[Accredited by NAAC & NBA, Approved by AICTE New Delhi & Permanently Affiliated to JNTUH]

VIDYA JYOTHI INSTITUTE OF TECHNOLOGY

An Autonomous Institution)

Aziz Nagar Gate, C.B. Post, Hyderabad - 500 075, Telangana.

COURSE STRUCTURE & SYLLABUS

R-21

For

B. Tech (Electrical and Electronics Engineering)

R21 B.TECH FIRST YEAR COURSE STRUCTURE

B.Tech. I Year I Semester

S. No.	Course Category	Course Title	L	T	P	Credits
1	BS-1	Mathematics-I	3	1	0	4.0
2	BS-2	Applied Physics	3	1	0	4.0
3	BS-Lab-1	Physics Lab	0	0	3	1.5
4	H&S-1	English	2	0	0	2.0
5	H&S Lab-1	English Language Skills Lab (ELSL)	0	0	2	1.0
6	ES-1	Programming for Problem Solving-I	2	0	0	2.0
7	ES Lab-1	Programming for Problem Solving Lab-I	0	0	2	1.0
8	ES-2	Engineering Graphics & Modeling	1	0	3	2.5
Total			**11**	**2**	**10**	**18**

B.Tech. I Year II Semester

S. No.	Course Category	Course Title	L	T	P	Credits
1	BS-3	Mathematics-II	3	1	0	4.0
2	BS-4	Chemistry	3	1	0	4.0
3	BS-Lab-2	Chemistry Lab	0	0	3	1.5
4	ES-3	Basic Electrical Engineering	3	0	0	3.0
5	ES-Lab-2	Basic Electrical Engineering Lab	0	0	2	1.0
6	ES Lab-3	Engineering Workshop	0	1	3	2.5
7	H&S Lab-2	English Communication Skills Lab (ECSL)	0	0	2	1.0
8	ES-4	Programming for Problem Solving-II	2	0	0	2.0
9	ES-Lab-4	Programming for Problem Solving Lab-II	0	0	2	1.0
Total			**11**	**3**	**12**	**20**

R21 B.TECH EEE SECOND YEAR COURSE STRUCTURE

B. Tech. II Year I Semester

S. No.	Course Category	Course Title	L	T	P	Credits
1	BS – 5	Complex Analysis & Fourier Transforms	3	0	0	3
2	H&S – 2	Professional Communication	2	0	0	2
3	ES – 5	Electronic Devices and Circuits	3	0	0	3
4	PC – 1	Network Analysis	3	0	0	3
5	PC – 2	Electro Magnetic Fields	3	0	0	3
6	PC – 3	Electrical Machines-I	4	0	0	4
7	PC Lab-1	Basic Simulation Tools Lab	0	0	2	1
8	PC Lab-2	Electrical Circuits Lab	0	0	2	1
9	MC – 1	Environmental Science	2	0	0	0
Total			**20**	**0**	**4**	**20**

B. Tech. II Year II Semester

S. No.	Course Category	Course Title	L	T	P	Credits
1	BS – 6	Numerical Methods and Partial Differential Equations	3	0	0	3
2	ES – 6	Switching Theory and Logic Design	3	0	0	3
3	PC – 4	Python for Electrical Engineers	3	0	0	3
4	PC – 5	Electrical Machines-II	3	0	0	3
5	PC – 6	Power Systems – I	3	0	0	3
6	PC – 7	Control Systems	3	0	0	3
7	PC Lab-3	Electrical Machines-I Lab	0	0	2	1
8	PC Lab-4	Electronic Devices and Circuits Lab	0	0	2	1
9	MC – 2	Gender Sensitization	2	0	0	0
Total			**20**	**0**	**4**	**20**

R21 B.TECH EEE THIRD YEAR COURSE STRUCTURE

B. Tech. III Year I Semester

S. No.	Course Category	Course Title	L	T	P	Credits
1	H&S – 3	Managerial Economics and Financial Analysis	3	0	0	3
2	PC – 8	Power Systems- II	3	0	0	3
3	PC – 9	Power Electronics	3	0	0	3
4	PC – 10	Microprocessors and Interfacing Devices	3	0	0	3
5	PE – 1	AI Techniques in Electrical Engineering/ Integrated Circuits and Applications/ Electrical Energy Conservation and Auditing	3	0	0	3
6	OE – 1	OPEN ELECTIVE – 1	3	0	0	3
7	PC Lab – 5	Electrical Machines-II Lab	0	0	2	1
8	PC Lab – 6	Advanced Communication Skills Lab	0	0	2	1
9	VAC – 1	Personality Development & Behavioral Skills	2	0	0	1
Total			**20**	**0**	**4**	**21**

B. Tech. III Year II Semester

S. No.	Course Category	Course Title	L	T	P	Credits
1	ES – 7	Essentials of Computer Networks	3	0	0	3
2	PC – 11	Computer Methods in Power Systems	3	0	0	3
3	PC – 12	Power Semiconductor Drives	3	0	0	3
4	PC – 13	Switch Gear and Protection	3	0	0	3
5	PE – 2	Modern Power Electronics/ Advanced Control Systems / System Design using Verilog HDL	3	0	0	3
6	OE – 2	OPEN ELECTIVE – 2	3	0	0	3
7	PC Lab – 7	Control Systems and Simulation Lab	0	0	2	1
8	PC Lab – 8	Power Electronics and Simulation Lab	0	0	2	1
9	VAC - 2	Quantitative Methods & Logical Reasoning	2	0	0	1
Total			**20**	**0**	**4**	**21**

R21 B.TECH EEE FOURTH YEAR COURSE STRUCTURE

B. Tech. IV Year I Semester

S. No.	Course Category	Course Title	L	T	P	Credits
1	PC -14	Electrical Measurements & Instrumentation	3	0	0	3
2	PC -15	Power Systems Operation and Control	3	0	0	3
3	PE – 3	Electric Vehicles/ Power Quality and FACTS/ Embedded Systems & IOT	3	0	0	3
4	PE – 4	Advanced Control of Electric Drives/ Programmable Logic Controllers & SCADA/ Smart Grids	3	0	0	3
5	OE-3	OPEN ELECTIVE – 3	3	0	0	3
6	PC Lab - 9	Microprocessors and Interfacing Lab	0	0	2	1
7	PC Lab - 10	Electrical Measurements Lab	0	0	2	1
8	PW-1	Industry Oriented Mini Project	0	0	0	3
Total			**15**	**0**	**4**	**20**

B. Tech. IV Year II Semester

S. No.	Course Category	Course Title	L	T	P	Credits
1	PC -16	Utilization of Electrical Energy	3	0	0	3
2	PC -17	Renewable Energy and Energy Storage Technologies	3	0	0	3
3	TS	Technical Seminar	0	2	0	2
4	CVV	Comprehensive Viva-Voce	0	0	0	2
5	PW-2	Major Project	0	0	20	10
Total			**6**	**2**	**20**	**20**

R21 COURSE STRUCTURE (for FAST TRACK CURRICULUM SCHEME)

B. Tech. III Year I Semester

S. No	Course Category	Course Title	L	T	P	Credits
1	H&S – 3	Managerial Economics and Financial Analysis	3	0	0	3
2	PC – 8	Power Systems- II	3	0	0	3
3	PC – 9	Power Electronics	3	0	0	3
4	PC – 10	Microprocessors and Interfacing Devices	3	0	0	3
5	PE – 1	AI Techniques in Electrical Engineering / Integrated Circuits and Applications/ Electrical Energy Conservation and Auditing	3	0	0	3
6	OE – 1	OPEN ELECTIVE – 1	3	0	0	3
7	PC Lab – 5	Electrical Machines-II Lab	0	0	2	1
8	PC Lab – 6	Advanced Communication Skills Lab	0	0	2	1
9	VAC – 1	Personality Development & Behavioral Skills	2	0	0	1
		Total	**20**	**0**	**4**	**21**

B. Tech. III Year II Semester

S.No.	Course Category	Course Title	L	T	P	Credits
1	ES – 7	Essentials of Computer Networks	3	0	0	3
2	PC – 11	Computer Methods in Power Systems	3	0	0	3
3	PC – 12	Power Semiconductor Drives	3	0	0	3
4	PC – 13	Switch Gear and Protection	3	0	0	3
5	PE – 2	Modern Power Electronics/ Advanced Control Systems/ System Design using Verilog HDL	3	0	0	3
6	OE – 2	OPEN ELECTIVE – 2	3	0	0	3
7	PC Lab – 7	Control Systems and Simulation Lab	0	0	2	1
8	PC Lab – 8	Power Electronics and Simulation Lab	0	0	2	1
9	VAC – 2	Quantitative Methods & Logical Reasoning	2	0	0	1
10	PC -16	Utilization of Electrical Energy	3	0	0	3
		Total	**23**	**0**	**4**	**24**

R21 COURSE STRUCTURE (for FAST TRACK CURRICULUM SCHEME)

B. Tech. IV Year I Semester

S.No.	Course Category	Course Title	L	T	P	Credits
1	PC -14	Electrical Measurements & Instrumentation	3	0	0	3
2	PC -15	Power Systems Operation and Control	3	0	0	3
3	PE – 3	Electric Vehicles/ Power Quality and FACTS/ Embedded Systems & IOT	3	0	0	3
4	PE – 4	Advanced Control of Electric Drives/ Programmable Logic Controllers & SCADA/ Smart Grids	3	0	0	3
5	OE-3	OPEN ELECTIVE – 3	3	0	0	3
6	PC Lab - 9	Microprocessors and Interfacing Lab	0	0	2	1
7	PC Lab - 10	Electrical Measurements Lab	0	0	2	1
8	PW-1	Industry Oriented Mini Project	0	0	0	3
9	PC – 17	Renewable Energy and Energy Storage Technologies	3	0	0	3
		Total	**18**	**0**	**4**	**23**

B. Tech. IV Year II Semester

S.No.	Course Category	Course Title	L	T	P	Credits
1	TS	Technical Seminar	0	2	0	2
2	CVV	Comprehensive Viva-Voce	0	0	0	2
3	PW-2	Major Project	0	0	20	10
		Total	**0**	**2**	**20**	**14**

B.TECH FIRST YEAR COURSE STRUCTURE & SYLLABUS

B.Tech. I Year I Semester

S.No	Course Code	Course Title	L	T	P	Credits
1		Mathematics-I	3	1	0	4.0
2		Applied Physics	3	1	0	4.0
3		Physics Lab	0	0	3	1.5
4		English	2	0	0	2.0
5		English Language Skills Lab (ELSL)	0	0	2	1.0
6		Programming for Problem Solving-I	2	0	0	2.0
7		Programming for Problem Solving Lab-I	0	0	2	1.0
8		Engineering Graphics & Modeling	1	0	3	2.5
Total			**11**	**2**	**10**	**18**

MATHEMATICS - I

(Matrices and Calculus)

B.Tech I Year I semester

L	T	P	C
3	1	0	4

Course Outcomes:

1. Write the matrix representation of system of linear equations and identify the consistency of the system ofequations.
2. Find the Eigen values and Eigen vectors of the matrix and discuss the nature of the quadratic form.
3. Analyze the convergence of sequence and series.
4. Discuss the applications of mean value theorems to the mathematical problems, Evaluation of improper integrals using Beta and Gamma functions.
5. Examine the extrima of functions of two variables with/ without constraints.

