JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

Course Structure for B. Tech (Electrical and Electronics Engineering)

(2015-16)

II B. Tech (EEE) – I Sem

S.No	Course Code	Subject	Th	Tu	Lab	C
1	15A54301	Mathematics –III	3	1	-	3
2	15A02301	Electrical Circuits – II	3	1	-	3
3	15A02302	Electrical Machines – I	3	1	-	3
4	15A02303	Control Systems Engineering	3	1	-	3
5	15A04301	Electronic Devices & Circuits	3	1	-	3
6	15A05201	Data Structures	3	1	-	3
7	15A02305	Electrical Circuits Simulation Laboratory	-		4	2
8	15A04305	Electronic Devices & Circuits Laboratory	-		4	2
		Total	**18**	**6**	**8**	**22**

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(15A54301) MATHEMATICS-III

(Common to All Branches)

Objectives:

- This course aims at providing the student with the concepts of Matrices, Numerical Techniques and Curve fitting.

UNIT – I

Elementary row transformations-Rank – Echelon form, normal form – Consistency of System of Linear equations. Linear transformations. Hermitian, Skew-Hermitian and Unitary matrices and their properties. Eigen Values, Eigen vectors for both real and complex matrices. Cayley – Hamilton Theorem and its applications – Diagonolization of matrix. Calculation of powers of matrix and inverse of a matrix. Quadratic forms – Reduction of quadratic form to canonical form and their nature.

UNIT – II

Solution of Algebraic and Transcendental Equations: The Bisection Method – The Method of False Position– Newton-Raphson Method, Solution of linear simultaneous equation: Crout's triangularisation method, Gauss - Seidal iteration method.

UNIT – III

Interpolation: Newton's forward and backward interpolation formulae – Lagrange's formulae. Gauss forward and backward formula, Stirling's formula, Bessel's formula.

UNIT – IV

Curve fitting: Fitting of a straight line – Second degree curve – Exponentional curve-Power curve by method of least squares. Numerical Differentiation for Newton's interpolation formula. Numerical Integration: Trapezoidal rule – Simpson's 1/3 Rule – Simpson's 3/8 Rule.

UNIT – V

Numerical solution of Ordinary Differential equations: Solution by Taylor's series-Picard's Method of successive Approximations-Euler's Method-Runge-Kutta Methods. Numerical solutions of Laplace equation using finite difference approximation.

TEXT BOOKS:

1. Higher Engineering Mathematics, B.S.Grewal, Khanna publishers.
2. Introductory Methods of Numerical Analysis, S.S. Sastry, PHI publisher.

REFERENCES:

1. Engineering Mathematics, Volume - II, E. Rukmangadachari Pearson Publisher.
2. Mathematical Methods by T.K.V. Iyengar, B.Krishna Gandhi, S.Ranganatham and M.V.S.S.N.Prasad, S. Chand publication.
3. Higher Engineering Mathematics, by B.V.Ramana, Mc Graw Hill publishers.
4. Advanced Engineering Mathematics, by Erwin Kreyszig, Wiley India.

Outcomes: The student will be able to analyze engineering problems using the concepts of Matrices and Numerical methods.

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(15A02301) ELECTRICAL CIRCUITS- II

OBJECTIVES:

To make the students learn about:

- The analysis of three phase balanced and unbalanced circuits
- How to measure active and reactive power in three phase circuits
- How to determine the transient response of R-L, R-C, R-L-C series circuits for d.c and a.c excitations
- Applications of Fourier transforms to electrical circuits excited by non-sinusoidal sources
- Different types of filters and equalizers

UNIT- I NETWORK TOPOLOGY

Definitions – Graph – Tree, Basic Cutset and Basic Tieset Matrices for Planar Networks – Loop and Nodal Methods of Analysis of Networks with Dependent & Independent Voltage and Current Sources – Duality & Dual Networks. Nodal Analysis, Mesh Analysis, Super Node and Super Mesh for D.C Excitations.

