ANNA UNIVERSITY TIRUCHIRAPPALLI
Tiruchirappalli - 620 024
Syllabus
B.E. Electronics and Communication Engineering
SEMESTER III

MATHEMATICS III

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(Common to all branches)

UNIT I PARTIAL DIFFERENTIAL EQUATIONS 9

Formation of partial differential equations by elimination of arbitrary constants and arbitrary functions – Solution of standard types of first order partial differential equations – Lagrange's linear equation – Linear partial differential equations of second and higher order with constant coefficients.

UNIT II FOURIER SERIES 9

Dirichlet's conditions – General Fourier series – Odd and even functions – Half range sine series – Half range cosine series – Complex form of Fourier Series – Parseval's identity – Harmonic Analysis.

UNIT III BOUNDARY VALUE PROBLEMS 9

Classification of second order quasi linear partial differential equations – Solutions of one dimensional wave equation – One dimensional heat equation – Steady state solution of two–dimensional heat equation (Insulated edges excluded) – Fourier series solutions in Cartesian coordinates.

UNIT IV FOURIER TRANSFORM 9

Fourier integral theorem (without proof) – Fourier transform pair – Sine and Cosine transforms – Properties – Transforms of simple functions – Convolution theorem – Parseval's identity.

UNIT V Z – TRANSFORM AND DIFFERENCE EQUATIONS 9

Z–Transform – Elementary properties – Inverse Z–Transform – Convolution theorem – Formation of difference equations – Solution of difference equations using Z–Transform.

L: 45 T: 15 Total: 60

TEXT BOOK

1. Grewal B.S., "Higher Engineering Mathematics", Fortieth Edition , Khanna Publishers, 2007.

REFERENCES

1. Churchill R.V. and Brown J.W., "Fourier Series and Boundary Value Problems", Fourth Edition , McGraw-Hill Book Co., 1987.
2. Veerarajan .T, "Engineering Mathematics III", Tata McGraw-Hill Education, Third Edition, 2007.
3. Kandasamy P., Thilagavathy K. and Gunavathy K., "Engineering Mathematics Volume III", S. Chand & Company ltd., 1996.

CIRCUIT ANALYSIS

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UNIT I DC CIRCUIT ANALYSIS 9

Basic components and electric circuits – Charge – Current – Voltage and Power– Voltage and Current Sources – Ohms Law – Voltage and Current laws – Kirchoff's Current Law – Kirchoff's voltage law – The single Node – Pair Circuit – Series and Parallel Connected Independent Sources – Resistors in Series and Parallel – Voltage and Current division – Basic Nodal and Mesh analysis – Nodal analysis – Mesh analysis.

UNIT II NETWORK THEOREM AND DUALITY 8

Useful Circuit Analysis techniques – Linearity and superposition – Thevenin and Norton Equivalent Circuits – Maximum Power Transfer – Delta – Wye Conversion – Duality – Dual circuits.

UNIT III SINUSOIDAL STEADY STATE ANALYSIS 10

Sinusoidal Steady – State analysis – Characteristics of Sinusoids– The Complex Forcing Function– The Phasor– Phasor relationship for R– L – C – impedance and Admittance – Nodal and Mesh Analysis– Phasor Diagrams – AC Circuit Power Analysis – Instantaneous Power – Average Power – apparent Power and Power Factor – Complex Power.

UNIT IV TRANSIENTS AND RESONANCE IN RLC CIRCUITS 9

Basic RL and RC Circuits – The Source – Free RL Circuit – The Source–Free RC Circuit – The Unit-Step Function – Driven RL Circuits – Driven RC Circuits – RLC Circuits – Frequency Response – Parallel Resonance – Series Resonance – Quality Factor.

UNIT V COUPLED CIRCUITS AND TOPOLOGY 9

Magnetically coupled circuits – Mutual inductance – the Linear Transformer – the Ideal Transformer – An introduction to Network Topology – Trees and General Nodal analysis – Links and Loop analysis.

L: 45 T: 15 Total: 60

TEXT BOOKS

1. William H.Hayt, Jr.Jack E. Kemmerly, Steven M.Durbin, "Engineering Circuit Analysis", Sixth Edition , Tata McGraw-Hill, 2006.
2. David A Bell, "Electric Circuits", PHI, 2006.

REFERENCES

1. Nilson,Reidal., "Electric Circuits" Eighth Edition , Pearson Education, 2008
2. Charles K. Alexander & Mathew N.O.Sadiku, "Fundamentals of Electric Circuits", Second Edition , McGraw- Hill, 2003.
3. Sudhakar and Shyammohan S. Palli, Third Edition , Tata Mc Graw -Hill, 2007.
4. D.R.Cunningham, J.A.Stuller, "Basic Circuit Analysis", Jaico Publishing House, 1996.
5. David E.Johnson, Johny R. Johnson, John L.Hilburn, "Electric Circuit Analysis", Second Edition , Prentice-Hall, 1997
6. K.V.V.Murthy, M.S.Kamath, "Basic Circuit Analysis", Jaico Publishing House, 1999.