UNIT-I:
Matrices and Linear System of Equations: Matrices and Linear system of equations: Real matrices Symmetric, skew symmetric, orthogonal. Complex matrices: Hermitian, Skew Hermitian and Unitary. Rank-Echelon form, Normal form. Solution of Linear Systems Gauss Elimination, Gauss Jordan & LU Decomposition methods.

UNIT-II:
Eigen Values and Eigen Vectors: Eigen values, Eigen vectors properties, Cayley-Hamilton Theorem (without Proof) Inverse and powers of a matrix by Cayley-Hamilton theorem Diagonolization of matrix Quadratic forms: Reduction to Canonical form, Nature, Index, Signature.

UNIT-III:
Sequences & Series:

Basic definitions of Sequences and series, Convergence and divergence, Ratio test, Comparison test, Cauchy's root test, Raabe's test, Integral test, Absolute and conditional convergence.

UNIT-IV:
Beta & Gamma Functions and Mean Value Theorems: Gamma and Beta Functions-Relation between them, their properties evaluation of improper integrals using Gamma / Beta functions. Rolle's Theorem, Lagrange's mean value theorem, Cauchy's mean value theorem, Generalized Mean Value theorem (all theorems without proof) Geometrical interpretation of Mean value theorems.

UNIT-V:
Functions of several variables: Partial Differentiation and total differentiation, Functional dependence, Jacobian Determinant- Maxima and Minima of functions of two variables with constraints and without constraints, Method of Lagrange Multipliers.

Text Books:

1. Higher Engineering Mathematics, B.S. Grewal, Khanna Publishers, 36th Edition, 2010
2. Advanced Engineering Mathematics by Jain & Iyengar Narosa Publications

Reference Books:

1. Calculus and Analytic geometry, G.B. Thomas and R.L. Finney, 9th Edition, Pearson, Reprint, 2002.
2. Advanced Engineering Mathematics, Erwin Kreyszig, 9th Edition, John Wiley & Sons, 2006.
3. Advanced Engineering Mathematics (2nd Edition) , Michael D.Greenberg

APPLIED PHYSICS

B.Tech I Year I Semester

L	T	P	C
3	1	0	4

Course Outcomes:

1. Identify various optical phenomena of light
2. Discuss the basic principles of quantum mechanics
3. Classify solids based on the band theory
4. Elucidate the characteristics of semiconductors and semiconductor devices
5. Explain the working principle of optical fibers and lasers

UNIT – I:
Wave Optics: Principle of Superposition, coherence. Interference - Interference in thin films by reflection, Newton's Rings. Diffraction Fraunhofer and Fresnel Diffraction, Farunhofer diffraction due to single slit, Plane Diffraction Grating, resolving power of grating (qualitative treatment). Polarization Polarization of light waves, Plane of vibration, plane of polarization, Double refraction, Nicol's Prism, Applications of Polarization.

UNIT-II:
Free electron theory and Introduction to Quantum Mechanics: Classical free electron Theory, Electrical Conductivity and Ohm's Law Drawbacks. Introduction to quantum physics: Black body radiation and Planck's Law(qualitative treatment), wave-particle duality, de-Broglie hypothesis of matter waves, Heisenberg uncertainty principle, time independent Schrodinger equation, Born interpretation of wave function, particle in an infinite potential well (one dimension).

UNIT-III:
Band theory of solids and semiconductors: Kronig-Penny model(qualitative treatment), E-k diagram, Energy bands in solids, classification of materials into metals, semiconductors, and insulators, Effective mass, Densityof States(qualitative treatment), Fermi distribution function, Fermi level and its importance.Intrinsic semiconductors, carrier concentration in intrinsic semiconductors, energy band diagram and position of Fermi level in intrinsic semiconductors, equation for electrical conductivity of semiconductors, extrinsic semiconductors (qualitative treatment).

UNIT-IV:
Semiconductor Devices: Direct and indirect band-gap semiconductors, Formation of p-n junction, energy diagram of PN junction, I-V characteristics of PN junction diode, Photo diode, solar cell- efficiency, light emitting diode and their characteristics, semiconductor laser: device structure and characteristics, Hall effect and its applications.

UNIT-V:
Fiber Optics and Lasers: Introduction, total internal reflection, acceptance angle and numerical aperture, step and graded index fibers, applications of optical fibers.Introduction to interaction of radiation with matter: stimulated absorption, spontaneous emission and stimulated emission, characteristics of a laser, population inversion, important components of a laser: active medium, pumping source, optical resonator. Construction and working of Ruby laser, He-Ne laser, applications of lasers.

Text Books:
1. Engineering Physics by P K Palanisamy, Scietech publication.
2. Engineering Physics by V Rajendran, McGraw Hill Education.

Reference Books:
1. Engineering Physics by S O Pillai, Sivakami, New Age International (P) Limited.
2. Physics Volume I & II, Resnick and Halliday, John Wiley and sons, Inc.

PHYSICS LAB

B.Tech I Year I Semester

L	T	P	C
0	0	3	1.5

Course Outcomes:

1. Apply optical phenomena to characterize optical sources and components.
2. Characterize semiconductors and semiconductor devices.
3. Study transient response of RC circuit.
4. Study the properties and resonance mechanisms in mechanical and electrical systems.
5. Evaluate the magnetic Induction along the axis of current carrying coil.

List of Experiments

1. Newton's rings: Determination of the radius of curvature of a given lens by forming Newton's rings.
2. Diffraction grating: Determination of wavelength of a given source using a plane diffraction grating.
3. Dispersive power: Determination of dispersive power of given prism.
4. Single Slit Diffraction using Lasers- Determination of wavelength of a Monochromatic Source (LASER).
5. Energy gap of P-N junction diode: Determination of the energy gap of a semiconductor diode.
6. Light emitting diode: Study of V-I and P-I characteristics of a given light emitting diode.
7. Photo diode: Study of V-I characteristics of photo diode at different intensities.
8. Melde's Experiment: Determination of frequency of electrically maintained tuning fork.
9. Sonometer: Determination of frequency of AC source.
10. Torsional pendulum: Determination of rigidity modulus of a given material.
11. Fly-wheel: Determination of moment of inertia of flywheel.
12. Stewart & Gee's experiment - Determination of magnetic field along the axis of current carrying coil.
13. LCR Circuit-Determination of the resonance frequency of forced electrical oscillator.
14. RC- Circuit – Determination of the time constant of RC-circuit.
15. Optical fiber: Determination of the numerical aperture of optical fiber. Note: Any 10 experiments are to be performed.

ENGLISH

B.Tech I Year I Semester

L	T	P	C
2	0	0	2

Course Outcomes:

1. Infer the importance of scientific discoveries in promoting social responsibilities.
2. Comprehend the given texts and respond appropriately for technical and professional purposes.
3. Communicate confidently and transfer information into various forms of writing.
4. Understand the importance of health and nutrition for a better society.
5. Present various forms of business writing skills for successful careers.

UNIT-I:

'The Raman Effect' from the prescribed textbook 'English for Engineers'

Grammar: Articles & Prepositions

Reading : Reading and Its Importance- Techniques for Effective Reading.
Writing : Organizing principles of paragraphs in documents.
Vocabulary: The concept of word Formation, synonyms, antonyms, and standard abbreviations.

UNIT-II:

'Ancient Architecture in India' from the prescribed textbook 'English for Engineers'

Reading : Improving Comprehension Skills – Techniques for good comprehension

Writing :Sentence Structures, Use of phrases and clauses in sentences

Writing Formal Letters - Eg. Letter of Complaint, Letter of Requisition, Job Application with Resume.

Vocabulary: Root words and acquaintance with prefixes and suffixes from foreign languages in English, to form derivatives

UNIT-III:

'Blue Jeans' from the prescribed textbook 'English for Engineers'

Grammar: Tenses: Types and uses.

Reading : Sub-skills of Reading- Skimming and Scanning

Writing : Identifying Common Errors in Writing

Subject-Verb agreement in number, gender and person Information Transfer-Process writing

UNIT-IV:

'What Should You Be Eating' from the prescribed textbook 'English for Engineers'

Reading : Intensive Reading and Extensive Reading

Writing : Nature and Style of Sensible Writing
Describing & Defining
Identifying common errors in writing

UNIT-V:

'How a Chinese Billionaire Built Her Fortune' from the prescribed textbook 'English for Engineers'

Vocabulary : Technical Vocabulary and their usage

Reading : Reading Comprehension-Exercises for Practice
Writing : Cohesive Devices
Précis Writing

Technical Reports-Introduction, Characteristics of a Report –
Categories of Reports, Formats- Structure of Reports (Manuscript Format) –Types of Reports - Writing a Report.

Text Books:

1. English for Engineers, Sudarshana, N.P. and Savitha, C. Cambridge University Press, 2018.

Reference Books:

1. Effective Technical communication, Muhammed Rizvi, TMH, 2008.
2. Advanced English Grammar, Hewings, Cambridge University Press, 2010.

ENGLISH LANGUAGE SKILLS LAB

B.Tech I Year I Semester

L	T	P	C
0	0	2	1

Course Outcomes:

1. Reproduce speech sounds and improve fluency in language.
2. Understand syllables and consonant clusters for appropriate pronunciation.
3. Exhibit effective professional skills with rhetoric eloquence.
4. Deliver enthusiastic and well-practiced presentation.
5. Learn Task-Based Language Learning (TBLL) through various language learning activities effectively.

Exercise-I:
CALL Lab

Introduction to Pronunciation- Speech Sounds, Vowels and Consonants- Practice for Listening
ICS Lab:
Ice-Breaking activity and JAM session

Exercise-II:
CALL Lab

Silent Letters, Consonant Clusters, Homographs
ICS Lab:
Common Everyday Situations: Conversations and Dialogues

Exercise-III:
CALL Lab

Syllables
ICS Lab
Communication at Workplace, Social and Professional Etiquette

Exercise-IV:
CALL Lab:

Word Accent and Stress Shifts
ICS Lab:

Formal Presentations, Visual Aids in Presentations

Exercise-V:
CALL Lab:

Intonation, Situational dialogues for practice
ICS Lab:
Interviews, Types of Interviews

Text Books:

1. A textbook of English Phonetics for Indian Students, T. Balasubramanian, Macmillan Publishers, 2010.

Reference Books:

1. Speaking English Effectively, Mohan, Macmillan Publishers, 2010.
2. A Handbook for English Language Laboratories, Suresh Kumar, E& Sreehari.P 2009, New DelhiFoundation(R3)

PROGRAMMING FOR PROBLEM SOLVING-I

B.Tech I Year I Semester

L	T	P	C
2	0	0	2

Course Outcomes:

1. Design Algorithms and Flowcharts for real world applications using 'C'.
2. Know the usage of various operators in Program development.
3. Design programs involving decision and iteration structures.
4. Apply the concepts code reusability using Functions.
5. Analyze various searching and sorting techniques using Arrays.

UNIT-I:

Problem Solving Using Computers: Introduction, Algorithms, Flowcharts and Pseudo code, Applications of C language.

Overview of C Language: Introduction, Salient Features of C Language, Structure of a "C" Program.

