

2007-2008

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY,  
HYDERABAD

B.TECH. ELECTRONICS AND COMMUNICATION ENGINEERING

II YEAR II Semester

| Code | Subject                           | T    | P | C  |
|------|-----------------------------------|------|---|----|
|      | Pulse and Digital Circuits        | 4+1* | - | 4  |
|      | Control Systems                   | 4+1* | - | 4  |
|      | Object Oriented Programming       | 4+1* | - | 4  |
|      | Switching Theory and Logic Design | 4+1* | - | 4  |
|      | EM Waves and Transmission Lines   | 4+1* | - | 4  |
|      | Analog Communications             | 4+1* | - | 4  |
|      | Analog Communications Lab.        | -    | 3 | 2  |
|      | Pulse and Digital Circuits Lab.   | -    | 3 | 2  |
|      |                                   | 30   | 6 | 28 |

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**II Year B.Tech. ECE. II-Sem**

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| <b>4+1*</b> | <b>0</b> | <b>4</b> |

**PULSE AND DIGITAL CIRCUITS**

**UNIT I**

**LINEAR WAVESHAPING** : High pass, low pass RC circuits, their response for sinusoidal, step, pulse, square and ramp inputs. RC network as differentiator and integrator, attenuators, its applications in CRO probe, RL and RLC circuits and their response for step input, Ringing circuit.

**UNIT II**

**NON-LINEAR WAVE SHAPING** : Diode clippers, Transistor clippers, clipping at two independent levels, Transfer characteristics of clippers, Emitter coupled clipper, Comparators, applications of voltage comparators, clamping operation, clamping circuits using diode with different inputs, Clamping circuit theorem, practical clamping circuits, effect of diode characteristics on clamping voltage, Transfer characteristics of clampers.

**UNIT III**

**SWITCHING CHARACTERISTICS OF DEVICES** : Diode as a switch, piecewise linear diode characteristics, Transistor as a switch, Break down voltage consideration of transistor, saturation parameters of Transistor and their variation with temperature, Design of transistor switch, transistor-switching times.

**UNIT IV**

**MULTIVIBRATORS** : Analysis and Design of Bistable, Monostable, Astable Multivibrators and Schmitt trigger using transistors.

**UNIT V**

**TIME BASE GENERATORS** : General features of a time base signal, methods of generating time base waveform, Miller and Bootstrap time base generators – basic principles, Transistor miller time base generator, Transistor Bootstrap time base generator, Current time base generators.

**UNIT VI**

**SYNCHRONIZATION AND FREQUENCY DIVISION** : Principles of Synchronization, Frequency division in sweep circuit, Astable relaxation circuits, Monostable relaxation circuits, Synchronization of a sweep circuit with symmetrical signals, Sine wave frequency division with a sweep circuit.

**UNIT VII**

**SAMPLING GATES** : Basic operating principles of sampling gates, Unidirectional and Bi-directional sampling gates, Reduction of pedestal in gate circuits, Applications of sampling gates.

**UNIT VIII**

**REALIZATION OF LOGIC GATES USING DIODES & TRANSISTORS** : AND, OR gates using Diodes, Resistor, Transistor Logic, Diode Transistor Logic.

**TEXT BOOKS :**

1. Pulse, Digital and Switching Waveforms - J. Millman and H. Taub, McGraw-Hill, 1991.
2. Solid State Pulse circuits - David A. Bell, PHI, 4th Edn., 2002 .

**REFERENCES :**

1. Pulse and Digital Circuits – A. Anand Kumar, PHI, 2005.
2. Wave Generation and Shaping - L. Strauss.
3. Pulse, Digital Circuits and Computer Fundamentals - R.Venkataraman.

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**CONTROL SYSTEMS**

**Objective :**

In this course it is aimed to introduce to the students the principles and applications of control systems in every day life. The basic concepts of block diagram reduction, time domain analysis solutions to time invariant systems and also deals with the different aspects of stability analysis of systems in frequency domain and time domain.

**UNIT – I INTRODUCTION**

Concepts of Control Systems- Open Loop and closed loop control systems and their differences- Different examples of control systems- Classification of control systems, Feed-Back Characteristics, Effects of feedback.

Mathematical models – Differential equations, Impulse Response and transfer functions - Translational and Rotational mechanical systems

**UNIT II TRANSFER FUNCTION REPRESENTATION**

Transfer Function of DC Servo motor - AC Servo motor- Synchro transmitter and Receiver, Block diagram representation of systems considering electrical systems as examples -Block diagram algebra – Representation by Signal flow graph - Reduction using mason's gain formula.