UNIT- II THREE PHASE A.C CIRCUITS

Phase Sequence- Star and Delta Connection-Relation Between Line and Phase Voltages and Currents in Balanced Systems-Analysis of Balanced Three Phase Circuits- Measurement of Active and Reactive Power in Balanced and Unbalanced Three Phase Systems. Analysis of Three Phase Unbalanced Circuits-Loop Method- Application of Millman's Theorem- Star Delta Transformation Technique – for balanced and unbalanced circuits, Measurement of Active and reactive Power.

UNIT- III TRANSIENT ANALYSIS

D.C Transient Analysis: Transient Response of R-L, R-C, R-L-C Series Circuits for D.C Excitation-Initial Conditions-Solution Method Using Differential Equation and Laplace Transforms, Response of R-L & R-C Networks to Pulse Excitation.

A.C Transient Analysis: Transient Response of R-L, R-C, R-L-C Series Circuits for Sinusoidal Excitations-Initial Conditions-Solution Method Using Differential Equations and Laplace Transforms

UNIT- IV FOURIER TRANSFORMS

Fourier Theorem- Trigonometric Form and Exponential Form of Fourier Series – Conditions of Symmetry- Line Spectra and Phase Angle Spectra- Analysis of Electrical Circuits to Non Sinusoidal Periodic Waveforms. Fourier Integrals and Fourier Transforms – Properties of Fourier Transforms and Application to Electrical Circuits.

UNIT V: FILTERS & CIRCUITS SIMULATION

Filters – Low Pass – High Pass and Band Pass – RC, RL filters– derived filters and composite filters design – Attenuators – Principle of Equalizers – Series and Shunt Equalizers – L Type, T type and Bridged – T and Lattice Equalizers.

Circuit Analysis – Description of Circuit elements, nodes and sources, Input and Output variables – Modeling of the above elements – Types of DC analysis.

OUTCOMES:

After completing the course, the student should be able to do the following:

- Analyze three phase balanced and unbalanced circuits and determine line voltages, line currents, phase voltages and phase currents
- Measure active and reactive power consumed by a given three phase circuit
- Determine the transient response of R-L, R-C, R-L-C circuits for d.c and a.c excitations
- Apply Fourier transforms to electrical circuits excited by non-sinusoidal sources
- Design different types of filters

TEXT BOOKS:

1. Electrical Circuit Theory and Technology 4th Edition, John Bird, Rovtled / T&F, 2011.
2. Network Analysis 3rd Edition, M.E Van Valkenberg, PHI, .

REFERENCES:

1. Circuit Theory (Analysis & Synthesis) 6th Edition, A. Chakrabarti, Dhanpat Rai & Sons, 2008.
2. Electric Circuits by N.Sreenivasulu, REEM Publications
3. Engineering circuit analysis by William Hayt and Jack E. Kemmerly, Mc Graw Hill Company, 6th edition.

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(15A02302) ELECTRICAL MACHINES - I

OBJECTIVES: To make the students learn about:

- The constructional features of DC machines and different types of winding employed in DC machines
- The phenomena of armature reaction and commutation
- Characteristics of generators and parallel operation of generators
- Methods for speed control of DC motors and applications of DC motors
- Various types of losses that occur in DC machines and how to calculate efficiency
- Testing of DC motors

UNIT – I PRINCIPLES OF ELECTROMECHANICAL ENERGY CONVERSION

Electromechanical Energy Conversion – Forces and Torque In Magnetic Field Systems – Energy Balance – Energy and Force in A Singly Excited Magnetic Field System, Determination of Magnetic Force - Co-Energy – Multi Excited Magnetic Field Systems.

UNIT – II D.C. GENERATORS -I

D.C. Generators – Principle of Operation – Constructional Features – Armature Windings – Lap and Wave Windings – Simplex and Multiplex Windings – Use of Laminated Armature – E. M.F Equation– Numerical Problems – Parallel Paths-Armature Reaction – Cross Magnetizing and De-Magnetizing AT/Pole – Compensating Winding – Commutation – Reactance Voltage – Methods of Improving Commutation.