C Language Preliminaries: Keywords and Identifiers, Constants, Variables, Data Types, and Input/ Output Statements with suitable illustrative "C" Programs.

UNIT-II:

Operators: Assignment Operators, Relational and Logical Operators, Increment and Decrement Operators, Bitwise Operators, Ternary Operator, Type Conversion, Precedence and Associativity with suitable illustrative "C" Programs.

UNIT-III:

Statements in C: Conditional/Decision Statements: if, if-else, Nested if-else, else-if ladder, and Switch-Statement with suitable illustrative "C" Programs.

Loop Control Statements: while, do-while and for with suitable illustrative "C" Programs.

UNIT-IV:

Functions: Introduction to Functions, benefits of functions, types of functions, Function calls, return vs exit( ), Parameter Passing mechanism: Call-by-Value, Recursion, Storage Classes.

UNIT-V:

Arrays: Introduction to Arrays, One-Dimensional Arrays, Two-Dimensional Arrays, Arrays and Functions.

Searching and Sorting: Linear Search, Binary Search, Bubble Sort, Insertion Sort.

Text Books:

1. COMPUTER SCIENCE: A Structured Programming Approach Using C, B.A.Forouzon and R.F. Gilberg Third edition, CENGAGE Learning, 2016.
2. C and Data Structures, Ashok N. Kamthane, "Pearson Education. 2010.

Reference Books:

1. Problem Solving Using C, M.T.Somashekara, PHI, 2nd Edition 2009.
2. Computer Fundamentals and Programming in C, A.K.Sharma, 2nd Edition, University Press.
3. Programming in C 2/e, Pradip Dey and Manas Ghosh, Oxford University Press, 2nd Edition 2011.
4. The Fundamentals of Computers Rajaraman V.,, 4th Edition, Prentice Hall of India, 2006.
5. Programming in C, R S Bichker, University Press, 2012.

PROGRAMMING FOR PROBLEM SOLVING LAB – I

B.Tech I Year I Semester

L	T	P	C
0	0	2	1

Course Outcomes:

1. Apply the specification of syntax rules for numerical constants and variables, data types.
2. Know the Usage of various operators and other C constructs.
3. Design programs on decision and control constructs.
4. Develop programs on code reusability using functions.
5. Implement various searching and sorting techniques using arrays.

Week 1
Ubuntu and Linux Commands.

Week 2
Designing of flowcharts and algorithms using raptor tool
1. Areas of Polygons.
2. Calculation of Simple and Compound Interest.
3. Swapping of Two numbers with and without temporary variable.
4. Checking whether a number is even or odd.
5. Sum of first 'n' natural numbers.
6. Checking a number whether it is divisible by any given number.
7. Evaluation of mathematical expressions.
8. Programs using scanf( ) and printf( ) statements.

Week 3
Programs on operators. (Minimum 4 Programs)

Week 4, 5 & 6
Programs on Conditional Statements. (Minimum 12 Programs)

Week 7,8 & 9
Programs on Control Statements. (Minimum 12 Programs)

Week 10 &11
Programs on Functions. (Minimum 6 Programs)

Week 12
Programs on One Dimensional Arrays. (Minimum 3 Programs)

Week 13
Programs on Two Dimensional Arrays. (Minimum 2 Programs)

Week 14
Implementation of Linear Search and Binary Search.
Week 15
Implementation of Bubble Sort and Insertion Sort.
Week 16
Review

ENGINEERING GRAPHICS & MODELING

B.Tech I Year I Semester

L	T	P	C
1	0	3	2.5

Course Outcomes:

1. Understand the concepts of engineering drawing of planes, solids and the CAD drawing software.
2. Applying the principles of engineering graphics while drawing the engineering components.
3. Analyse the sectional views for their configurations.
4. Evaluate the surfaces of solids developed for further processing in the engineering applications.

UNIT- I:

Introduction to Engineering Drawing: Principles of engineering graphics and their significance, usage of drawing instruments, conic sections, including the rectangular hyperbola general method only. Cycloid, Epicycloid, Hypocycloid. Scales plain & diagonal only.

Introduction to CAD: Introduction to CAD software and its importance, standard toolbar/menus and navigation tools used in the software, using basic commands limits ,units, grid, test , move, offset ,mirror, rotate, trim, extend, fillet etc. drawing lines using line command. Drawing spline, ellipse, circle, rectangle etc.. Concept of layers and dimensioning.

UNIT- II:

Principles of Orthographic Projections: Conventions. Projections of points, projections of lines (first angle projection) inclined to both planes (traces and midpoint problem to be excluded).

Implementation of CAD: Drawing orthographic projections of points and lines using a CAD package.

UNIT – III:

Projections of the Planes: Projections of regular planes inclined to both the planes.

Projections of Solids: Projections of regular solids inclined to both the planes (prisms, pyramids, cones and cylinders, Change of potion method only).

Implementation in CAD: Drawing orthographic projection of planes and regular solids using a CAD package.

UNIT- IV:

Sections and Sectional Views of Right Angular Solids: Prism, Cylinder, Pyramid, Cone. Development of surfacesof right regular solids - Prism, Pyramid, Cylinder and Cone.

Implementation in CAD: Concept of hatching, drawing sectional views of solids and the development of right regular solids using a CAD package.

UNIT-V:

Principles of Isometric projection: Isometric scale, isometric views, conventions, isometric views of lines, planes, simple solids, conversion of isometric views to orthographic views and vice-versa, conventions.

Implementation in CAD: Drawing isometric views of simple solids. Drawing isometric views from giving orthographic views and vice-versa using a CAD package.

Note: Implementation in CAD (For Internal Evaluation Weightage Only)

Text Books:

1. Engineering Drawing, Bhatt N.D., Panchal V.M. & Ingle P.R., (2014), Charotar Publishing House.

Reference Books:

1. Engineering Graphics, Agrawal B. & Agrawal C. M. (2012), TMH Publication Narayana,
2. K.L. & P Kannaiah (2008), Text book on Engineering Drawing, Scitech Publishers.
3. Engineering Drawing and Computer Graphics, Shah, M.B. & Rana B.C. (2008), Pearson Education.
4. http://docs.autodesk.com/ACDMAC/2013/ENU/PDFs/acdmac_2013_users_guide.pdf

B.Tech I Year II Semester

S. No	Course Code	Course Title	L	T	P	Credits
1		Mathematics-II	3	1	0	4.0
2		Chemistry	3	1	0	4.0
3		Chemistry Lab	0	0	3	1.5
4		Basic Electrical Engineering	3	0	0	3.0
5		Basic Electrical Engineering Lab	0	0	2	1.0
6		Engineering Workshop	0	1	3	2.5
7		English Communication Skills Lab (ECSL)	0	0	2	1.0
8		Programming for Problem Solving-II	2	0	0	2.0
9		Programming for Problem Solving Lab-II	0	0	2	1.0
Total			**11**	**3**	**12**	**20**

MATHEMATICS - II
(Ordinary Differential Equations and Vector Calculus)

B.Tech I Year II Semester

L	T	P	C
3	1	0	4

Course Outcomes:

1. Classify the various types of differential equations of first order and first degree and apply the concepts of differential equations to the real world problems.
2. Solve higher order differential equations and apply the concepts of differential equations to the real world problems.
3. Find the Laplace Transform of various functions and apply to find the solutions of differential equations.
4. Evaluate the multiple integrals and identify the vector differential operators physically in engineering problems.
5. Evaluate the line, surface and volume integrals and converting them from one to another by using vector integral theorems.

UNIT-I:

First order Ordinary Differential Equations and their Applications: Formation of Differential equations, Differential equations of first order and first degree: exact, linear and Bernoulli, Applications of ODE: Newton's law of cooling, law of natural growth and decay, orthogonal trajectories.

UNIT-II:

Higher Order Linear Differential Equations: Linear differential equations of second and higher order with constant coefficients, RHS term of the type f(X) = e^{ax}, sinax, cosax *and* x^k, e^{ax} $V(x)$, $x^kV(x)$. Method of variation of parameters

UNIT-III:

Laplace transforms: Laplace transform of standard functions Inverse transform first shifting Theorem, Transforms of derivatives and integrals Unit step function second shifting theorem Dirac's delta function Convolution theorem Periodic function - Differentiation and integration of transforms Application of Laplace transforms to ordinary differential equations.

UNIT-IV:

Multiple Integrals & Vector Differentiation:

Multiple integrals double and triple integrals change of order of integration (Only Cartesian form)- change of variables (Cartesian to Polar for double integral, Cartesian to Spherical for triple integral). Gradient- Divergence- Curl and their related properties Potential function Laplacian and second order operators.

UNIT-V:

Vector Integration: Line integral, work done, Surface and Volume integrals. Vector integrals theorems: Green's, Stoke's and Gauss Divergence Theorems (Only Statements & their Verifications).

Textbooks:

1. Higher Engineering Mathematics, B.S. Grewal, Khanna Publishers, 36th Edition, 2010
2. Advanced Engineering Mathematics by Jain & Iyengar Narosa Publications.

Reference Books:

1. Calculus and Analytic geometry, G.B. Thomas and R.L. Finney, 9th Edition, Pearson, Reprint, 2002.
2. Advanced Engineering Mathematics, Erwin Kreyszig, 9th Edition, John Wiley & Sons, 2006.
3. Advanced Engineering Mathematics (2nd Edition), Michael D. Greenberg

CHEMISTRY

B.Tech I Year II Semester

L	T	P	C
3	1	0	4

Course Outcomes:

1. Acquire knowledge of atomic, molecular and electronic changes related to conductivity.
2. Apply the various processes of treatment of water for both domestic and industrial purpose.
3. Apply the knowledge of electrode potentials for the protection of metals from corrosion.
4. Analyze the major chemical reactions that are used in the synthesis of compounds.
5. Apply the knowledge of polymers in every day's life.

UNIT I: Atomic and molecular structure

Introduction, Concept of atomic and molecular orbitals, Crystal field theory- Crystal field splitting patterns of transition metal ion d- orbital- tetrahedral & octahedral geometries.
LCAO, Molecular orbitals of di-atomic molecules: Molecular orbital energy level diagrams of diatomic molecules (N_2, O_2& F_2). Pi-molecular orbitals of butadiene and benzene.

UNIT II: Water Technology

Hardness of water, expression of hardness ($CaCO_3$ equivalent), units and types of hardness. Estimation of temporary and permanent hardness of water by EDTA method. Numerical problems based on hardness of water. Potable water: Characteristics, treatment of water for domestic supply. Desalination of brackish water: Reverse osmosis. Alkalinity of water and its determination. Boiler feed water and its treatment: Internal treatment (Colloidal, Phosphate Calgon conditioning of water). External treatment (Ion –exchange process).

UNIT III: Electrochemistry and corrosion

Electrode, electrode potential, galvanic cell, cell reactions and cell notation, cell EMF, types of electrodes (Calomel electrode and Quinhydrone electrode), Determination of P^H using quinhydrone electrode. Nernst equation, Numerical problems.