**UNIT-III TIME RESPONSE ANALYSIS**

Standard test signals - Time response of first order systems – Characteristic Equation of Feedback control systems, Transient response of second order systems - Time domain specifications – Steady state response - Steady state errors and error constants – Effects of proportional derivative, proportional integral systems.

**UNIT – IV STABILITY ANALYSIS IN S-DOMAIN**

The concept of stability – Routh's stability criterion – qualitative stability and conditional stability – limitations of Routh's stability

**Root Locus Technique:**

The root locus concept - construction of root loci-effects of adding poles and zeros to  $G(s)H(s)$  on the root loci.

**UNIT – V FREQUENCY RESPONSE ANALYSIS**

Introduction, Frequency domain specifications-Bode diagrams-Determination of Frequency domain specifications and transfer function from the Bode Diagram-Phase margin and Gain margin-Stability Analysis from Bode Plots.

**UNIT – VI STABILITY ANALYSIS IN FREQUENCY DOMAIN**

Polar Plots, Nyquist Plots Stability Analysis.

**UNIT – VII CLASSICAL CONTROL DESIGN TECHNIQUES**

Compensation techniques – Lag, Lead, Lead-Lag Controllers design in frequency Domain, PID Controllers.

**UNIT – VIII State Space Analysis of Continuous Systems**

Concepts of state, state variables and state model, derivation of state models from block diagrams, Diagonalization- Solving the Time invariant state Equations- State Transition Matrix and it's Properties – Concepts of Controllability and Observability

**TEXT BOOKS:**

1. Automatic Control Systems 8th edition– by B. C. Kuo 2003– John wiley and son's.,
2. Control Systems Engineering – by I. J. Nagrath and M. Gopal, New Age International (P) Limited, Publishers, 2<sup>nd</sup> edition.

**REFERENCE BOOKS:**

1. Modern Control Engineering – by Katsuhiko Ogata – Prentice Hall of India Pvt. Ltd., 3<sup>rd</sup> edition, 1998.
2. Control Systems by N.K.Sinha, New Age International (P) Limited Publishers, 3<sup>rd</sup> Edition, 1998.
3. Control Systems Engg. by NISE 3<sup>rd</sup> Edition – John wiley
4. “ Modelling & Control Of Dynamic Systems” by Narciso F. Macia George J. Thaler, Thomson Publishers.

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**OBJECT ORIENTED PROGRAMMING**

**UNIT-I**

**Introduction** : Creation of Java, importance of Java to internet, byte code, Java buzzwords, OOP Principles, Encapsulation, Inheritance and Polymorphism, data types, variables, declaring variables, dynamic initialization, scope and life time of variables, arrays, operators, control statements, type conversion and casting, compiling and running of simple Java program.

**UNIT-II**

**Classes and Objects** : Concepts of classes and objects, class fundamentals Declaring objects, assigning object reference variables, introducing methods, constructors, usage of static with data and methods, usage of final with data, access control, this key word, garbage collection, overloading methods and constructors, parameter passing – call by value, recursion, nested classes and inner classes, exploring the String class.

**UNIT-III**

**Inheritance** : Basic concepts, member access rules, usage of super key word, forms of inheritance, method overriding, abstract classes, dynamic method dispatch, using final with inheritance, the Object class.

**UNIT-IV**

**Packages and Interfaces** : Defining, Creating and Accessing a Package, Understanding CLASSPATH, importing packages, differences between classes and interfaces, defining an interface, implementing interface, applying interfaces, variables in interface and extending interfaces.

**UNIT-V**

**Exception Handling and Multithreading** : Concepts of Exception handling, types of exceptions, usage of try, catch, throw, throws and finally keywords, Built-in exceptions, creating own exception sub classes, Concepts of Multithreading, differences between process and thread, thread life cycle, creating multiple threads using Thread class, Runnable interface, Synchronization, thread priorities, inter thread communication, daemon threads, deadlocks, thread groups.

**UNIT-VI**

**Event Handling** : Events, Event sources, Event classes, Event Listeners, Delegation event model, handling mouse and keyboard events, Adapter classes.

**AWT** : Concepts of components, container, panel, window, frame, canvas, Font class, Color class and Graphics.

**UNIT-VII**

**AWT Controls** : Buttons, Labels, Text fields, Text area, Check boxes, Check box groups, Lists, Choice, Scrollbars, Menus, Layout Managers – Flow, Border, Grid, Card and Gridbag.