ELECTRONIC DEVICES

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UNIT I ELECTRON BALLISTICS AND APPLICATIONS 9

Force on charged particles in an electric field – magnetic field – calculation of electrostatic and magnetic deflection sensitivity in cathode ray tube – analysis of parallel and perpendicular electric and magnetic fields – cyclotron – energy band structure of conductors – intrinsic and extrinsic semiconductor – N and P type – insulators – Hall effect.

UNIT II SEMICONDUCTOR DIODES 9

PN junction – derivation of diode equation – current components – switching characteristics of diode – common diode applications – characteristics and applications of Varactor diode and Zener diode – Mechanism of Avalanche and Zener breakdown – backward diode – tunnel diode – PIN diode – point contact diode – Schottky barrier diode – photo diode – APD – light emitting diodes.

UNIT III BIPOLAR JUNCTION TRANSISTORS AND FIELD EFFECT TRANSISTORS 9

Bipolar junction transistor – PNP and NPN action – current components – Eber-Moll model – transistor switching times – comparison of CE, CB and CC configuration – BJT applications – construction and characteristics of JFET – Relation between Pinch-off voltage and Drain current – MOSFET – enhancement and depletion types – MESFET – introduction to VMOS and CMOS devices.

UNIT IV TRANSISTOR BIASING 9

BJT – operating point – need for biasing – various biasing methods of BJT – bias stability – stability parameters – biasing methods of FET – use of JFET as a voltage variable resistor (VVR).

UNIT V REGULATED POWER SUPPLY AND POWER CONTROL DEVICES 9

Basic elements of regulated power supply system – stabilization – series and shunt voltage regulators – general purpose and monolithic linear regulators – SMPS – power control devices – characteristics and equivalent circuit of UJT – intrinsic stand off ratio – PUT – PNPN diode – two transistor model – SUS, SCR, DIAC,TRIAC.

L: 45 T: 15 Total: 60

TEXT BOOK

1. Jacob Millman & Christos C. Halkias, “Electronic Devices and Circuits” Tata McGraw-Hill, 1991.
2. Robert T.Paynter, “Introductory Electronic Devices and Circuits”, Seventh Edition**,** Pearson Education, 2006.

REFERENCES

1. R.L. Boylestad and L. Nashelsky, “Electronic Devices and Circuit Theory”, Prentice Hall of India,1997
2. Allen Mottershead, “Electronic Devices and Circuits – An Introduction”, Prentice Hall of India, 2003.
3. S.Salivahanan, N.Sureshkumar and A.Vallavaraj, “Electronic Devices and Circuits”, Tata McGraw-Hill, 1998.

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DIGITAL SYSTEM DESIGN

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UNIT I BASIC CONCEPTS AND COMBINATIONAL CIRCUITS 9

Number Systems – n's complement – Codes – Sum of products and product of sums– Minterms and Maxterms– Karnaugh map and Tabulation method – problem formulation and design of Combinational Circuits – Adder – Subtractor – Encoder/decoder – three state devices, Priority Encoder– Mux/Demux – Code–converters – Comparators.

UNIT II SEQUENTIAL CIRCUITS 9

Flip flops – SR– JK– T– D– Master/Slave FF– Triggering of FF– Analysis of clocked sequential circuits – their design– state minimization – Moore/Mealy model – state assignment – circuit implementation – Registers – shift registers – Ripple counters– Synchronous counters – Timing signal – RAM – Memory decoding – Semiconductor memories – Feedback sequential – Circuit analysis and design – Sequential Circuit Design with Verilog.

UNIT III FUNDAMENTAL MODE SEQUENTIAL CIRCUITS 9

Stable – Unstable states – output specifications – cycles and races – state reduction – race free assignments – Hazards – Essential Hazards – Pulse mode sequential circuits – Design of Hazard free circuit.

UNIT IV MEMORY, CPLDs AND FPGAs 9

Classification of memories – Implementation of combinational logic using standard ICs – ROM – EPROM and EEPROM– ROM – Read/Write memory – Static RAM – Dynamic RAM– PAL– PLA– CPLD – FPGA XL 4000 – CLBs – I/O Block – Programmable Inter connects – Realization of simple combinational and sequential circuits – Coding of Combination Circuits using Verilog

UNIT V LOGIC FAMILIES 9

Logic families – TTL – NMOS – CMOS – BiCMOS logic–Electrical behavior–static– dynamic – CMOS input and output structures – CMOS logic families – low voltage CMOS logic & interfacing – Bipolar logic realization of NAND and NOR logic.