Batteries: Introduction to cell and battery, Primary (lithium cell) and secondary cells, (Lead-acid cell, and Lithium-ion cells). Fuel cells – Methanol – Oxygen fuel cell, advantages and engineering applications of fuel cells.
Corrosion: Introduction, types of corrosion: chemical and electrochemical corrosion, factors affecting the rate of corrosion: Nature of the metal - Position of metal in galvanic series, Purity of metal, Nature of corrosion product. Nature of environment - Effect of temperature, Effect of P^H, Humidity. Corrosion control methods: Cathodic protection: Sacrificial anode method and Impressed current cathode method. Protective coatings: Metallic coatings (anodic and cathodic), methods of application on metals- Electroless plating of Ni.

UNIT IV: Stereochemistry

Structural isomers and stereoisomers, configurations, symmetry and chirality, enantiomers, diastereomers, optical activity. Conformations of n-butane.

Organic reactions and synthesis of a drug molecule

Introduction to reactions involving substitution (SN1 & SN2), addition (addition of HBr to propene, Markownikoff and Anti Markownikoff addition), elimination, oxidation (oxidation of alcohols using $KMnO_4$ & CrO_3), reduction (reduction of carbonyl compounds by $LiAlH_4$ & $NaBH_4$). Synthesis of a commonly used drug molecule- Paracetamol and Asprin.

UNIT V: Polymer Chemistry

Introduction, classification of polymers, types of polymerization (addition and condensation, mechanisms not included). Plastics- types of plastics -Thermoplastics and Thermosetting plastics. Preparation, properties and engineering applications of PVC, Teflon and Bakelite. Fibers: Nylon 6, 6 and Terelene (Dacron). Elastomers: Natural rubber-structure, vulcanization. Synthetic rubbers: Buna-S & Butyl rubber. Conducting polymers: Classification, polyacetylene and applications.
Biodegradable polymers: Types, examples: Polyhydroxy butyrate (PHB), Polyglycolic acid (PGA), Polylactic acid (PLA). Applications of biodegradable polymers.

Text Books:

1. Engineering Chemistry by P.C Jain & Monica Jain, Dhanpat Rai Publishing Company.
2. Engineering Chemistry by Shashi Chawla, Dhanpat Rai Publishing Company.

Reference Books:

1. Physical Chemistry, by P. W. Atkins, W.H.Freeman & Company.
2. Text book of Engineering Chemistry by Dr.M.Tirumala Chary & Dr. E. Laxminarayana. Scitech Publicaions (INDIA) Pvt Ltd.,
3. Engineering Chemistry (NPTEL Web-book), by B.L. Tembe, Kamaluddin and M.S.Krishnan.

CHEMISTRY LAB

B.Tech I Year II Semester

L	T	P	C
0	0	3	1.5

Course Outcomes:

1. Determination of parameters like hardness, alkalinity and chloride content in water.
2. Estimation of rate constant of a reaction from concentration-time relationships.
3. Determination of physical properties like adsorption, surface tension and viscosity.
4. Synthesize a small drug molecule and analyze a salt sample.
5. Calculation of strength of compound using instrumentation techniques.

Choice of 10-12 experiments from the following:

1. Estimation of total hardness of water by EDTA method.
2. Determination of alkalinity of water.
3. Determination of chloride content of water.
4. Estimation of HCl by conductometric titration.
5. Estimation of mixture of acids by conductometric titration.
6. Estimation of HCl by potentiometric titration.
7. Estimation of Fe^{2+} by potentiometry using KMnO4.
8. Determination of the rate constant of a reaction.
9. Determination of surface tension.
10. Determination of viscosity of a lubricant.
11. Chemical analysis of a salt.
12. Synthesis of a polymer/drug.
13. Adsorption of acetic acid by charcoal.
14. Determination of Saponification /acid value of an oil.

Reference Books:

1. Practical Engineering Chemistry by Mukkanti, B.S.Publications, 2010.
2. Volga's Qualitative Inorganic Chemistry by PEAR Publications 2010.

BASIC ELECTRICAL ENGINEERING

B.Tech I Year II Semester

L	T	P	C
3	0	0	3

Course Outcomes: At the end of the course the student will be able to

1. Understand the fundamentals of basic circuit components and their characteristics.
2. Analyze basic electrical circuits with A.C excitation.
3. Understand the concepts of magnetic circuits and transformers.
4. Acquire the basic concepts of electrical motors.
5. Understand the concept of A.C generator and low voltage electrical installations.

UNIT I:

Introduction to Electrical Engineering And Dc Circuits: Basic definitions, types of elements, types of sources, Kirchhoff‘s Laws, resistive networks, inductive networks, series, parallel circuits, Star- Delta and Delta- Star transformation, Network theorems- Superposition, Thevenin‘s - simple problems.

UNIT II:

Ac Circuits: Representation of sinusoidal waveforms, peak, RMS and average values Elementary treatment of single-phase AC circuits consisting of R, R-L, R-C, R-L-C combinations (series and parallel) Phase representation, real power, reactive power, apparent power, resonance concept. Three phase balanced circuits, voltage and current relations in star and delta connections.

UNIT III:

Magnetic Circuits &Transformers:

Magnetic circuits: Magnetic materials, Faraday‘s laws of Electromagnetic Induction, BH characteristics, Magnetic Circuits - concept of Self & Mutual Inductance.

Transformers: Ideal and practical single phase transformer, OC-SC tests, equivalent circuit, losses in transformer, regulation and efficiency - simple problems.

UNTI IV:

DC Machines and Induction Motors: DC Machines: Construction, Principle and Operation of DC Motor, Voltage- torque equations - simple problems.

Three Phase Induction Motor: Construction, Principle and working of three phase Induction Motor, torque slip characteristics, - simple problems.

Single Phase Induction Motor: Single phase Induction Motor construction and working principle, capacitor start - applications

UNIT V:

Ac Generator & Electrical Installation: AC Generator: Construction, Principle of operation of Synchronous Generator, Pitch Factor- Distribution Factor (or winding factor) - EMF equation simple problems.

Electrical Installation: Fuse, Circuit breakers, difference between fuse and circuit breaker, Types of Batteries, battery backup.

Text Books:

1. Basic Electrical Engineering, D.P Kothari & I.J Nagrath, Tata McGraw Hill Publishing Company Limited-2nd Edition.
2. Basic Electrical Engineering, T.K. Nagsarkar and M.S. Sukhija, Oxford University Press-3rd Edition.

Reference Books:

1. Circuits and Networks, A.Sudhakar&ShyamMohan.S, Tata McGraw Hill Publishing Company limited, 5th Edition.
2. Basic Electrical Engineering, K.Uma Rao and A.Jayalakshmi, Pearson Publications.
3. Basic Electrical Engineering by D C Kulshreshtha, McGraw Hill Education Private limited, 1st Edition.

BASIC ELECTRICAL ENGINEERING LAB

B.Tech I Year II Semester

L	T	P	C
0	0	2	1

Course Outcomes:

1. Get an exposure to basic electrical laws.
2. Understand the response of different types of electrical circuits to different excitations.
3. Understand the measurement, calculation and relation between the basic electrical parameters.
4. Understand the performance characteristics of D.C electrical machines.
5. Understand the performance characteristics of A.C electrical machines.

List of experiments/ demonstrations
Any 5 experiments from Part-A and Part-B should be conducted (Total 10 Experiments)

Part A

1. Verification of Ohms law
2. Verification of KVL and KCL
3. Verification of Thevenin‘s Theorem
4. Verification of Superposition Theorem
5. Transient Response of Series R- L and R - C circuits using DC excitation
6. Determination and Verification of Impedance and Current of RL and RC series circuits

Part B

1. Transient Response of R-L-C Series circuit using DC excitation
2. Load Test on Single Phase Transformer (Calculate Efficiency and Regulation)
3. OC & SC Test on Single phase transformer
4. Brake test on DC shunt motor
5. Brake test on Three Phase Squirrel cage induction motor.
6. OCC of Three phase alternator.

Reference Books:

1. Circuits and Networks by A.Sudhakar&ShyamMohan.S, Tata McGraw Hill Publishing Company Limited, 5th Edition.
2. Basic Electrical Engineering - by T.K. Nagsarkar and M.S. Sukhija, Oxford University Press, 3rd Edition
3. Basic Electrical Engineering by D.P Kothari & I.J Nagrath, Tata McGraw Hill Publishing Company Limited, 2nd Edition

ENGINEERING WORKSHOP

B.Tech I Year II Semester

L	T	P	C
0	1	3	2.5

Course Outcomes:

1. Understanding the tools and methods of using to fabricate engineering components
2. Applying the measuring techniques to verify the dimensional accuracy
3. Evaluating various methods and trades of workshop in the component building

(i) Lectures & videos:
Detailed contents:

1. Manufacturing Methods- Metal Forming, Machining, Advanced manufacturing methods (2 lectures)
2. CNC machining, Additive manufacturing (2 lectures)
3. Fitting operations & power tools (1 lecture)
4. House wiring (1 lecture)
5. Carpentry (1 lecture)
6. Plastic moulding(1 lecture)
7. Metal casting (1 lecture)
8. Welding (1 Lecture)

(ii) Workshop Practice:
Detailed contents:

1. Machine shop (Lathe machine)
2. Fitting shop
3. Carpentry
4. House Wiring
5. Welding shop (Arc welding)
6. Tin Smithy

Reference Books:

1. Elements of Workshop Technology, Hajra Choudhury S.K., Hajra Choudhury A.K. and Nirjhar Roy S.K., Vol. I 2008 and Vol. II 2010, Media promoters and publishers private limited, Mumbai.
2. Manufacturing Engineering and Technology, Kalpakjian S. And Steven S. Schmid, 4th edition, Pearson Education India Edition, 2002.

ENGLISH COMMUNICATION SKILLS LAB

B.Tech I Year II Semester

L	T	P	C
0	0	2	1

Course Outcomes:

1. Understand the variants in pronunciation.
2. Identify the diverse purposes of listening and speaking.
3. Discuss ideas in diverse communicative settings.
4. Exhibit increased confidence in public speaking.
5. Display critical thinking, problem solving and decision making skills through GD's

Exercise-I:
CALL Lab: Spoken vs. Written language-Formal and Informal English- Introducing Oneself and Others.

Exercise-II:
CALL Lab: Listening Skill- Its importance Purpose- Process- Types- Barriers- Effective Listening. ICS Lab: Features of Good Conversation – Strategies for Effective Communication Role-Play- Making Requests and Seeking Permissions - Telephone Etiquette.

Exercise-III:
CALL Lab: Information Transfer

ICS Lab: Descriptions-Narrations-Giving Directions and Guidelines-Giving Instructions-Seeking Clarifications-Asking for and Giving Directions-Thanking and Responding-Agreeing and Disagreeing-Seeking and Giving Advice-Making Suggestions.

Exercise-IV:
CALL Lab: Past Tense Marker and Plural Marker
ICS Lab: Public Speaking- Exposure to Structured Talks - Non-verbal Communication- Making a Short Speech - Extempore

Exercise-V:
CALL Lab: Intonation- Sentence Stress -Weak Forms and Strong Forms.
ICS Lab: Group Discussion, Mock Group Discussion sessions

Text Book:

1. A textbook of English Phonetics for Indian Students, T. Balasubramanian, Macmillan Publishers, 2010.

Reference Books:

1. Speaking English Effectively, Mohan, Macmillan Publishers, 2010.
2. Lab Manual

PROGRAMMING FOR PROBLEM SOLVING-II

B.Tech I Year II Semester

L	T	P	C
2	0	0	2

Course Outcomes

1. Identify various string handling functions in 'C'.
2. Develop programs with user defined data types.
3. Use Dynamic memory allocation functions with pointers.
4. Distinguish between Stacks and Queues.
5. Analyze various Dynamic Data Structures.