**Swing** – JApplet, JFrame and JComponent, Icons and Labels, Handling threading issues, text fields, buttons – The JButton class, Check boxes, Radio buttons, Combo boxes, Tabbed Panes, Scroll Panes, Trees, and Tables. Applets – Concepts of Applets, differences between applets and applications, life cycle of an applet, types of applets, creating applets, passing parameters to applets.

**UNIT-VIII**

**Networking and Java Library** : Basics of Networking, InetAddress, TCP/IP sockets, Datagrams, URL, URL connection, String handling, java.util, java.io and java.net packages.

**TEXT BOOKS :**

1. The Complete Reference Java J2SE 5th Edition, Herbert Schildt, TMH Publishing Company Ltd, New Delhi.
2. Big Java 2nd Edition, Cay Horstmann, John Wiley and Sons.

**REFERENCES :**

1. Java How to Program, Sixth Edition, H.M.Dietel and P.J.Dietel, Pearson Education/PHI
2. Core Java 2, Vol 1, Fundamentals, Cay.S.Horstmann and Gary Cornell, Seventh Edition, Pearson Education.
3. Core Java 2, Vol 2, Advanced Features, Cay.S.Horstmann and Gary Cornell, Seventh Edition, Pearson Education.
4. Beginning in Java 2, Iver Horton, Wrox Publications.
5. Java, Somasundaram, Jaico.

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**SWITCHING THEORY AND LOGIC DESIGN**

**UNIT I**

**NUMBER SYSTEMS & CODES** : Philosophy of number systems – complement representation of negative numbers-binary arithmetic-binary codes-error detecting & error correcting codes –hamming codes.

**UNIT II**

**BOOLEAN ALGEBRA AND SWITCHING FUNCTIONS** : Fundamental postulates of Boolean Algebra - Basic theorems and properties - switching functions–Canonical and Standard forms-Algebraic simplification digital logic gates, properties of XOR gates –universal gates-Multilevel NAND/NOR realizations.

**UNIT III**

**MINIMIZATION OF SWITCHING FUNCTIONS** : Map method, Prime implicants, Don't care combinations, Minimal SOP and POS forms, Tabular Method, Prime –Implicant chart, simplification rules.

**UNIT IV**

**COMBINATIONAL LOGIC DESIGN**

Design using conventional logic gates, Encoder, Decoder, Multiplexer, De-Multiplexer, Modular design using IC chips, MUX Realization of switching functions Parity bit generator, Code-converters, Hazards and hazard free realizations.

**UNIT V**

**PROGRAMMABLE LOGIC DEVICES, THRESHOLD LOGIC** : Basic PLD's-ROM, PROM, PLA, PLD Realization of Switching functions using PLD's. Capabilities and limitations of Threshold gate, Synthesis of Threshold functions, Multigate Synthesis.

**UNIT VI**

**SEQUENTIAL CIRCUITS - I** : Classification of sequential circuits (Synchronous, Asynchronous, Pulse mode, Level mode with examples) Basic flip-flops-Triggering and excitation tables. Steps in synchronous sequential circuit design. Design of modulo-N Ring & Shift counters, Serial binary adder, sequence detector.

**UNIT VII**

**SEQUENTIAL CIRCUITS - II** : Finite state machine-capabilities and limitations, Mealy and Moore models-minimization of completely specified and incompletely specified sequential machines, Partition techniques and Merger chart methods-concept of minimal cover table.

**UNIT VIII**

**ALGORITHMIC STATE MACHINES** : Salient features of the ASM chart-Simple examples-System design using data path and control subsystems-control implementations-examples of Weighing machine and Binary multiplier.

**TEXTBOOKS :**

1. Switching & Finite Automata theory – Zvi Kohavi, TMH, 2nd Edition.
2. Digital Design – Morris Mano, PHI, 3<sup>rd</sup> Edition, 2006.

**REFERENCES :**

1. An Engineering Approach To Digital Design – Fletcher, PHI. Digital Logic – Application and Design – John M. Yarbrough, Thomson.
2. Fundamentals of Logic Design – Charles H. Roth, Thomson Publications, 5th Edition, 2004.
3. Digital Logic Applications and Design – John M. Yarbrough, Thomson Publications, 2006.

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**EM WAVES AND TRANSMISSION LINES**

**Review of Coordinate Systems, Vector Calculus :**

**UNIT I**

**ELECTROSTATICS:** Coulomb's Law, Electric Field Intensity – Fields due to Different Charge Distributions, Electric Flux Density, Gauss Law and Applications, Electric Potential, Relations Between E and V, Maxwell's Two Equations for Electrostatic Fields, Energy Density, Related Problems. Convection and Conduction Currents, Dielectric Constant, Isotropic and Homogeneous Dielectrics, Continuity Equation, Relaxation Time, Poisson's and Laplace's Equations; Capacitance – Parallel Plate, Coaxial, Spherical Capacitors, Related Problems.