L: 45 T: 15 Total: 60

TEXT BOOKS

1. Morris Mano, " Digital logic ", Prentice Hall of India, 1998
2. John. F. Wakerly, "Digital design principles and practices", Fourth Edition , Pearson Education, 2007.

REFERENCES

1. Charles H. Roth, Jr, "Fundamentals of Logic Design", Fourth Edition , Jaico Books, 2002
2. Floyd T.L., "Digital Fundamentals", Charles E. Merril publishing company, 1982
3. Jain R.P., "Modern Digital Electronics", Tata McGraw Hill, 1999.
4. Donald L Schillings, Charles Belove., "Electronic circuits – Discrete and Integrated", McGrawHill.

DATA STRUCTURES

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UNITI PROBLEM SOLVING **9**

Problem Solving – Top-down Design – Implementation – Verification – Efficiency – Analysis – Sample Algorithms.

UNIT II LISTS - STACKS AND QUEUES **8**

Abstract Data Type (ADT) – The List ADT – The Stack ADT – The Queue ADT

UNIT III TREES **10**

Binary Trees – The Search Tree ADT – Binary Search Trees – AVL Trees – Tree Traversals – Hashing – General Idea – Hash Function – Separate Chaining – Open Addressing – Linear Probing – Priority Queues (Heaps) – Model – Simple Implementations – Binary Heap

UNIT IV SORTING **9**

Insertion Sort–Shell Sort – Heap Sort – Merge Sort – Quick Sort – External Sorting

UNIT V GRAPHS **9**

Topological Sort – Shortest Path Algorithms – Unweighted Shortest Paths – Dijkstra's Algorithm – Minimum Spanning Tree – Prim's Algorithm – Applications of Depth-First Search – Undirected Graphs – Biconnectivity – Introduction to NP Completeness

Total: 45

TEXT BOOKS

1. R. G. Dromey, "How to Solve it by Computer" (Chapters 1 -2), Prentice-Hall of India, 2002.
2. M. A. Weiss, "Data Structures and Algorithm Analysis in C", Second Edition , Pearson Education, 2002.

REFERENCES

1. Y. Langsam M. J. Augenstein and A. M. Tenenbaum, "Data Structures using C", Pearson Education, 2004
2. Richard F. Gilberg, Behrouz A. Forouzan, "Data Structures - A Pseudocode Approach with C", Thomson Brooks / COLE, 1998.
3. Aho J. E. Hopcroft and J. D. Ullman, "Data Structures and Algorithms", Pearson education, 1983.
4. Harowitz,Sahani,Anderson-Freed, Second Edition, "Fundamentals of Data Structures in C", 2007.

ENVIRONMENTAL SCIENCE AND ENGINEERING

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UNIT I IMPORTANCE OF ENVIRONMENTAL STUDIES 9

Definition – Scope and Importance – Need for Public Awareness – Forest resources – Water resources – Mineral resources – Land resources – Energy resources – Food resources – Equitable use of resources for sustainable lifestyles.

UNIT II ECOSYSTEMS AND BIO DIVERSITY 9

Concept of Ecosystem – Structure and function of an ecosystem – Energy flow in the ecosystem – Food chains – Food webs – Ecological Pyramids – Definition of Bio–diversity – Bio–geographical classification in India – Value of bio–diversity – Bio–diversity at Global – National and local levels – India as a mega diversity nation – Hot spots of bio diversity – Threats to bio diversity – Conservation of bio–diversity

UNIT III ENVIRONMENTAL POLLUTION 9

Definition – Causes and Effects of Environmental Pollution – Air Pollution – Water Pollution – Soil Pollution – Marine Pollution – Noise Pollution – Thermal Pollution – Nuclear Hazards – Solid waste management – Societal role in Pollution prevention – Environmental Disasters and management.

UNIT IV SOCIAL ISSUES AND THE ENVIRONMENT 9

Unsustainable to sustainable development – Concept of conservation – Water and energy conservation – Rain water harvesting – Climate change – Global warning – Acid rain – Ozone layer depletion – Nuclear accidents and holocaust – Environmental protection Act – Issues involved in Enforcement of Environmental legislation – Public awareness.

UNIT V HUMAN POPULATION AND THE ENVIRONMENT 9

Population growth – Population explosion – Family welfare programme – Environment and Human Health – Human rights – Value education – HIV / AIDS – Women and child welfare – Role of IT in Environment and Human Health

Total: 45

TEXT BOOKS

1. Gilbert M. Masters, “Introduction to Environmental Engineering and Science”, Second Edition , Pearson Education, 2004.
2. Miller T.G. Jr., “Environmental Science Working With the Earth”, Thomson Learning.
3. Trivedi R.K and P.K. Goel, “Introduction to Air Pollution”, Techno-Science Publications.