UNIT–III D.C GENERATORS – II

Methods of Excitation – Separately Excited and Self Excited Generators – Build-Up of E.M.F - Critical Field Resistance and Critical Speed - Causes for Failure to Self Excite and Remedial Measures-Load Characteristics of Shunt, Series and Compound Generators – Parallel Operation of D.C Series Generators – Use of Equalizer Bar and Cross Connection of Field Windings – Load Sharing.

UNIT – IV D.C. MOTORS

D.C Motors – Principle of Operation – Back E.M.F. – Circuit Model – Torque Equation – Characteristics and Application of Shunt, Series and Compound Motors – Armature Reaction and Commutation.

Speed Control of D.C. Motors: Armature Voltage and Field Flux Control Methods. Ward-Leonard System–Braking of D.C Motors – Permanent Magnet D.C Motor (PMDC).

Motor Starters (3 Point and 4 Point Starters) – Protective Devices-Calculation of Starter Steps for D.C Shunt Motors.

UNIT – V TESTING OF DC MACHINES

Losses – Constant & Variable Losses – Calculation of Efficiency – Condition for Maximum Efficiency.

Methods of Testing – Direct, Indirect – Brake Test – Swinburne's Test – Hopkinson's Test – Field's Test – Retardation Test

OUTCOMES:

After completing the course, the student should be able to do the following:

- Calculate the e.m.f. generated on open circuit and find terminal voltage on load
- Diagonise the failure of DC generator to build up voltage
- Compute the load shared by each generator when several generators operate in parallel
- Determine the gross torque and useful torque developed by DC motor
- Identify suitable method and conditions for obtaining the required speed of DC motor
- Calculate the losses and efficiency of DC generators and motors

TEXT BOOKS:

1. Electric Machines by I.J. Nagrath & D.P. Kothari, Tata Mc Graw – Hill Publishers, 3rd Edition, 2004.
2. Electrical Machines – P.S. Bimbhra., Khanna Publishers, 2011.

REFERENCES:

1. Performance and Design of D.C Machines – by Clayton & Hancock, BPB Publishers, 2004.
2. Electrical Machines -S.K. Battacharya, TMH Edn Pvt. Ltd., 3rd Edition, 2009.
3. Electric Machinary – A. E. Fitzgerald, C. Kingsley and S. Umans, Mc Graw-Hill Companies, 5th Editon, 2003.
4. Electrical Machines – M.V Deshpande, Wheeler Publishing, 2004.
5. Electromechanics – I - Kamakshaiah S., Overseas Publishers Pvt. Ltd, 3rd Edition, 2004.

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(15A02303) CONTROL SYSTEMS ENGINEERING

OBJECTIVES:

To make the students learn about:

- Merits and demerits of open loop and closed loop systems; the effect of feedback
- The use of block diagram algebra and Mason's gain formula to find the effective transfer function
- Transient and steady state response , time domain specifications
- The concept of Root loci
- Frequency domain specifications, Bode diagrams and Nyquist plots
- The fundamental aspects of modern control

UNIT – I INTRODUCTION

Open Loop and closed loop control systems and their differences- Examples of control systems- Classification of control systems, Feedback Characteristics, Effects of positive and negative feedback. Mathematical models – Differential equations of Translational and Rotational mechanical systems, and Electrical Systems, Block diagram reduction methods – Signal flow graph - Reduction using Mason's gain formula. Transfer Function of DC Servo motor - AC Servo motor - Synchro transmitter and Receiver

UNIT-II TIME RESPONSE ANALYSIS

Step Response - Impulse Response - 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

UNIT – III STABILITY

The concept of stability – Routh's stability criterion – Stability and conditional stability – limitations of Routh's stability. The root locus concept - construction of root loci-effects of adding poles and zeros to G(s)H(s) on the root loci.

