions, local , static and global variables, pointers & functions
Text: Chapter 5: 5.1 to 5.5 06 Hrs

5. Arrays: using single data variables, array fundamentals, one-dimensional arrays and functions, character strings
Text: Chapter 6: 6.1 to 6.5 06 Hrs

6. User defined data types: Customized data types, data structures, accessing structure elements, structure arrays, structure within structures, structures & functions, structure arrays & functions, enumerated data types
Text: Chapter 7: 7.1 to 7.5, 7.7, 7.9 and 7.10 09 Hrs

7. Classes and Objects: object oriented principles and definitions, classes and objects, writing member functions, class constructors and destructors, examples, array of objects, pointer and classes
Text: Chapter 9: 9.1 to 9.7 and 9.9 09 Hrs

8. Class Relationships: using C++ language classes, user defined classes
Text: Chapter 10: 10.2 and 10.3 04 Hrs

9. Inheritance and Virtual functions: importance of inheritance and basics
Text: Chapter 11: 11.1 and 11.2 02 Hrs

***Text book*:** C++ Programming today – Barbara Johnston, PHI, 2002
***Reference book*:**Programming in C++ - Timothy B. D'Orazio, MacGraw Hill, 2004

DSP ARCHITECTURE
(EC/TC)

Subject Code: EC/TC-EL662 **IA marks: 25**
Hours per week: 04 **Exam Hours: 03**
Total Hrs: 52 **Exam Marks: 100**

1.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. (Text: Chapter 2) *5hrs*

2.Architectures for Programmable Digital Signal-Processing Devices

Introduction, Basic Architectural Features, DSP Computational Building Blocks, Bus Architecture and Memory, Data Addressing Capabilities, Address Generation Unit, Programmability an Program Execution, Speed Issues, Features for External Interfacing .

Text: Chapter 4 *10 Hrs*

3.Programmable Digital Signal Processors

Introduction, Commercial Digital Signal-processing Devices, Data Addressing Modes of TMS320C54xx Digital Signal Processors, 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 . (Text: Chapter 5) *08 Hrs*

4.Implementations of Basic DSP Algorithms

Introduction, The Q-notation, FIR Filters, IIR Filters, Interpolation Filters, Decimation Filters, PID Controller, Adaptive Filters, 2-D Signal Processing . (Text: Chapter 7)
09 Hrs

5.Implementation of FFT Algorithms

Introduction, An FFT Algorithm for DFT Computation, A Butterfly Computation, Overflow and Scaling, Bit-Reversed Index Generation, FFT Implementation on the TMS320C54xx, Computation of the Signal Spectrum .(Text: Chapter 8) *04 Hrs*

6.Interfacing Memory and Parallel I/O Peripherals to Programmable DSP Devices

Introduction, Memory Space Organization, External Bus Interfacing Signals, Memory Interface, Parallel I/O Interface, Programmed I/O, Interrupts and I/O, Direct Memory Access (DMA).
Text: Chapter 9 *04 Hrs*

7.Interfacing Serial Converters to a Programmable DSP Device

Introduction, Synchronous Serial Interface, A multi-channel Buffered Serial Port (McBSP), McBSP Programming, A CODEC Interface Circuit, CODEC Programming, A CODEC-DSP Interface Example. (Text: Chapter 10) *08 Hrs*

8.Applications of Programmable DSP Devices

Introduction, A DSP System, DSP-Based Bio-telemetry Receiver, A Speech Processing System, An Image Processing System. Text: Chapter 11,Section 11.1 to 11.5) *04 Hrs*

***Text Book*:**

Digital Signal Processing - Avatar Singh and S Srinivasan, Thomson Learning, 2004

***Reference Books*:**

1. Digital Signal Processing: *A* Practical Approach - Ifeachor E. C., Jervis B. W., 2e, Pearson-Education, 2002
2. Digital Signal Processors - B Venkataramani and M Bhaskar, TMH, 2002

APPLIED NUMERICAL METHODS
(EC/TC)

Subject Code: EC/TC-EL663 **IA marks: 25**
Hours per week: 04 **Exam Hours: 03**
Total Hrs: 52 **Exam Marks:100**

1. NUMERICAL COMPUTATION

Motivation and Objectives / Number Representation / Machine Precision / Round-Of f Error / Truncation Error / Random Number Generation.
Text: Chapter 1, Section 1.1 to 1.6 04 Hrs

2.LINEAR ALGEBRAIC SYSTEMS
Motivation and Objectives / Gauss-Jordan Elimination / Gaussian Elimination / LU Decomposition / Ill-Conditioned Systems / Iterative Methods,
Text: Chapter 2 11 Hrs

3.EIGENVALUES AND EIGENVECTORS:
Motivation and Objectives / The Characteristic Polynomial / Power Methods / Jacobi's Method / Householder Transformation / QR Method / Danilevsky's Method / Polynomial Roots.
Text: Chapter 3, Section 3.1 to 3.8 08 Hrs

4.CURVE FITTING:
Motivation and Objectives / Interpolation / Newton's Difference Formula / Cubic Splines / Least Square / Two-Dimensional Interpolation.
Text: Chapter 4, Section 4.1 to 4.6 08 Hrs

5.ROOT FINDING:
Motivation and Objectives / Bracketing Methods / Contraction Mapping Method / Se cant Method / Muller's Method / Newton's Method / Polynomial Roots / Nonlinear Systems of Equations.
Text: Chapter 5, Section 5.1 to 5.8 11 Hrs