REFERENCES

1. Bharucha Erach, “The Biodiversity of India”, Mapin Publishing, Ahmedabad.
2. Trivedi R.K., “Handbook of Environmental Laws, Rules, Guidelines, Compliances and Standards”, Vol.I and II Environ Media.
3. Cunningham W.P. Copper, T.H. Gorhani, “Environmental Encyclopaedia”, Jaico Publ., Mumbai, 2001.

ELECTRONIC DEVICES LABORATORY

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1. Measurement of characteristics of PN Junction Diode.
2. Measurement of characteristics of Zener Diode
3. Measurement of characteristics of Special Diodes such as
   - (i)Varactor Diode
   - (ii)Tunnel Diode
   - (iii)Photo Diode
   - (iv)Schottky Diode
4. Clipper and Clamper Circuits using Diode.
5. Design and testing of Rectifiers with and without Filters.
6. Input and Output characteristics of BJT and determination of h- parameters from the graph.
7. Output characteristics of JFET.
   - (i) Plot of Transfer characteristics from the output characteristics.
   - (ii) Determination of pinch off voltage and Idss
8. Fixed Bias amplifier circuits using BJT.
   - (i) Waveforms at input and output without bias.
   - (ii) Determination of bias resistance to locate Q-point at center of load line.
   - (iii) Measurement of h_{FE} and gain.
   - (iv) Calculation of $h_{ie}=V_T/Ib_{dc}$ and gain assuming $h_{FE}= h_{fe}$.
   - (v) Plot of frequency response.
9. BJT Amplifier using voltage divider bias (self bias) with unbypassed emitter resistor.
   - (i) Measurement of input resistance and gain
   - (ii) Comparison with calculated values.
   - (iii) Plot of DC collector current as a function of collector resistance.
10. Source follower with Bootstrapped gate resistance.
    - (i) Measurement of gain, input resistance and output resistance with and without
    - (ii) Bootstrapping.
    - (iii) Comparison with calculated values.
11. Measurement of UJT and SCR Characteristics.
    - (i) Firing Characteristics of SCR.
    - (ii) Measurements of Intrinsic stand off ratio of UJT.
    - (iii) Measurement of DIAC and TRIAC Characteristics.
12. Study of SMPS.

Total: 45

DIGITAL SYSTEM DESIGN LABORATORY

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1. Design and implementation of Adders and Subtractors using logic gates.
2. Design and implementation of code converters using logic gates
   - (i) BCD to excess–3 code and voice versa
   - (ii) Binary to gray and vice–versa
3. Design and implementation of 4 bit binary Adder/ subtractor and BCD adder using IC 7483
4. Design and implementation of2Bit Magnitude Comparator using logic gates 8 Bit Magnitude Comparator using IC 7485
5. Design and implementation of 16 bit odd/even parity checker generator using IC74180.
6. Design and implementation of Multiplexer and De–multiplexer using logic gates and study of IC74150 and IC 74154
7. Design and implementation of encoder and decoder using logic gates and study of IC7445 and IC74147
8. Construction and verification of 4 bit ripple counter and Mod–10 / Mod–12 Ripple counters
9. Design and implementation of 3–bit synchronous up/down counter
10. Implementation of SISO, SIPO, PISO and PIPO shift registers using Flip– flops

Total: 45

DATA STRUCTURES LABORATORY

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Implement the following exercises using C:

1. Array implementation of List Abstract Data Type (ADT)
2. Linked list implementation of List ADT
3. Cursor implementation of List ADT
4. Array implementations of Stack ADT
5. Linked list implementations of Stack ADT
   The following three exercises are to be done by implementing the following source files
   (a) Program for 'Balanced Paranthesis'
   (b) Array implementation of Stack ADT
   (c) Linked list implementation of Stack ADT
   (d) Program for 'Evaluating Postfix Expressions'
   An appropriate header file for the Stack ADT should be #included in (a) and (d)

6. Implement the application for checking 'Balanced Paranthesis' using array implementation of
7. Stack ADT (by implementing files (a) and (b) given above)
8. Implement the application for checking 'Balanced Paranthesis' using linked list implementation of Stack ADT by using file (a) from experiment 6 and implementing file (c))
   Implement the application for 'Evaluating Postfix Expressions' using array and linked list implementations of Stack ADT (by implementing file (d) and using file (b) – and then by using files (d) and (c))
9. Queue ADT
10. Search Tree ADT – Binary Search Tree
11. Heap Sort
12. Quick Sort

Total: 45

SEMESTER IV

RANDOM PROCESSES

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UNIT I PROBABILITY AND RANDOM VARIABLE 9

Axioms of probability – Conditional probability – Total probability – Baye's theorem – Random variable – Probability mass function – Probability density functions – Properties –Moments – Moment generating functions and their properties.