UNIT – I

Overview of Arrays and Functions.

Strings: Introduction to Strings, String I/O, String Operations with and without built-in functions (strlen( ), strcmp( ), strcat( ),strcpy( ) and strrev( )).

UNIT -II

Structures: Definition and Initialization of Structures, Accessing structure members, Nested Structures, Array of Structures, Structures and Functions, Unions, typedef, Enumerated Data types.

UNIT-III

Pointers: Introduction to Pointers, Pointer Arithmetic, Pointers and Arrays, Pointer to Structure, Pointers and Strings, Parameter passing mechanism: Call by Reference, Pointer to Pointer, Dynamic Memory Allocation.

UNIT-IV

Introduction to Data Structures: Lists and Operations, Linear and Nonlinear Data structures.

Stacks- Introduction to Stacks, Operations, Implementation of Stack using Arrays.
Queues- Introduction to Queues, Operations, Implementation of Queue using Arrays.

UNIT-V

Linked Lists: Introduction to Linked List, Operations on Single Linked List (search, Insertion & Deletion).
Files: Introduction to Files, File Operations (Open, Close, read & Write).

Text Books:

1. COMPUTER SCIENCE: A Structured Programming Approach Using C, B.A.Forouzon and R.F. Gilberg Third edition, CENGAGE Learning, 2016.
2. C and Data Structures, Ashok N. Kamthane, "Pearson Education. 2010.

Reference Books

1. Problem Solving Using C, M.T.Somashekara, PHI, 2nd Edition 2009.
2. Computer Fundamentals and Programming in C, A.K.Sharma, 2nd Edition, University Press.
3. Programming in C 2/e, Pradip Dey and Manas Ghosh, Oxford University Press, 2nd Edition 2011.
4. The Fundamentals of Computers Rajaraman V.,, 4th Edition, Prentice Hall of India, 2006.
5. Programming in C, R S Bichker, University Press, 2012.

PROGRAMMING FOR PROBLEM SOLVING LAB – II

B.Tech I Year II Semester

L	T	P	C
0	0	2	1

Course Outcomes:

1. Build programs on various string handling functions.
2. Develop applications on user defined datatypes.
3. Apply dynamic memory allocation throughpointers.
4. Implement linear data structures through stacks andqueues.
5. Create linked list dynamically through stacks and queues.

Week 1
Programs on Arrays and Functions. (Minimum 3 Programs)

Week 2 & 3
Programs on Strings with and without string built-in Functions. (Minimum 6 Programs)

Week 4
Programs on Accessing Structures and Nested Structures. (Minimum 3 Programs)

Week 5 & 6
Programs on Array of Structures, Structures and Functions. (Minimum 5 Programs)

Week 7
Programs on Unions, typedef and enum. (Minimum 4 Programs)

Week 8
Programs on Pointers, pointer arithmetic, pointer expression, One Dimensional and Two dimensional arrays. (Minimum 4 Programs)

Week 9
Programs on Pointer to structure, Call by Reference, Pointer to Pointer. (Minimum 3 Programs)

Week 10
Programs on Dynamic Memory Allocation Functions. (Minimum 3 Programs)

Week 11
Programs on Stacks and Queues using Arrays.

Week 12 & 13
Programs on Single Linked List.

Week 14 & 15
Programs on File Operations. (Minimum 6 Programs)

Week 16
Review

B. Tech. II Year I Semester

S. No.	Course Category	Course Title	L	T	P	Credits
1	BS – 5	Complex Analysis & Fourier Transforms	3	0	0	3
2	H&S – 2	Professional Communication	2	0	0	2
3	ES – 5	Electronic Devices and Circuits	3	0	0	3
4	PC – 1	Network Analysis	3	0	0	3
5	PC – 2	Electro Magnetic Fields	3	0	0	3
6	PC – 3	Electrical Machines-I	4	0	0	4
7	PC Lab-1	Basic Simulation Tools Lab	0	0	2	1
8	PC Lab-2	Electrical Circuits Lab	0	0	2	1
9	MC – 1	Environmental Science	2	0	0	0
Total			**20**	**0**	**4**	**20**

COMPLEX ANALYSIS AND FOURIER TRANSFORMS

B. Tech. II Year I Semester

L	T	P	C
3	0	0	3

Course Outcomes: At the end of the course, the student should be able to

1. Work with the functions of complex variables and evaluation of complex differentiation.
2. Acquire the knowledge of complex power series and integration.
3. Apply the knowledge of contour integration to evaluate real integrals in engineering problems and acquire the knowledge of evaluating of conformal mapping and bilinear transformations.
4. Study Fourier series and define it for various types of functions.
5. Apply Fourier sine and cosine integral theorems for a given function f(x), evaluate Fourier transforms, sine and cosine transforms.

UNIT I
FUNCTIONS OF COMPLEX VARIABLES:

Introduction, Complex functions - limits and Continuity-Differentiability, Analytic functions and Properties, Cauchy-Riemann Equations (Cartesian and Polar), Harmonic functions, Construction of analytic functions.

UNIT II
COMPLEX INTEGRATION:

Introduction, Complex integration-Line integral, Cauchy's integral theorem, Cauchy's integral formula, Generalized Cauchy's integral formula, Power series: Taylor's series, Laurent series, Singular points, Types of Singularities, Residue, Cauchy's Residuetheorem.

UNIT III
EVALUATION OF INTEGRALS & CONFORMAL MAPPING:

Introduction, Evaluation of improper real integrals of the type (a) $\int_{-\infty}^{\infty} f(x)dx$

(b) $\int_{c}^{c+2\pi}(cos\theta, sin\theta)d\theta$

Conformal Mapping - Critical Points-Bilinear transformation – fixed point – cross ratio - properties - invariance of circles.

UNIT IV
FOURIER SERIES:

Introduction- Periodic functions- Fourier series of periodic function- Dirichlet's conditions- Even and odd functions- Change of interval- Half-range sine and cosine series.

UNIT V
FOURIER TRANSFORMS:

Introduction- Fourier integral theorem (without proof)- Fourier integrals in complex form- Standard results- Fourier sine and cosine integrals- Fourier Transforms- Infinite and finite Fourier Transforms- Properties- Fourier sine and cosine transforms- inverse transforms, Finite Fourier transforms.

TEXT BOOKS:

1. Higher Engineering Mathematics, Dr. B. S. Grewal, Khanna Publisher-44thedition.
2. A Text book of Engineering Mathematics, N.P.Bali, Manesh Goyal- 9thedition.

REFERENCE BOOKS:

1. Advanced Engineering Mathematics, Kreyszig, John Wiley & Sons-10th edition.
2. Fundamentals of Complex Analysis, Saff, E. B. and A. D. Snider, Pearson-3rd edition.
3. Functions of Complex Variables, J.N.Sharma, Publisher Krishna prakashan-49th edition.

PROFESSIONAL COMMUNICATION

B. Tech. II Year I Semester

L	T	P	C
2	0	0	2

Course Outcomes: At the end of the course, the student should be able to

1. Acquire enhanced personality
2. Exhibit appropriate professional etiquette
3. Practice team building with strong communication skills
4. Develop problem solving skills and decision-making
5. Demonstrate effective presentation skills

UNIT I
SELF APPRAISAL:

Self-Introspection/ Self Retrospection introducing self & others
Goal setting SWOT Analysis,

UNIT II
PROFESSIONAL ETIQUETTE:

Etiquette-Telephone Etiquette- Netiquette Email, Social Network
Behavioral Traits Case study

UNIT III
TEAM BUILDING:

Leadership skills-Case Studies Team Essentials
Negotiation Skills
Group Discussion-Functional Aspects

UNIT IV
LOGICAL THINKING AND ANALYTICAL REASONING:

Decision Making Problem Solving Conflict management Case Study

UNIT V
PRESENTATION SKILLS:

Poster Presentation
Oral Presentation-Individual Presentation, Team Presentation, Thematic Presentation

TEXT BOOKS:

1. Effective technical communication, Ashrif Rizvi, Tata McGraw Hill-2011

REFERENCE BOOKS:

1. Speaking and writing for effective business, Soundaraja, MACMILLAN,2010.
2. English for professional success, Hector Sanchez, Thomson,2010.

ELECTRONIC DEVICES AND CIRCUITS

B. Tech. II Year I Semester

L	T	P	C
3	0	0	3

Course Outcomes:

After going through this course the student will be able to:

1. Demonstrate the concepts of semiconductor theory.
2. Interpret the characteristics of different semiconductor devices with its applications.
3. Apply different biasing techniques of transistors for amplification.
4. Analyze transistor amplifiers using small signal model.
5. Describe the behaviour of special purpose diodes.

UNIT I

Diode: PN junction Diode – Characteristics, Current equation, Temperature dependence, Static and Dynamic resistances, Equivalent circuit, Diffusion and Transition Capacitances.

Diode Applications: Rectifier - Half Wave Rectifier, Full Wave Rectifier, Bridge Rectifier, Rectifiers with Capacitive Filter, Clippers and Clampers.

UNIT II

Bipolar Junction Transistor (BJT): Principle of Operation and characteristics - Common Emitter, Common Base, Common Collector Configurations, Operating point, DC & AC load lines, Transistor Hybrid parameter model, Determination of h-parameters from transistor characteristics, Conversion of h-parameters.

UNIT III

Transistor Biasing and Stabilization: Bias Stability, Fixed Bias, Collector to Base bias, Self Bias, Bias compensation using Diodes and Transistors.

Analysis and Design of Small Signal Low Frequency BJT Amplifiers: Analysis of CE, CC, CB Amplifiers and CE Amplifier with emitter resistance, low frequency response of BJT Amplifiers, effect of coupling and bypass capacitors on CE Amplifier.

UNIT IV

Junction Field Effect Transistor: Construction, Principle of Operation, Pinch-Off voltage, Volt-Ampere characteristics, comparison of BJT and FET, Biasing of FET, FET as voltage variable resistor, MOSFET construction and its characteristics in enhancement and depletion modes.

UNIT V

FET Amplifiers: Small Signal Model, Analysis of CS, CD, CG JFET Amplifiers. Basic Concepts of MOSFET Amplifiers.

Special Purpose Devices: Zener Diode - Characteristics, Voltage Regulator; Principle of Operation - SCR, Tunnel diode, UJT, Varactor Diode.

TEXT BOOKS:

1. Electronic devices and circuits, Millman & Halkias, McGraw Hill , 2007.
2. Electronic Devices and Circuits, S. Salivahanan, N. Suresh Kumar, A. Vallavaraj , Tata Mc Graw Hill , 2008.

REFERENCE BOOKS:

1. Electronic Devices and Circuits, Boylestad R L & Louis Nashelsky, Prentice Hall India, 2006.
2. Electronic Devices and Circuits, Gupta J B, S. K. Kataria, 2009.