**UNIT II**

**Magneto Statics :** Biot-Savart Law, Ampere's Circuital Law and Applications, Magnetic Flux Density, Maxwell's Two Equations for Magnetostatic Fields, Magnetic Scalar and Vector Potentials, Forces due to Magnetic Fields, Ampere's Force Law, Inductances and Magnetic Energy. Related Problems.

**UNIT III**

**Maxwell's Equations (Time Varying Fields):** Faraday's Law and Transformer emf, Inconsistency of Ampere's Law and Displacement Current Density, Maxwell's Equations in Different Final Forms and Word Statements. Conditions at a Boundary Surface : Dielectric-Dielectric and Dielectric-Conductor Interfaces. Related Problems .

**UNIT IV**

**EM Wave Characteristics - I:** Wave Equations for Conducting and Perfect Dielectric Media, Uniform Plane Waves – Definition, All Relations Between E & H. Sinusoidal Variations. Wave Propagation in Lossless and Conducting Media. Conductors & Dielectrics – Characterization, Wave Propagation in Good Conductors and Good Dielectrics. Polarization. Related Problems.

**UNIT V**

**EM Wave Characteristics – II:** Reflection and Refraction of Plane Waves – Normal and Oblique Incidences, for both Perfect Conductor and Perfect Dielectrics, Brewster Angle, Critical Angle and Total Internal Reflection, Surface Impedance. Poynting Vector and Poynting Theorem – Applications, Power Loss in a Plane Conductor. Related Problems.

**UNIT V**

**Guided Waves :** Parallel Plane Waveguides: Introduction, TE, TM, TEM Modes - Concepts and Analysis, Cut-off Frequencies, Velocities, Wavelengths, Wave Impedances. Attenuations Factor – Expression for TEM Case. Related Problems.

**UNIT VII**

**Transmission Lines - I :** Types, Parameters, Transmission Line Equations, Primary & Secondary Constants, Expressions for Characteristic Impedance, Propagation Constant, Phase and Group Velocities, Infinite Line Concepts, Losslessness/Low Loss Characterization, Distortion – Condition for Distortionlessness and Minimum Attenuation, Loading - Types of Loading. Related Problems.

**UNIT VIII**

**Transmission Lines – II :** Input Impedance Relations, SC and OC Lines, Reflection Coefficient, VSWR. UHF Lines as Circuit Elements;  $\lambda/4$ ,  $\lambda/2$ ,  $\lambda/8$  Lines – Impedance Transformations. Smith Chart – Configuration and Applications, Single and Double Stub Matching. Related Problems.

**TEXT BOOKS :**

1. Elements of Electromagnetic – Matthew N.O. Sadiku, Oxford Univ. Press, 3rd ed., 2001.
2. Electromagnetic Waves and Radiating Systems – E.C. Jordan and K.G. Balmain, PHI, 2<sup>nd</sup> Edition, 2000.

**REFERENCES :**

1. Engineering Electromagnetics – Nathan Ida, Springer (India) Pvt. Ltd., New Delhi, 2nd ed., 2005.
2. Engineering Electromagnetics – William H. Hayt Jr. and John A. Buck, TMH, 7th ed., 2006.
3. Networks, Lines and Fields – John D. Ryder, PHI, 2nd ed., 1999.
4. Transmission Lines and Networks – Umesh Sinha, Satya Prakashan (Tech. India Publications), New Delhi, 2001.
5. Electromagnetic Field Theory and Transmission Lines – G.S.N. Raju, Pearson Edn. Pte. Ltd., 2005.

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**ANALOG COMMUNICATIONS**

**UNIT I**

**INTRODUCTION** : Introduction to communication system, Need for modulation, Frequency Division Multiplexing , Amplitude Modulation, Definition, Time domain and frequency domain description, single tone modulation, power relations in AM waves, Generation of AM waves, square law Modulator, Switching modulator, Detection of AM Waves; Square law detector, Envelope detector.

**UNIT II**

**DSB MODULATION** : Double side band suppressed carrier modulators, time domain and frequency domain description, Generation of DSBSC Waves, Balanced Modulators, Ring Modulator, Coherent detection of DSB-SC Modulated waves, COSTAS Loop.