UNIT II STANDARD DISTRIBUTIONS 9

Binomial – Poisson – Uniform – Exponential – Gamma – Normal distributions and their properties – Functions of a random variable – Chebyshev Inequality.

UNIT III TWO DIMENSIONAL RANDOM VARIABLES 9

Joint distributions – Marginal and conditional distributions – Covariance – Correlation and regression – Transformation of random variables – Central limit theorem.

UNIT IV CLASSIFICATION OF RANDOM PROCESSES 9

Definition and examples – first order – second order – strictly stationary – wide – sense stationary and Ergodic processes – Markov process – Binomial – Poisson and Normal processes – Sine wave process.

UNIT V CORRELATION AND SPECTRAL DENSITIES 9

Auto correlation – Cross correlation – Properties – Power spectral density – Cross spectral density – Properties – Wiener –Khintchine relation – Relationship between cross power spectrum and cross correlation function – Linear time invariant system – System transfer function –Linear systems with random inputs – Auto correlation and cross correlation functions of input and output.

L: 45 T: 15 Total: 60

TEXT BOOKS

1. Ross S., "A First Course in Probability", Seventh Edition , Pearson Education, 2006.
2. S.Karlin and H.M. Taylor, "An Introduction to Stochastic Modeling", Academic Press, 2007.

REFERENCES

1. Veerarajan T., "Probabilitiy – Statistics and Random process", Second Edition , Tata McGraw–Hill, 2006.
2. Richard A Johnson, "Probability and Statistics for Engineers" Seventh Edition , Pearson Education, 2005.
3. Mood, Alexander McFarlane, "Introduction to Theory of Statistics", Tata McGraw – Hill,1974.

ELECTRONIC CIRCUITS

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UNIT I MIDBAND ANALYSIS OF SMALL SIGNAL AMPLIFIERS 9

Midband analysis of single stage CE, CB and CC amplifiers – Miller's theorem – comparison of CB, CE and CC amplifiers – Darlington connection using similar and complementary transistors – bootstrapping – basic emitter coupled differential amplifier circuit – CMRR – use of constant current circuit to improve CMRR – use as linear amplifier – limiter – amplitude modulator – FET amplifiers – CS, CG and CD – multistage amplifiers.

UNIT II FREQUENCY RESPONSE OF AMPLIFIERS 9

General shape of frequency response of amplifiers – cut-off frequencies and bandwidth – low frequency analysis of amplifiers – hybrid – pi equivalent circuit of BJT – high frequency analysis of BJT amplifiers – FET – high frequency analysis – gain-bandwidth product – multistage amplifiers – amplifier rise time and lag time with relation to cut off frequencies.

UNIT III UNTUNED AMPLIFIERS 9

Amplifiers – classification – distortion – frequency response -analysis of low frequency response of RC-coupled amplifier – cascaded CE stage – step response of an amplifier – bandpass of cascaded stages – effect of an emitter (or a source) by pass capacitor on low – frequency response – noise.

UNIT IV FEEDBACK AMPLIFIERS AND OSCILLATORS 9

Feedback concept – characteristics of negative feedback amplifiers – analysis of feedback amplifiers – voltage series – voltage shunt – current series – current shunt types – oscillator – general form – analysis of sinusoidal – phase-shift – resonant – circuit – Wien Bridge – Colpits – Unijunction and Crystal oscillator.

UNIT V LARGE SIGNAL AMPLIFIERS 9

Classification of amplifiers (class A, B, AB, C and D) – efficiency of class A – RC coupled and transformer-coupled power amplifiers – class B complementary-symmetry – push-pull power amplifiers – calculation of power output – efficiency and power dissipation – crossover distortion and methods of elimination – heat sink design.

L: 45 T: 15 Total: 60

TEXT BOOKS

1. J. Millman and C. Halkias, "Integrated Electronics", Tata McGraw-Hill.
2. T. Robert Paynter, "Introductory Electronic Devices and Circuits", Seventh Edition, Pearson Education, 2006.

REFERENCES

1. L. Robert Boylestad and Louis Nashelsky, Eighth Edition, Pearson Education, 2002.
2. Jacob Millman and Christos C. Halkias, "Electronic Devices and Circuits" Tata McGraw-Hill, 1991.
3. S. Salivahanan, N. Sureshkumar and A. Vallava Raj, "Electronic Devices and Circuits", Tata McGraw-Hill, 1998.
4. Floyd, "Electronic Devices", Sixth Edition, Pearson Education, 2003.

LINEAR INTEGRATED CIRCUITS

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UNIT I CIRCUIT CONFIGURATION FOR LINEAR ICs 9

Current sources – Analysis of difference amplifiers with active loads – supply and temperature independent biasing – Band gap references – Monolithic IC operational amplifiers – specifications – frequency compensation – slew rate and methods of improving slew rate.