NETWORK ANALYSIS

B. Tech. II Year I Semester

L	T	P	C
3	0	0	3

Course Outcomes: At the end of the course, the student will be able to

CO1. Apply network theorems for the analysis of electrical networks.
CO2. Obtain the transient and steady-state response of electrical circuits.
CO3. Examine graph theory to formulate network equations.
CO4. Analyze two port networks.
CO5. Evaluate circuits in the sinusoidal steady-state (Three-phase).

UNIT - I

NETWORK THEOREMS (DC & AC), MESH AND NODAL ANALYSIS: Analysis of Circuits using Mesh and Nodal methods, Norton's theorem, Maximum Power Transfer theorem, Reciprocity theorem, Millman's theorem and Compensation theorem.

UNIT II

D.C AND A.C TRANSIENT ANALYSIS: Transient response of R-L, R-C, R-L-C circuits (series and parallel) for D.C excitation- Initial conditions- Solution method using differential equation and Laplace transforms .

Transient response of R-L, R-C, R-L-C circuits (series and parallel) for sinusoidal excitation- Initial conditions- Solution method using differential equation and Laplace transforms.

UNIT III

NETWORK TOPOLOGY: Network Topology - Definitions, Graph, Tree, Incidence Matrix, Basic Cut Set and Basic Tie Set Matrices for Planar Networks, Loop and Nodal methods for analysis of Networks with Voltage and Current Sources, Duality & Dual Networks.

UNIT IV

TWO PORT NETWORKS: Two port network parameters - Z, Y, ABCD and Hybrid parameters and their inter relations. Series, parallel and cascaded connection of two port networks, Concept of transformed network - Two port network parameters using transformed variables.

UNIT V

ANALYSIS OF THREE PHASE CIRCUITS: Three phase Circuits – Generation of Three Phase Voltage - Review of Voltage and Current relations in Star and Delta systems. Analysis of balanced and unbalanced three phase circuits - Measurement of active and reactive power.

TEXT BOOKS:

1. Circuit theory-analysis & synthesis, A. Chakrabarthy, Dhanpat Rai & Sons - 7th revised Edition.
2. Circuits & networks-analysis and synthesis, A. Sudhakar and Shyammohan S. Palli, Tata McGraw Hill-5thEdition.

REFERENCE BOOKS:

1. Network analysis, Van Valkenburg, Prentice Hall-3rdEdition.
2. Network analysis, Mahmood Nahvi, Joseph Edminister, Schaum's Outline series, McGraw Hill Companies 4thEdition.
3. Electric circuit analysis, C.L.Wadhwa, New Age International-2ndEdition.

ELECTRO MAGNETIC FIELDS

B. Tech. II Year I Semester

L	T	P	C
3	0	0	3

Course Outcomes: At the end of the course, the student will be able to

CO1. Understand the basic laws of electromagnetism.
CO2. Compare the electric and magnetic fields concepts for simple configurations under static conditions.
CO3. Illustrate time varying magnetic fields.
CO4. Examine Maxwell's equations in different forms and different media.
CO5. Apply electromagnetic concepts to electrical machines.

UNIT - I

ELECTROSTATICS: Vector Algebra - Coordinate Systems - Divergence theorem. Electrostatic Fields - Coulomb's Law - Electric Field Intensity (EFI) - EFI due to a line and a surface charge, work done in moving a point charge in an electrostatic field, Electric Potential, Properties of potential function, Potential gradient. Gauss's law - Application of Gauss's Law, Maxwell's first law, Laplace's equations and Poison's equations.

UNIT - II

DIPOLE& CAPACITANCE: Electric Dipole, Dipole moment, Polarization, Potential due to an Electric Dipole and Torque. Capacitance - Capacitance of parallel plate, spherical and co-axial capacitors with composite dielectrics. Energy stored and energy density in static electric field. Current density, conduction and Convection current densities, Ohm's law in point form, Equation of continuity.

UNIT - III

MAGNETO STATICS, AMPERE'S CIRCUITAL LAW: Biot-Savart's law - Magnetic field intensity (MFI) - MFI due to a straight current carrying filament- MFI due to circular and solenoid current Carrying wire, Relation between magnetic flux, magnetic flux density, Maxwell's second Equation.

Ampere's circuital Law & Applications: Ampere's circuital law and its applications viz. - MFI due to an infinite sheet of current and a long current carrying filament, Point form of Ampere's circuital law - Curl-Stroke's Theorem, Maxwell's third equation.

UNIT – IV

FORCE IN MAGNETIC FIELDS, MAGNETIC POTENTIAL: Magnetic force - Lorentz force equation – force on a current element in a magnetic field - Force on a straight and a long current carrying conductor in a magnetic field – Force between two straight long and parallel current carrying conductors – Magnetic dipole and dipole moment – Torque in a magnetic field. Scalar Magnetic potential and its limitations, vector magnetic potential and its properties.

UNIT - V

INDUCTANCE, TIME VARYING FIELDS: Self and Mutual inductances, Determination of self-inductance of a solenoid, toroid and mutual inductance between a straight long wire, Energy stored and Density in a Magnetic field. Time varying fields - Faraday's laws of electromagnetic induction, Maxwell's fourth equation - Simple problems, Modification of Maxwell's equations for time varying fields, Displacement current.

TEXT BOOKS:

1. Engineering electromagnetics by William H. Hayt & John. A. Buck, McGraw Hill Companies-7th Edition, 2012.
2. Electromagnetic fields, Sadiku, Oxford Publications-7thEdition.

REFERENCE BOOKS:

1. Engineering electromagnetics, J P Tewari, Khanna Publishers-2nd Edition, 2005.
2. Elements of electromagnetic fields, S. P. Seth, Dhanpat Rai & Co. (Pvt.) Ltd-2ndEdition.
3. Electromagnetic field theory, K. A. Gangadhar, P. M. Ramanathan, Khanna Publishers- 16th Edition.

ELECTRICAL MACHINES-I

B. Tech. II Year I Semester

L	T	P	C
4	0	0	4

Course Outcomes: At the end of this course, students will be able to

CO1. Understand different parts of DC Generators & understand its operation.
CO2. Explain the operation of DC motors.
CO3. Illustrate the different testing methods of DC machines.
CO4. Examine the constructional and operation of single phase transformers.
CO5. Analyze three phase transformers connections.

UNIT – I

D.C. Generators: Principle of operation – Action of commutator – constructional features – armature windings – lap and wave windings – simplex and multiplex windings – use of laminated armature – E.M.F Equation. Armature reaction – Cross magnetizing and de-magnetizing AT/pole – compensating winding – commutation – reactance voltage – methods of improving commutation. Methods of Excitation – separately excited and self-excited generators – build-up of E.M.F - critical field resistance and critical speed - causes for failure of self-excitation and remedial measures. Load characteristics of shunt, series and compound generators.

UNIT – II

D.C Motors: Principle of operation – Back E.M.F. - Torque equation – characteristics and applications of shunt, series and compound motors – Necessity of starter, principle of operation of 3-point and 4-point starters with protective devices ,Speed control of D.C. Motors - Armature voltage and field flux control methods.

UNIT – III

Testing of DC Machines: Losses – Constant & Variable losses – calculation of efficiency – condition for maximum efficiency. Methods of Testing – direct, indirect, and regenerative testing – Brake test – Swinburne's test – Hopkinson's test – Field's test - separation of stray losses in a d.c. motor.

UNIT – IV

Single Phase Transformers: Types - constructional details-minimization of hysteresis and eddy current losses- EMF equation - operation on no load and on load - phasor diagrams Equivalent circuit - losses and efficiency – regulation - All day efficiency - effect of variations of frequency & supply voltage on iron losses.

UNIT – V

Testing of Transformers and Poly-Phase Transformers: OC and SC tests - Sumpner's test - predetermination of efficiency and regulation-separation of core losses-parallel operation with equal and unequal voltage ratios - auto transformers-equivalent circuit - comparison with two winding transformers. Poly-phase transformers – Poly-phase connections - Y/Y, Y/Δ, Δ/Y, Δ/ Δ and open Δ

TEXT BOOKS:

1. Theory and Performance of Electrical Machines, J.B. Gupta , S.K.Kataria & Sons , 2013.
2. Electrical Machines, R.K.Rajput Laxmi Publications (P) Ltd, 2004.

REFERENCE BOOKS:

1. Electrical Machinery, P. S. Bimbhra, Khanna Publishers, 2011.
2. Electric Machines, I. J. Nagrath and D. P. Kothari McGraw Hill Education, 2010.
3. Electrical Machines III, M.V.Bakshi & U.A.Bakshi, Technical Publications.

BASIC SIMULATION TOOLS LAB

B. Tech. II Year I Semester

L	T	P	C
0	0	2	1

Course Outcomes: Upon the completion of laboratory course, the student will be able to

CO1. Correlate the data using plots.
CO2. Verify network theorems.
CO3. Observe transient response of series circuits.
CO4. Simulate rectifier circuits.
CO5. Analyze networks using network theorems.

Any Ten of the following experiments should be conducted

1. Basic operation on matrices.
2. Basic 2D plots of simple equations.
3. Find loop currents using mesh analysis.
4. Find node voltage using nodal analysis.
5. Transient analysis of RL series circuit.
6. Transient analysis of RC series circuit.
7. Transient analysis of RLC series circuit.
8. Analysis of half wave rectifier with and without filter.
9. Analysis of full wave rectifier with and without filter.
10. Verification of Thevenin's theorem.
11. Verification of Maximum power transfer theorem.
12. Verification of super position theorem.

ELECTRICAL CIRCUITS LAB

B. Tech. II Year I Semester

L	T	P	C
0	0	2	1

Course Outcomes: Upon the completion of Laboratory course, the student will be able to

CO1. Evaluate response in a given network by using network theorems.
CO2. Analyze complex DC and AC linear circuits.
CO3. Apply concepts of electrical circuits.
CO4. Evaluate active power and reactive power of electric circuits.
CO5. Determine two port network parameters.

Any Ten of the following experiments should be conducted

1. Measurement of voltage, current and equivalent resistance of various circuits.
2. Verification of Norton's theorem.
3. Verification of maximum power transfer theorem on DC excitation.
4. Verification of compensation theorem.
5. Verification of reciprocity theorem & Millman's theorem.
6. Resonance in series and parallel R, L, C circuits.
7. Determination of self-inductance, mutual inductance and coefficient of coupling.
8. Locus diagrams of series RL and RC circuits.
9. Calculation of RMS, average values, form factor and peak factor of complex waveform.
10. Determination of Z & Y parameters.
11. Determination of transmission & hybrid parameters.
12. Measurement of active power for three phase balanced loads.
13. Measurement of reactive power for three phase balanced loads.

ENVIRONMENTAL SCIENCE

B. Tech. II Year I Semester

L	T	P	C
2	0	0	0

Course Outcomes

Students will be able to:

1. Define and explain the structure and functions of ecosystem, value of biodiversity, threats and conservation of biodiversity.
2. Explain the limitations of the resources and impacts of over utilization of all natural resources.
3. Explain the sources and effects of environmental pollutions and list the available techniques to control the pollution.
4. Explain the global environmental issues like climate change, ozone hole and can explain the scope of EIA, Environmental Management Plan, environmental audit and list the EIA methods.
5. Mention the salient features of environmental acts and rules, define the sustainable goals along with measures required for the sustainability.