UNIT – IV FREQUENCY RESPONSE ANALYSIS

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

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

UNIT – V STATE SPACE ANALYSIS

Concepts of state, state variables and state model, derivation of state models from differential equations. Transfer function models. Block diagrams. Diagonalization. Solving the Time invariant state Equations- State Transition Matrix and it's Properties. System response through State Space models. The concepts of controllability and observability.

OUTCOMES:

After completing the course, the student should be able to do the following:

- Evaluate the effective transfer function of a system from input to output using (i) block diagram reduction techniques (ii) Mason's gain formula
- Compute the steady state errors and transient response characteristics for a given system and excitation
- Determine the absolute stability and relative stability of a system
- Draw root loci
- Design a compensator to accomplish desired performance
- Derive state space model of a given physical system and solve the state equation

TEXT BOOKS:

1. Modern Control Engineering – by Katsuhiko Ogata – Prentice Hall of India Pvt. Ltd., 5th edition, 2010.
2. Control Systems Engineering – by I. J. Nagrath and M. Gopal, New Age International (P) Limited, Publishers, 5th edition, 2007.

REFERENCE BOOKS:

1. Control Systems Principles & Design 4th Edition, M.Gopal, Mc Graw Hill Education, 2012.
2. Automatic Control Systems– by B. C. Kuo and Farid Golnaraghi – John wiley and son's, 8th edition, 2003.
3. Control Systems 3rd Edition, Joseph J Distefano III, Allen R Stubberud & Ivan J Williams, Schaum's Mc Graw Hill Education.
4. John J D'Azzo and C. H. Houpis , "Linear Control System Analysis and Design Conventional and Modern", McGraw - Hill Book Company, 1988.

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(13A04301) ELECTRONIC DEVICES AND CIRCUITS

Course Outcomes:

Upon completion of the course, students will be able to:

- Analyze the operating principles of major electronic devices, its characteristics and applications.
- Design and analyze the DC bias circuitry of BJT and FET.
- Design and analyze basic transistor amplifier circuits using BJT and FET.

UNIT- I

PN JUNCTION DIODE & ITS APPLICATIONS:

Review of semi conductor Physics n and p –type semi conductors, Mass Action Law, Continuity Equation, Hall Effect, Fermi level in intrinsic and extrinsic semiconductors, PN Diode Equation, Volt-Ampere (V-I) Characteristics, Temperature Dependence of V-I Characteristics, Ideal Versus Practical Static and Dynamic Resistances, Diode Equivalent circuits, Break down Mechanisms in semiconductor Diodes, Zener Diode Characteristics. PN Junction as a Rectifier, Half wave rectifier, ripple factor, full wave rectifier, Bridge Rectifier, Harmonic components in a rectifier circuit, Inductor filter, Capacitor filter, L- section filter, π- section filter, Use of Zener Diode as a Regulator, Illustrative problems.

UNIT- II

TRANSISTOR AND FET CHARECTERISTICS: Transistor construction, BJT Operation, BJT Symbol, Transistor as an Amplifier, Common Emitter, Common Base and Common Collector Configurations, Limits of Operation, BJT Specifications, The Junction Field Effect Transistor (Construction, Principle of Operation, Symbol) - Pinch-Off Voltage – Volt-Ampere Characteristics, FET as Voltage Variable Resistor, Comparison between BJT and FET, MOSFET- Basic Concepts, Construction, modes(depletion & enhancement), symbol, principle of operation, characteristics.

UNIT-III

BIASING AND STABILISATION: Operating Point, DC and AC Load Lines, Importance of Biasing, Fixed Bias, Collector to Base Bias, Self Bias, Bias Stability, Stabilization against Variations in $I_{CO}V_{BE}$ and β, Bias Compensation Using Diodes and Transistors, Thermal Runaway, Condition for Thermal Stability in CE configuration, Biasing of FET – Source self bias, Biasing for zero current Drift, Biasing against Devices variation, Illustrative problems.