UNIT II APPLICATIONS OF OPERATIONAL AMPLIFIERS 9

Linear and Nonlinear Circuits using operational amplifiers and their analysis – Inverting and Non inverting Amplifiers – Differentiator – Integrator – Voltage to current converter – Instrumentation amplifier – Sine wave Oscillator – Low – pass –High – pass and band – pass filters – Comparator – Multivibrators and Schmitt trigger – Triangular wave generator – Precision rectifier – Log and Antilog amplifiers – Non –linear function generator.

UNIT III ANALOG MULTIPLIER AND PLL 9

Analysis of four quadrant (Gilbert cell) and variable transconductance multipliers – Voltage controlled Oscillator – Closed loop analysis of PLL – AM – PM and FSK modulators and demodulators – Frequency synthesizers – Comparator ICs.

UNIT IV ANALOG TO DIGITAL AND DIGITAL TO ANALOG CONVERTERS 9

Analog switches – High speed sample and hold circuits and sample and hold ICs – Types of D/A converter – Current driven DAC – Switches for DAC – A/D converter –Flash – Single slope – Dual slope – Successive approximation – Delta Sigma Modulation – Voltage to Time converters.

UNIT V SPECIAL FUNCTION INTEGRATED CIRCUITS 9

Astable and Monostable Multivibrators using 555 Timer – Voltage regulators –linear and switched mode types – Switched capacitor filter – Frequency to Voltage converters – Tuned amplifiers – Power amplifiers and Isolation Amplifiers – Video amplifiers – Fiber optic ICs and Opto –couplers.

Total: 45

TEXT BOOKS

1. Sergio Franco, “Design with operational amplifiers and analog integrated circuits”, McGraw–Hill, 1997.
2. D.Roy Choudhry and Shail Jain, “Linear Integrated Circuits”, New Age International, 2000.

REFERENCES

1. Gray and Meyer, “Analysis and Design of Analog Integrated Circuits”, Wiley, 1995.
2. J.Michael Jacob, “Applications and Design with Analog Integrated Circuits”, Prentice Hall of India, 1996.
3. Ramakant A.Gayakwad, “OP-AMP and Linear IC’s”, Prentice Hall / Pearson Education, 1994.
4. K.R.Botkar, “Integrated Circuits”, Khanna Publishers, 1996.
5. Taub and Schilling, Digital Integrated Electronics, McGraw-Hill, 1997.
6. Millman.J. and Halkias.C.C, “Integrated Electronics”, McGraw-Hill, 1972.
7. William D.Stanely, “Operational Amplifiers with Linear Integrated Circuits”, Pearson Education, 2004.

SIGNALS AND SYSTEMS

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UNIT I REPRESENTATION OF SIGNALS 9

Continuous and discrete time signals- Classification of Signals – Periodic – Aperiodic even – odd – energy and power signals – Deterministic and random signals – complex exponential and sinusoidal signals – periodicity – properties of discrete time –complex exponential unit impulse – unit step impulse functions – Transformation in independent variable of signals: time scaling – time shifting. Determination of Fourier series representation of continuous time and discrete time periodic signals – properties of continuous time and discrete time Fourier series.

UNIT II ANALYSIS OF CONTINUOUS TIME SIGNALS AND SYSTEMS 9

Continuous time Fourier Transform and Laplace Transform analysis with examples – properties– Parseval's relation – and convolution in time and frequency domains – Basic properties of continuous time systems: Linearity – Causality – time invariance – stability – magnitude and Phase representations of frequency response of LTI systems –Analysis and characterization of LTI systems using Laplace transform: Computation of impulse response and transfer function using Laplace transform.

UNIT III SAMPLING THEOREM AND Z – TRANSFORMS 9

Representation of continuous time signals by its sample – Sampling theorem – Reconstruction of a Signal from its samples – aliasing – discrete time processing of continuous time signals – sampling of band pass signals.Basic principles of z – transform – definition – Region Of Convergence (ROC) – properties of ROC – Properties of z – transform – Poles and Zeros – inverse z – transform using Contour integration – Residue Theorem – Power Series expansion and Partial fraction expansion – Relationship between z –transform and Fourier transform.

UNIT IV DISCRETE TIME SYSTEMS 9

Computation of Impulse response & Transfer function using Z Transform. DTFT Properties and examples – LTI –DT systems –Characterization using difference equation – Block diagram representation – Properties of convolution and the interconnection of LTI Systems – Causality and stability of LTI Systems.

UNIT V SYSTEMS WITH FINITE AND INFINITE DURATION IMPULSE RESPONSE 9

Systems with finite duration and infinite duration impulse response – recursive and non–recursive discrete time system – realization structures – direct form – I– direct form – II– Transpose – cascade and parallel forms.