6.OPTIMIZATION
Motivation and Objectives / Local and Global Minima / Line Searches / Steepest Descent Method / Conjugate-Gradient Method / Quasi-Newton Methods / Penalty Functions / Simulated Annealing.
Text: Chapter 6, Section 6.1 to 6.8 10 Hrs

Text Book
Applied Numerical Methods for Engineers Using MatLab and C - Robert Schilling and Sandra Harris, Thomson Learning, 2002

Reference book
1.Applied Numerical Analysis - Gerald and Wheatley, Pearson Education, 2002
2.Numerical Recipes in C - William Press *et. al.,*2e, Cambridge University Press,

VIDEO ENGINEERING

(EC/TC)

Subject Code: EC/TC-EL664 **IA marks: 25**
Hours per week: 04 **Exam Hours: 03**
Total Hrs: 52 **Exam Marks:100**

1. Block schematic of Television system, Picture characteristics, luminance signal Bandwidth calculation, chrominance signal, Composite video signal
Text1 : Chapter 1,2, 5 & 6 (1.1 to 1.4, 2.1 to 2.6, 5.1 to 5.6, 6.1 to 6.8)
6 hrs

2. NTSC and PAL, SECAM standards, Colour information, Modulation, Video generation, Stereo Audio channel assignment.
Text 2: Chapter 8 (Page 239 to 297)
6 hrs

3. NTSC and PAL Encoding and decoding, Luminance signal processing, Colour difference signal processing, Colour sub-carrier, Phasor Diagram representation ,Horizontal and vertical synchronizing timings, Limiting Alpha channel support, Gen locking support, Digital de-coding, DC restoration,

Luminance and chrominance separation and demodulation, Gen locking, Video timing generation, Auto detection of Video signal

Text 2: Chapter 9 (Page 370 to 447)

15 hrs

4. MPEG I and MPEG II:

MPEG Vs JPEG, quality issues, Video interlacing , encoding, motion compensation, I,P,B,D frames, Video Bit stream Video decoding, Additional features of MPEG II like program stream, Transport Stream, PES Packet, Test signals, EIA, EBU, SMPTE Bars , Y Bars, Ramp, stair case & Pedistoral Longitudinal time code and vertical time code.

Text 2: Chapter 12 & 13 (Page 519 to 556, Page 558 to 643).

15 hrs

5. Digital Television, SDTV, HDTV, other video signal interfaces

Text 2: Chapter 14 (Page 644 to 664)

6. VCR and VDR.

Text 1: Chapter 28 (28.1 to 28.7)

10 hrs

Text Books:

1. Modern television practice - By R.R.Gulati, 2e New age International Publishers
2. Video Demystified -by Keith Jack,3e, Penram International Publishing India Pvt.Ltd.,

Reference Books:

1. Advanced Digital Communication - Camilo Feher, PHI
2. Video Engineering – Inglis, Mc Graw Hill

ADVANCED POWER ELECTRONICS
(EC/TC)

Subject Code: EC/TC-EL665 **IA marks: 25**
Hours per week: 04 **Exam Hours: 03**
Total Hrs: 52 **Exam Marks:100**

1. DC – DC Switch-Mode Converters:

Introduction, Control of dc-dc converters, Step-down (Buck) Converter, Step-UP Converter, Buck-Boost Converter, Cuk dc-dc Converter, Full Bridge dc-dc Converter, dc-dc Converter Comparison.

Text 1: Chapter 7 08 Hrs

3.Switch-Mode DC – AC Inverters:

Introduction, Basic concepts of Switch-Mode inverters, Single-Phase Inverters, Three-Phase Inverters, Effects of Blanking Time on Output Voltage in PWM Inverters, Other Inverter Switching Schemes, Rectifier Mode of Operation.

Text 1: Chapter 8 08 Hrs.

3. Resonant Converters:

Introduction, Classification of Resonant Converters, Basic Resonant circuit Concepts, Load Resonant Converters, Resonant-Switch Converters, Zero-Voltage-Switching Clamped-Voltage Topologies, Resonant-dc-Link Inverters with Zero-Voltage Switching.
Text 1: Chapter 9 except section 9.8 10 Hrs

4. Multilevel Inverters :
Introduction, Multilevel concept, Types of Multilevel Inverters, Diode-Clamped Multilevel Inverters, Flying-Capacitor Multilevel Inverter, Cascaded Multilevel Inverter, Applications, Switching device Currents, DC-Lnk Capacitor Voltage Balancing, Features of Multilevel Inverters, Comparison of Multilevel Converters.
Text 2: Chapter 9 08 Hrs

5. Power Supplies:
Switched-Mode, Resonant and Bidirectional DC and AC Power Supplies, Multistage Conversions, Magnetic Design Considerations.
Text 2: Chapter 14 08 Hrs.

6. Snubber Circuits :
Function and Types of Snubber circuits, Diode Snubbers, Snubber Circuits for Thyristors, Need for Snubbers with Transistors, Turn-Off Snubber, Overvoltage Snubber, Turn-On Snubber, Snubbers for Bridge Circuit Configurations.
Text 1: Chapter 27 08 Hrs

***Text Books*:**
1. Power Electronics – Converters, Applications, and Design - Mohan, Underland & Robbins, 3e, John Wiley, 2003.
2. Power Electronics – Circuits, Devices, and Applications - M.H.Rashid: 3e, PHI / Pearson Education, 2004.