UNIT- IV

SMALL SIGNAL ANALYSIS OF AMPLIFIERS (BJT & FET):

BJT Modeling using h-parameters, Determination of h-Parameters from Transistor Characteristics, Measurement of h-Parameters, Analysis of CE, CB and CC configurations using h-Parameters, Comparison of CB, CE and CC configurations, Simplified Hybrid Model, Millers Theorem, Dual of Millers Theorem. Small Signal Model of JFET & MOSFET ,Small signal analysis of Common Source, and Common Drain Amplifiers using FET, Illustrative problems.

UNIT-V

SPECIAL PURPOSE ELECTRONIC DEVICES:

Principle of Operation, and Characteristics of Tunnel Diode, Varactor Diode, Schottky Barrier Diode, Silicon Control Rectifier, Diac, Triac & Uni-Junction Transistor (UJT),Semiconductor photo devices - LDR, LED, Photo diodes & Photo transistors.

TEXT BOOKS:

1. J.Millman and Christos.C.Halkias, Satyabrata, "Electronic Devices and Circuits", TMH Third edition, 2012,
2. K .Lal kishore, "Electronic Devices and Circuits", BSP. 2nd edition, 2005,

REFERENCES:

1. R.L. Boylestad, "Introductory Circuit Analysis", PEARSON,12th edition, 2013
2. B.P.Singh and Rekha Singh, "Electronic Devices and Circuits", PEARSON, 2nd Edition2013.
3. David A. Bell, "Electronic Devices and Circuits", Oxford University press ,5th Edition, 2008,.
4. Mohammad H.Rashid, "Electronic Devices and Circuits", CENGAGE Learning
5. N.Salivahanan, and N.Suresh Kumar, "Electronic Devices and Circuits", TMH ,3rd Edition, 2012
6. A. S. Sedra and K. C. Smith, "Microelectronic Circuits", Oxford University Press, 5th Ed.

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(15A05201) DATA STRUCTURES
(Common to all branches of Engineering)

Objectives:

- Understand different Data Structures
- Understand Searching and Sorting techniques

Unit-1

Introduction and overview: Asymptotic Notations, One Dimensional array- Multi Dimensional array- pointer arrays.

Linked lists: Definition- Single linked list- Circular linked list- Double linked list- Circular Double linked list- Application of linked lists.

Unit-2

Stacks: Introduction-Definition-Representation of Stack-Operations on Stacks- Applications of Stacks.

Queues: Introduction, Definition- Representations of Queues- Various Queue Structures- Applications of Queues.
Tables: Hash tables.

Unit-3

Trees: Basic Terminologies- Definition and Concepts- Representations of Binary Tree- Operation on a Binary Tree- Types of Binary Trees-Binary Search Tree, Heap Trees, Height Balanced Trees, B. Trees, Red Black Trees.

Graphs: Introduction- Graph terminologies- Representation of graphs- Operations on Graphs- Application of Graph Structures: Shortest path problem- topological sorting.

Unit-4

Sorting : Sorting Techniques- Sorting by Insertion: Straight Insertion sort- List insertion sort- Binary insertion sort- Sorting by selection: Straight selection sort- Heap Sort- Sorting by Exchange- Bubble Sort- Shell Sort-Quick Sort-External Sorts: Merging Order Files-Merging Unorder Files- Sorting Process.

Unit-5

Searching: List Searches- Sequential Search- Variations on Sequential Searches- Binary Search- Analyzing Search Algorithm- Hashed List Searches- Basic Concepts- Hashing Methods- Collision Resolutions- Open Addressing- Linked List Collision Resolution- Bucket Hashing.

Text Books:

1. "Classic Data Structures", Second Edition by Debasis Samanta, PHI.
2. "Data Structures A Pseudo code Approach with C", Second Edition by Richard F. Gilberg, Behrouz A. Forouzan, Cengage Learning.