UNIT I:

Ecosystem: Definition, Scope and Importance of ecosystem, Structure and Functions of ecosystem: Food chains, Food Web and Ecological Pyramids, Flow of energy; Bio-magnification.

Biodiversity and Biotic Resources: Introduction, Definition, levels of Biodiversity, Value of biodiversity, Hot spots of biodiversity, Threats to biodiversity, conservation of biodiversity: In-Situ and Ex-situ conservation.

UNIT II:

Natural Resources: Classification of Resources, **Water resources**: use and over utilization of surface and ground water, Dams: benefits and problems, Rain water harvesting; **Energy resources**: growing energy needs, Renewable and Non Renewable Energy resources. **Land resources**: land degradation – Landslide and Soil Erosion; **Forest Resources –** Uses and Exploitation.

UNIT III:

Environmental Pollution And Control: Types of Pollution, Sources, Effects and Control measures of Air Pollution ,Water Pollution ,Soil Pollution and Noise Pollution.

UNIT IV:

Global Environmental Problems and Global Efforts: Green house effect, Global Warming, climate change and their impacts on human environment; Ozone depletion and Ozone depleting substances (ODS); Aid Rains.

Environmental Impact Assessment (EIA): Scope of EIA and EIA methods, scope of Environmental audit and Environmental Management Plan.

UNIT V:

Environmental Policy, Legislation, Rules And Regulations: Salient features of Environmental Protection act, Air (Prevention and Control of pollution) Act- 1981, Water (Prevention and Control of pollution) Act-1974, Forest Conservation Act, Municipal solid waste, Hazardous waste, E-waste, Bio-medical waste, Radioactive waste Rules.

Towards Sustainable Future: Concept of Sustainable Development, Sustainable goals defined by UN, Threats to Sustainability, Environmental Education, Role of IT in Environment, Smart Cities, Concept of Green Building, Low Carbon Lifestyle, Life cycle assessment and Ecological Foot Print.

TEXT BOOKS:

1. Text Book of Environmental Studies by Anubha Kaushik (4th Edition), New age International Publishers.
2. Environmental studies by Erach Bharucha 2005, University Grants Commission, University Press.

REFERENCE BOOKS:

1. Textbook of Environmental Science and Technology by M. Anji Reddy,2007.
2. Text Book of Environmental Studies by Anubha Kaushik (3rdEdition), New age International Publishers.
3. Environmental Science : Towards a Sustainable Future by Richard T. Wright,2008 PHL Learning Private Ltd, New Delhi.

B. Tech. II Year II Semester

S. No.	Course Code	Course Title	L	T	P	Credits
1	A44019	Numerical Methods and Partial Differential Equations	3	0	0	3
2	A44405	Switching Theory and Logic Design	3	0	0	3
3	A44207	Python for Electrical Engineers	3	0	0	3
4.	A44208	Electrical Machines-II	3	0	0	3
5	A44209	Power Systems – I	3	0	0	3
6	A44210	Control Systems	3	0	0	3
7	A44285	Electrical Machines-I Lab	0	0	2	1
8	A44484	Electronic Devices and Circuits Lab	0	0	2	1
9	A44MC2	Gender Sensitization	2	0	0	0
Total			**20**	**0**	**4**	**20**

NUMERICAL METHODS AND PARTIAL DIFFERENTIAL EQUATIONS

B. Tech. II Year II Semester

Course Code: A44019

L	T	P	C
3	0	0	3

Course Outcomes: At the end of the course, the student should be able to

1. Develop skills in solving engineering problems involving algebraic and transcendental equations.
2. Acquires the knowledge of interpolation in predicting future out comes based on the present knowledge and also to fit different types of curves.
3. To know various types of numerical methods in solving engineering problems.
4. Classify the nature of second and higher order partial differential equations and find the solutions of linear and nonlinear PDE.
5. To apply partial differential equations in different engineering problems.

UNIT I
NUMERICAL TECHNIQUES: SOLUTION OF ALGEBRAIC AND TRANSCENDENTAL EQUATIONS:

Introduction - The Bisection Method- The Method of False Position- The Iteration Method-Newton-Raphson Method. Solving system of linear Non- Homogeneous equations by Jacobi's and Gauss-Seidel Iteration methods.

UNIT II
CURVE FITTING AND NUMERICAL INTEGRATION:

Curve fitting: Fitting a straight line -second degree curve-exponential curve, power curve by method of least squares.

Numerical integration – General Quadrature (Newton's Cote's formula), Trapezoidal rule, Simpson's rule. $\left(\frac{1}{3}^{rd} \& \frac{3}{8}^{th}\right)$

UNIT III
NUMERICAL SOLUTIONS OF IVP'S:

Numerical solution of Ordinary Differential equations: Introduction- Solution by Taylor's series method- Picard's Method of successive approximations- Single step methods-Euler's Method - Runge- Kutta (second and classical fourth order) Methods- Predictor Corrector method- Adam's - Bashforth method.

UNIT IV
PARTIAL DIFFERENTIAL EQUATIONS:

Introduction- Formation of partial differential equations by elimination of arbitrary constants and arbitrary functions- Solutions of first order Linear (Lagrange) Equation, Nonlinear Equations- Charpits Method.

UNIT V

APPLICATIONS OF PARTIAL DIFFERENTIAL EQUATIONS:

Introduction- Classification of general second order partial differential equations- Method of separation of variables for second order equations- Applications of Partial Differential Equations- One dimensional wave equation – One dimensional heat equation- Steady State two dimensional Heat equation (or Laplace equation).

TEXT BOOKS:

1. Higher engineering mathematics, B.S. Grewal, Khanna Publishers-43rdEdition.
2. Numerical methods, S. S. Sastry PHI Publications.

REFERENCE BOOKS:

1. Introductions of numerical methods, Jain &Iyengar
2. Numerical methods, E. Balaguruswamy, Tata McGraw Hill Publication.
3. Ordinary and partial differential equations, theory and applications, Shah and, Nita H, PHI Publications.

SWITCHING THEORY AND LOGIC DESIGN

B. Tech. II Year II Semester

L	T	P	C
3	0	0	3

Course Code: A44405

Course Outcomes: At the end of the course, the student should be able to

1. Demonstrate the basic theorems of Boolean algebra, logic gates, combinational and sequential circuits and memories.
2. Analyze the combinational and sequential circuits and memories.
3. Design of logic circuits
4. Realization of gates using different logic families.
5. Explain the design and operation of different semiconductor memories

UNIT I
NUMBER SYSTEM AND MINIMIZATION TECHNIQUES:

Number System: Review of number system and base conversion, complements, signed binary numbers, floating point number representation, Error detection (parity detection only).
Minimization techniques: Boolean Algebra**,** postulates ,basic logic gates, Canonical and Standard Form, NAND and NOR implementation, Minimization of switching function using theorem, The Karnaugh Map Method-Up to Five Variable Maps, Tabular Method.

UNIT II
COMBINATIONAL CIRCUITS:

Adders & Subtractor, Binary Adder-Subtractor, Decimal Adder, Binary Multiplier, Magnitude Comparators, Multiplexers, De-multiplexers, Decoders, Encoders and Code converters, Hazards and Hazard Free Relations.

UNIT III
SEQUENTIAL CIRCUITS-I:

Basic Architectural Distinctions between Combinational and Sequential circuits, Latches, Flip Flops: SR, JK, Race Around Condition in JK, JK Master Slave, D and T Type Flip Flops, Excitation Table of all Flip Flops, Design of a Clocked Flip-Flop, Timing and Triggering Consideration, Clock Skew, Conversion from one type of Flip-Flop to another.

UNIT IV
SEQUENTIAL CIRCUITS-II:

Synchronous – Asynchronous – Comparison, Design of Single mode Counter, Ripple Counter, Ring Counter, Shift Register, Shift Register Sequences, Ring Counter Using Shift Register, MOD Counters. Finite state machine - capabilities and limitations, Mealy and Moore models.

UNIT V

LOGIC FAMILIES AND SEMICONDUCTOR MEMORIES:

Logic Families: DCTL, RTL, DTL, TTL and CML Logic –gate realization - Comparison,
Semiconductor Memories: Introduction to ROM, PAL, PLA, CPLD, FPGA.

TEXT BOOKS:

1. Switching and finite automata theory, Zvi Kohavi & Niraj K. Jha, Cambridge-3rd Edition.
2. Modern digital electronics – R. P. Jain, Tata McGraw-Hill-3rd Edition.

REFERENCE BOOKS:

1. Digital design, Morris Mano, PHI-4thEdition.
2. Introduction to switching theory and logic design, Fredriac J. Hill, Gerald R. Peterson, John Wiley & Sons Inc-3rdEdition.
3. Fundamentals of logic design- Charles H. Roth, Cengage Learning-5thEdition.

PYTHON FOR ELECTRICAL ENGINEERS

B. Tech. II Year II Semester

L	T	P	C
3	0	0	3

Course Outcomes: At the end of the course, student will be able to

CO1. Understand the applications of Python programming in the area of electrical and electronics engineering.
CO2. Write programs on functions, modules and packages.
CO3. Apply Lists, Tuples, Dictionaries and matrix operations in Python
CO4. Enhance logical thinking and implementation of the electrical and electronic principles into a working code.
CO5. Analyze electric and magnetic circuit using Python

UNIT – I

Introduction to Python: History of python, Features of Python Language, understanding wide range of Python applications, Literal Constants, Comments, Reserved Words, Variables and Identifiers, Data Types, functions (Arguments, Return & In-built functions), Operations (Integers and floats, Strings, Type Conversions & Booleans), Expressions, Type Conversion.
Control Statements: Selection / Conditional Branching Statements, Loops (IF, IF - else &elif, for and while). Break and continue.

UNIT – II

Functions and Modules: Function Definition, Function Calling, return statement, Types of Arguments: Required, Keyword, Default Variable-length, Pandas and NumPy Packages in Python, Doc Strings.
Lists: Basic operations, list methods, looping in lists, Dictionaries, Tuples, Sets, Arrays, Exceptions, Tuples: Creating Tuple, Accessing Values in a Tuple, Basic Tuple Operations, Nested Tuples, index() and count() methods of tuple, Variable-length Argument Tuples, zip() Function, Advantages of Tuple over List.

UNIT – III

Dictionaries, NumPy package: Dictionaries: Creating a Dictionary, Accessing Values, Modifying an Entry, Deleting Items, Sorting Items in a Dictionary, Nested Dictionaries, Built-in Dictionary Functions and Methods.Difference between a List and a Dictionary
NumPy package: Array, Matrix and associated operations, Linear algebra and related operations, Data visualization on dataset using matplotlib and seaborn libraries, Scatter plot, Line plot, Bar plot, Histogram, Box plot, Pair plot.

UNIT – IV

Boolean Algebra& Logic Gates: Boolean operations, Boolean functions, Algebraic manipulations, Min-terms and Max terms, Sum-of-products and Product-of-sum representations, Two-input logic gates, NAND /NOR implementations using Python programming.
Implementation of Network Theorems: D.C Circuits & Network Theorems: Superposition theorem, Reciprocity theorem, Thevenin's and Norton's theorem, and Maximum Power Transfer Theorem.