L: 45 T: 15 Total: 60

TEXT BOOK

1. AlanV.Oppenheim, Alan S.Willsky with S.Hamid Nawab, "Signals & Systems", Second Edition , Pearson Education, 1997.
2. Alan V.Oppenheim, Ronald W.Schaffer, "Digital Signal Processing", Prentice Hall of India

REFERENCES

1. John G.Proakis and Dimitris G.Manolakis, "Digital Signal Processing-Principles, Algorithms and Applications", Third edition, PHI, 2000.
2. M.J.Roberts, "Signals and Systems Analysis using Transform method and MATLAB",TMH, 2003.
3. Simon Haykin and Barry Van Veen, "Signals and Systems", John Wiley, 1999.
4. Moman H. Hays, "Digital Signal Processing", Schaum's outlines, Tata McGraw-Hill, 2004.

ELECTROMAGNETIC FIELDS

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UNIT I STATIC ELECTRIC FIELDS 9

Introduction to Co –ordinate System – Rectangular – Cylindrical and Spherical Co– ordinate System – Introduction to line – Surface and Volume Integrals – Definition of Curl – Divergence and Gradient – Meaning of Strokes theorem and Divergence theorem Coulomb's Law in Vector Form – Definition of Electric Field Intensity – Principle of Superposition – Electric Field due to discrete charges – Electric field due to continuous charge distribution – Electric Field due to charges distributed uniformly on an infinite and finite line – Electric Field on the axis of a uniformly charged circular disc – Electric Field due to an infinite uniformly charged sheet. Electric Scalar Potential – Relationship between potential and electric field – Potential due to infinite uniformly charged line – Potential due to electrical dipole – Electric Flux Density – Gauss Law – Proof of Gauss Law – Applications.

UNIT II STATIC MAGNETIC FIELD 9

The Biot –Savarts Law in vector form – Magnetic Field intensity due to a finite and infinite wire carrying a current I – Magnetic field intensity on the axis of a circular and rectangular loop carrying a current I – Ampere's circuital law and simple applications. Magnetic flux density – The Lorentz force equation for a moving charge and applications – Force on a wire carrying a current I placed in a magnetic field – Torque on a loop carrying a current I – Magnetic moment – Magnetic Vector Potential.

UNITIII ELECTRIC AND MAGNETIC FIELDS IN MATERIALS 9

Poisson's and Laplace's equation – Electric Polarization –Nature of dielectric materials – Definition of Capacitance – Capacitance of various geometries using Laplace's equation – Electrostatic energy and energy density – Boundary conditions for electric fields – Electric current – Current density – point form of ohm's law – continuity equation for current.Definition of Inductance – Inductance of loops and solenoids – Definition of mutual inductance – simple examples. Energy density in magnetic fields – Nature of magnetic materials – magnetization and permeability – magnetic boundary conditions.

UNIT IV TIME VARYING ELECTRIC AND MAGNETIC FIELDS 9

Faraday's law – Maxwell's Second Equation in integral form from Faraday's Law – Equation expressed in point form. Displacement current – Ampere's circuital law in integral form – Modified form of Ampere's circuital law as Maxwell's first equation in integral form – Equation expressed in point form. Maxwell's four equations in integral form and differential form. Poynting Vector and the flow of power – Power flow in a co –axial cable – Instantaneous Average and Complex Poynting Vector.

UNIT ELECTROMAGNETIC WAVES 9

Derivation of Wave Equation – Uniform Plane Waves – Maxwell's equation in Phasor form – Wave equation in Phasor form – Plane waves in free space and in a homogenous material.

Wave equation for a conducting medium – Plane waves in lossy dielectrics – Propagation in good conductors – Skin effect. Linear – Elliptical and circular polarization – Reflection of Plane Wave from a conductor – normal incidence – Reflection of Plane Waves by a perfect dielectric – normal and oblique incidence – Dependence on Polarization – Brewster angle.

L: 45 T: 15 Total: 60

TEXTBOOKS

1. William H.Hayt : “Engineering Electromagnetics”, Tata Mc GrawHill, 2003.
2. E.C. Jordan & K.G. Balmain, “Electromagnetic Waves and Radiating Systems”, Second Edition , Prentice Hall of India, 2003.

REFERENCES

1. Ramo, Whinnery and Van Duzer, “Fields and Waves in Communications Electronics”, Third Edition , John Wiley & Sons, 2003.
2 Narayana Rao, N, “Elements of Engineering Electromagnetics”, Fourth Edition , Prentice Hall of India, 1998.
3. M.N.O.Sadiku, “Elements of Engineering Electromagnetics”, Third Edition , Oxford University Press, 2000.
4. David K.Cherp, “Field and Wave Electromagnetics”, Second Edition , Pearson Edition, 2004.
5. David J.Grithiths, “Introduction to Electrodynamics”, Third Edition , PHI, 2004.