**UNIT III**

**SSB MODULATION** : Frequency domain description, Frequency discrimination method for generation of AM SSB Modulated Wave, Time domain description, Phase discrimination method for generating AM SSB Modulated waves. Demodulation of SSB Waves, Vestigial side band modulation: Frequency description, Generation of VSB Modulated wave, Time domain description, Envelope detection of a VSB Wave pulse Carrier, Comparison of AM Techniques, Applications of different AM Systems.

**UNIT IV**

**ANGLE MODULATION** : Basic concepts, Frequency Modulation: Single tone frequency modulation, Spectrum Analysis of Sinusoidal FM Wave, Narrow band FM, Wide band FM, Constant Average Power, Transmission bandwidth of FM Wave - Generation of FM Waves, Direct FM, Detection of FM Waves: Balanced Frequency discriminator, Zero crossing detector, Phase locked loop, Comparison of FM & AM.

**UNIT V**

**NOISE** : Noise in Analog communication System, Noise in DSB& SSB System Noise in AM System, Noise in Angle Modulation System, Threshold effect in Angle Modulation System, Pre-emphasis & de-emphasis

**UNIT VI**

**TRANSMITTERS** : Radio Transmitter - Classification of Transmitter, AM Transmitter, Effect of feed back on performance of AM Transmitter, FM Transmitter – Variable reactance type and phase modulated FM Transmitter, frequency stability in FM Transmitter.

**UNIT VII**

**RECEIVERS** : Radio Receiver - Receiver Types - Tuned radio frequency receiver, Superhetrodyne receiver, RF section and Characteristics - Frequency changing and tracking, Intermediate frequency, AGC, FM Receiver, Comparison with AM Receiver, Amplitude limiting.

**UNIT VIII**

**PULSE MODULATION** : Time Divison Multiplexing, Types of Pulse modulation, PAM (Single polarity, double polarity) PWM: Generation & demodulation of PWM, PPM, Generation and demodulation of PPM

**TEXTBOOKS :**

1. Principles of Communication Systems – H Taub & D. Schilling, Gautam Sahe, TMH, 2007 3<sup>rd</sup> Edition.
2. Communication Systems – B.P. Lathi, BS Publication, 2006.

**REFERENCES :**

1. Principles of Communication Systems - Simon Haykin, John Wiley, 2<sup>nd</sup> Ed.,.
2. Electronics & Communication System – George Kennedy and Bernard Davis, TMH 2004.
3. Communication Systems Second Edition – R.P. Singh, SP Sapre, TMH, 2007.
4. Fundamentals of Communication Systems - John G. Proakis, Masond, Salehi PEA, 2006.

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**ANALOG COMMUNICATIONS LAB**

***Minimum 12 experiments should be conducted :***

1. Amplitude modulation and demodulation.
2. Diode detector characteristics.
3. Frequency modulation and demodulation.
4. Balanced modulator.
5. Pre-emphasis & de-emphasis.
6. Characteristics of mixer.
7. Digital Phase detector.
8. Phase locked loop.
9. Synchronous detector.
10. SSB system.
11. Spectral analysis of AM and FM signals using spectrum analyzer.
12. Squelch Circuit.
13. Frequency Synthesiser.
14. AGC Characteristics.

**Equipment required for Laboratories:**

1. RPS                    -            0 – 30 V
2. CRO                   -            0 – 20 M Hz.
3. Function Generators   -            0 – 1 M Hz
4. RF Generators       -            0 – 1000 M Hz./0 – 100 M Hz.
5. Multimeters
6. Lab Experimental kits for Analog Communication
7. Components
8. Radio Receiver/TV Receiver Demo kits or Trainees.
9. Spectrum Analyzer -            60 M Hz.



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**PULSE AND DIGITAL CIRCUITS LAB**

**Minimum Twelve experiments to be conducted:**

1. Linear wave shaping.
2. Non Linear wave shaping – Clippers.
3. Non Linear wave shaping – Clampers.
4. Transistor as a switch.
5. Study of Logic Gates & Some applications.
6. Study of Flip-Flops & some applications.
7. Sampling Gates.
8. Astable Multivibrator.
9. Monostable Multivibrator.
10. Bistable Multivibrator.
11. Schmitt Trigger.
12. UJT Relaxation Oscillator.
13. Bootstrap sweep circuit.

**Equipment required for Laboratories:**

1. RPS                    -            0 – 30 V
2. CRO                   -            0 – 20 M Hz.
3. Function Generators   -            0 – 1 M Hz
4. Components
5. Multi Meters