Reference Books:

1. Fundamentals of Data Structures in C – Horowitz, Sahni, Anderson-Freed, Universities Press, Second Edition.
2. Schaum' Outlines – Data Structures – Seymour Lipschutz – McGrawHill-Revised First Edition.
3. Data structures and Algorithms using C++, Ananda Rao Akepogu and Radhika Raju Palagiri, Pearson Education.

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(15A02305) ELECTRIC CIRCUITS AND SIMULATION LABORATORY

OBJECTIVES:

- To verify all theorems with practically.
- To know performance of RLC series and parallel circuits.
- To know the measurement of three phase power.
- To emphasis a brief introduction to PSPICE for analysis of DC Circuits.

List of Experiments

1) Simulation of DC Circuits
2) DC Transient Response
3) Mesh Analysis
4) Nodal Analysis
5) Frequency response of RLC Series Circuits
6) Analysis of RL and RC Series circuits for DC Excitation
7) Analysis of RL and RC Series circuits for AC Excitation
8) Analysis of Three Phase balanced systems
9) Analysis of Three Phase unbalanced systems
10) Verification of the maximum power dissipation (plot the power dissipated versus the load).

OUTCOMES:

1. Understand and compare basic electric circuit theorems with actual working circuits.

2. Students can Design and understand RLC series and parallel circuits and its resonance condition.

3. They can able to measure power in three phase circuits in day to day life.

4. They can also be able to understand simulation programs for DC circuit analysis using PSPICE.

REFERENCES:

1. Simulation of Power Electronics Circuit, M B Patil, V Ramanarayan and V T Ranganat, Alpha Science International Ltd., 2009.

2. Public Domain Simulator: http:// www.ee.iitb.ac.in/~sequel

3. PSPICE A/D user's manual – Microsim, USA.

4. PSPICE reference guide – Microsim, USA.

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(15A04305) ELECTRONIC DEVICES AND CIRCUITS LABORATORY

Course Outcomes:

- Students able to learn electrical model for various semiconductor devices and learns the practical applications of the semiconductor devices

PART A: Electronic Workshop Practice

1. Identification, Specifications, Testing of R, L, C Components (Colour Codes), Potentiometers, Coils, Gang Condensers, Relays, Bread Boards.
2. Identification, Specifications and Testing of active devices, Diodes, BJTs, JFETs, LEDs, LCDs, SCR, UJT.
3. Soldering Practice- Simple circuits using active and passive components.
4. Study and operation of Ammeters, Voltmeters, Transformers, Analog and Digital Multimeter, Function Generator, Regulated Power Supply and CRO.

PART B: List of Experiments

(For Laboratory Examination-Minimum of Ten Experiments)

1. P-N Junction Diode Characteristics

Part A: Germanium Diode (Forward bias& Reverse bias)

Part B: Silicon Diode (Forward bias only)

2. Zener Diode Characteristics

Part A: V-I Characteristics

Part B: Zener Diode act as a Voltage Regulator

3. Rectifiers (without and with c-filter)

Part A: Half-wave Rectifier

Part B: Full-wave Rectifier

4. BJT Characteristics(CE Configuration)

Part A: Input Characteristics

Part B: Output Characteristics

5. FET Characteristics(CS Configuration)

Part A: Drain (Output) Characteristics

Part B: Transfer Characteristics

6. SCR Characteristics
7. UJT Characteristics
8. Transistor Biasing
9. CRO Operation and its Measurements
10. BJT-CE Amplifier
11. Emitter Follower-CC Amplifier
12. FET-CS Amplifier

PART C: Equipment required for Laboratory

1. Regulated Power supplies
2. Analog/Digital Storage Oscilloscopes
3. Analog/Digital Function Generators
4. Digital Multimeters
5. Decade Résistance Boxes/Rheostats
6. Decade Capacitance Boxes
7. Ammeters (Analog or Digital)
8. Voltmeters (Analog or Digital)
9. Active & Passive Electronic Components
10. Bread Boards
11. Connecting Wires

CRO Probes etc.