ELECTRICAL MACHINES

L	T	P
3	0	0

UNIT I D.C. MACHINES **9**

Constructional details – emf equation – Methods of excitation – Self and separately excited generators – Characteristics of series – shunt and compound generators – Principle of operation of D.C. motor – Back emf and torque equation – Characteristics of series – shunt and compound motors – Starting of D.C. motors – Types of starters – Testing – brake test and Swinburne's test – Speed control of D.C. shunt motors.

UNIT II TRANSFORMERS **9**

Constructional details – Principle of operation – emf equation – Transformation ratio – Transformer on no load – Parameters referred to HV/LV windings – Equivalent circuit – Transformer on load – Regulation – Testing – Load test – open circuit and short circuit tests.

UNIT III INDUCTION MOTORS **9**

Construction – Types – Principle of operation of three – phase induction motors – Equivalent circuit – Performance calculation – Starting and speed control – Single –phase induction motors (only qualitative treatment).

UNIT IV SYNCHRONOUS AND SPECIAL MACHINES **9**

Construction of synchronous machines – types – Induced emf – Voltage regulation emf and mmf methods – Brushless alternators – Reluctance motor – Hysteresis motor – Stepper motor.

UNIT V TRANSMISSION AND DISTRIBUTION **9**

Structure of electric power systems – Generation – transmission – sub –transmission and distribution systems – EHVAC and EHVDC transmission systems – Substation layout – Insulators – cables.

Total: 45

TEXT BOOKS

1. D.P.Kothari and I.J.Nagrath, "Basic Electrical Engineering", Second Edition, Tata McGraw Hill, 2002.
2. C.L. Wadhwa, "Electrical Power Systems", Wiley eastern, 1985.

REFERENCES

1. S.K.Bhattacharya, "Electrical Machines", Second Edition, Tata McGraw Hill, 1998.
2. V.K.Mehta and Rohit Mehta, "Principles of Power System", Third Edition, S.Chand and Company, 2003.

ELECTRONICS CIRCUITS AND SIMULATION LABORATORY

L	T	P
0	0	3

1. Series and Shunt feedback amplifiers - Frequency response, Input and output impedance calculation
2. Class B Complementary symmetry power amplifier
   - Observation of the output wave form with cross over Distortion.
   - Modification of the circuit to avoid cross over distortion.
   - Measurement of maximum power output.
   - Determination of efficiency.
   - Comparison with calculated values.
3. Differential amplifier using BJT.
   - Construction of the circuit.
   - Measurement of DC collector current of individual transistors.
   - Equalization of DC current using individual emitter resistance (50 – 100 Ohms)
   - Measurement of CMRR.
4. Design of oscillator
   - RC Phase shift
   - Wein Bridge Oscillator
   - Hartley and Colpitts Oscilator.
5. Class C Tuned Amplifier.

SIMULATION USING PSPICE / MULTISIM

1. Differentiatial amplifier
2. Active filter: Butterworth IInd order LPF
3. Astable, Monostable and Bistable Multivibrator - Transistor bias
4. D/A and A/D converter (Successive approximation)
5. Analog multiplier
6. CMOS Invertors, NAND and NOR

Total: 45

LINEAR INTEGRATED CIRCUITS LABORATORY

L	T	P
0	0	3

DESIGN AND TESTING

1. Inverting – Non inverting and differential amplifiers.
2. Integrator and Differentiator.
3. Instrumentation amplifier.
4. Active lowpass, hidh pass and bandpass filter.
5. Astable – Monostable multivibrators and Schmitt Trigger using op – amp.
6. Phase shift and Wien bridge oscillator using op –amp.
7. Astable and monostable using NE555 Timer.
8. PLL characteristics and Frequency Multiplier using PLL.
9. DC power supply using LM317 and LM723.
10. Study of SMPS control IC SG3524 / SG3525.

Total: 45

ELECTRICAL MACHINES LABORATORY

L	T	P
0	0	3

1. Open circuit and load characteristics of separately excited and self excited D.C. generator.
2. Load test on D.C. shunt motor.
3. Load test on D.C. series motor.
4. Swinburne's test and speed control of D.C. shunt motor.
5. Load test on single phase transformer and open circuit and short circuit test on single phase transformer
6. Regulation of three phase alternator by EMF and MMF methods.
7. Load test on three phase induction motor.
8. No load and blocked rotor tests on three phase induction motor (Determination of equivalent circuit parameters)
9. Load test on single–phase induction motor.
10. Study of D.C. motor and induction motor starters.

Total: 45