UNIT – V

An Engineering perspective: Simulating a basic resistive circuit, The working of a diode using simulations, Basics of magnetic and electric fields. Study of inductors and capacitors, Phasor diagrams, writing control functions using Python, Simulating a transformer and magnetic circuits.

TEXT BOOKS:

1. Python Programming using Problem Solving Approach, Reema Thareja, First Edition, Oxford Higher Education.
2. Circuit theory-analysis & synthesis, A. Chakrabarthy, Dhanpat Rai & Sons - 7th revised Edition.

REFERENCES:

1. Fundamentals of Python, Kenneth A.Lambert
2. The Joy of Computing Using Python [NPTEL], Prof. SudarshanIyengar, IIT Ropar, Prof. Yayati Gupta, IIIT Dharwad (05-01-2021), Available: https: // nptel.ac.in /courses/ 106/106/106106 182/#
3. Python OOP Tutorials - Working with Classes, (05-01-2021) Prof. Kannan Moudgalya, Professor, IIT Bombay, Python 3.4.3, [SWAYAM], (05-01-2021), Available: https://onlinecourses.swayam2.ac.in/aic20_sp33/preview[4].Corey Schafer

ELECTRICAL MACHINES – II

B. Tech. II Year II Semester

L	T	P	C
3	0	0	3

Course Outcomes: At the end of this course, students will be able to

CO1. Understand the concepts of poly phase induction machines.
CO2. Examine the operation of induction motors.
CO3. Analyze performance characteristics of synchronous machines.
CO4. Evaluate the performance characteristics of Synchronous Generators
CO5. Assess the construction and operation of synchronous motors and special machines

UNIT – I

Poly-Phase Induction Machines: Constructional details of cage and wound rotor machines-production of a rotating magnetic field - principle of operation - rotor EMF and rotor frequency - rotor reactance, rotor current and Power factor at standstill and during operation. Induction generator-principle of operation(elementary treatment only).

UNIT – II

Characteristics of Induction Motor: Rotor power input, rotor copper loss and mechanical power developed. Torque equation- expressions for maximum torque and starting torque - torque slip characteristic - equivalent circuit - phasor diagram-crawling and cogging - No-load Test and Blocked rotor test –Predetermination of performance-Methods of starting and starting current and Torque calculations.

Speed Control Methods: Change of voltage, change of frequency, voltage/frequency, and injection of an EMF into rotor circuit (qualitative treatment only)

UNIT – III

Synchronous Machines: Constructional Features of round rotor and salient pole machines – Armature windings – Integral slot and fractional slot windings; Distributed and concentrated windings – distribution, pitch and winding factors – E.M.F Equation. Harmonics in generated e.m.f. – suppression of harmonics – armature reaction - leakage reactance – synchronous reactance and impedance – experimental determination - phasor diagram – load characteristics.

UNIT – IV

Regulation and Parallel operation of Synchronous Machine: Regulation: Regulation by synchronous impedance method, M.M.F. method, Z.P.F. method and A.S.A. methods – salient pole alternators – two reaction concept – experimental determination of X_d and X_q (Slip test).

Parallel Operation of Synchronous Machines: Synchronizing alternators with infinite bus bars – synchronizing power torque – parallel operation and load sharing - Effect of change of excitation and mechanical power input.

UNIT – V

Synchronous Motors and Special Machines: Synchronous Motors: Theory of operation –Methods of starting- phasor diagram – Variation of current and power factor with excitation – synchronous condenser – Mathematical analysis for power developed - hunting and its suppression –synchronous induction motor.

Special Machines: Principles of operation of Reluctance Motors, Permanent magnet Brushless DC Motors.

TEXT BOOKS:

1. Theory and Performance of Electrical Machines, J.B. Gupta, S.K.Kataria & Sons , 2013.
2. Electrical Machines, R.K.Rajput, Laxmi Publications (P) Ltd, 2004.

REFERENCE BOOKS:

1. Electrical Machinery, P. S. Bimbhra, Khanna Publishers, 2011.
2. Electric Machines, I. J. Nagrath and D. P. Kothari, McGraw Hill Education, 2010.
3. Alternating current machines, A. S. Langsdorf, McGraw Hill Education, 1984.

POWER SYSTEMS – I

B. Tech. II Year II Semester

L	T	P	C
3	0	0	3

Course Outcomes: At the end of the course, the student will be able to

CO1. Understand the principle of generation of electric power in thermal, hydro, nuclear and gas power stations.
CO2. Apply concepts in distribution systems to solve problems.
CO3. Interpret the arrangement and operation of AIS and GIS substations.
CO4. Analyze methods to improve the power factor and voltage control.
CO5. Evaluate various power tariff methods.

UNIT - I

POWER STATIONS: Thermal Power Stations: Line diagram of Thermal Power Station (TPS) showing paths of coal, steam, water, air, ash and flue gasses. Brief description of TPS components- Economizers, Boilers, Super heaters, Turbines, Condensers, Chimney and cooling towers.

Hydel Power Stations: Schematic Arrangement, Brief description of Hydraulic Structures, Water turbines.

Nuclear Power Stations: Nuclear Fission and Chain reaction, Nuclear fuels, Principle of operation of Nuclear reactor, Reactor Components- Moderators, Control rods, Reflectors and Coolants, Radiation hazards- Shielding and Safety precautions, Types of Nuclear reactors and brief description of PWR,BWR and FBR.

Gas Power Stations: Principle of Operation and Components (Block Diagram Approach Only).

UNIT - II

D.C & A.C DISTRIBUTION SYSTEMS: D.C Distribution Systems: Classification of Distribution Systems - Comparison of DC vs. AC and Under-Ground vs. Over -Head Distribution Systems- Requirements and Design features of Distribution Systems Voltage, Drop Calculations (Numerical Problems in D.C Distributors for the following cases: Radial D.C Distributor fed one end and at the both the ends (equal/unequal voltages) and Ring Main Distributor.

Distribution Systems: Voltage Drop Calculations (Numerical Problems) in A.C. Distributors for the following cases: Power Factors referred to receiving end voltage and with respect to related load voltages.

UNIT - III

AIR INSULATED & GAS INSULATED (GIS) SUBSTATIONS: Classification of substations: - Indoor & Outdoor substations: Substations layout showing the location of all the substation equipment. Bus bar arrangements in the Sub-Stations: Simple arrangements like single busbar, sectionalized single busbar, main and transfer busbar system with relevant diagrams.

Gas Insulated Substations (GIS): Advantages of Gas insulated substations, different types of gas insulated substations, single line diagram of gas insulated substations, busbar, construction aspects of GIS, Installation and maintenance of GIS, Comparison of Air insulated substations and Gas insulated substations.

UNIT - IV

POWER FACTOR & VOLTAGE CONTROL: Causes of low power factor – Methods of Improving power factor – Phase advancing and generation of reactive KVAR using static Capacitors – Most economical power factor for constant KW load and constant KVA type loads, Numerical Problems. Dependency of Voltage on Reactive Power flow- Methods of Voltage Control: Shunt Capacitors, Series Capacitors, Synchronous Capacitors, Tap changing and Booster Transformers.

UNIT - V

ECONOMIC ASPECTS OF POWER GENERATION & TARIFF: Load curve, load duration and integrated load duration curves-load, demand, diversity, capacity, utilization and plant use factors-Numerical Problems.

Tariff methods: Costs of Generation and their division into Fixed, Semi-fixed and Running Costs. Desirable Characteristics of a Tariff Method-Tariff Methods: Flat Rate, Block- Rate, two-part, three-part, and power factor tariff methods and Numerical Problems.

TEXT BOOKS:

1. A text book on power system engineering, A.Chakrabarthi, M.L.Soni, P.V.Gupta and M.L Soni, DhanpathRai and Sons-2016 Edition
2. Principles of power systems, V.K.Mehtha and Rohit Mehtha, S.Chand Company Pvt. Ltd, 2005, RevisedEdition

REFERENCE BOOKS:

1. Generation, distribution and utilization of electrical energy, C.L.Wadhwa, New Age International-3rd Edition.
2. A course in power systems, J.B.Gupta, S.K. Kataria&Sons-11thEdition.
3. A text book of power system engineering, R.K. Rajput, Laxmi Publications (P) Limited-1st Edition.

CONTROL SYSTEMS

B. Tech. II Year II Semester

L	T	P	C
3	0	0	3

Course Outcomes

At the end of the course the student will be able to

CO1. Understand the fundamentals of classical and modern control systems.
CO2. Apply modelling concepts for electrical and mechanical systems.
CO3. Analyse time and frequency responses of first and second-order systems.
CO4. Assess stability of control systems.
CO5. Analyze stability using state space

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 - Translation 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 and Stability 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.

The concept of stability – Routh's stability criterion – qualitative 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-Phase margin and Gain margin Stability Analysis from Bode Plots, Nyquist Plots-Stability Analysis.

UNIT – V

Classical Control Design Techniques:

Introduction to Compensation techniques, PID Controllers.

State Space Analysis of Continuous Systems:

Concepts of state, state variables and state model, derivation of state models - Solving the Time invariant state Equations - State Transition Matrix and its Properties, Concepts of Controllability and Observability.

TEXT BOOKS:

1. Control Systems Engineering – I.J.Nagrath and M.Gopal, New Age International (P) Limited, Publishers, 2nd edition, 2009.
2. Automatic Control Systems - B. C. Kuo, John wiley and sons. 8th edition, 2003.
3. Control Systems – N.C.Jagan, BS Publications

REFERENCE BOOKS:

1. Modern Control Engineering –Katsuhiko Ogata – Prentice Hall of India Pvt. Ltd., 3rd Edition, 1998.
2. Control Systems-N.K.Sinha, New Age International (P) Limited Publishers, 3rd Edition, 1998.
3. Control Systems Engg. -– John wiley, NISE, 4rd edition, 2007.
4. Control Systems – Nagoorkani, 1998.

ELECTRICAL MACHINES - I LAB

B. Tech. II Year II Semester

L	T	P	C
0	0	2	1

Course Outcomes: Upon the completion of Laboratory course, the student will be able to

CO1. Start and control the Different types of DC motors.
CO2. Assess the performance of different types of DC machines using different testing methods.
CO3. Identify different conditions required to be satisfied for self - excitation of DC Generators.
CO4. Separation losses of DC motor into different components.
CO5. Analyze the performance of coupled machines.

Any 10 out of the following 12 experiments should be conducted:

1. Magnetization characteristics of a DC shunt generator.
2. Load test on DC shunt generator.
3. Load test on DC compound generator.
4. Load test on DC series generator.
5. Brake test on DC compound motor.
6. Hopkinson's test on DC Shunt machines.
7. Field's test on DC Series machines.
8. Separation of losses in DC shunts motor.

In addition to the above eight experiments at least any two of the following experiments are required to be conducted from the following list.

1. Retardation test on DC shunt motor.
2. Speed control of DC shunt motor.
3. Swinburne's test on DC shunt machine.
4. Brake Test on DC shunt Motor.

GENDER SENSITIZATION

B. Tech. II Year II Semester

L	T	P	C
2	0	0	0

Course Outcomes: At the end of the course, the student should be able to

1. To develop awareness about gender discrimination and take measurable steps to counter it.
2. To identify the basic dimensions of biological, sociological, psychological and legal aspects of gender.
3. To acquire knowledge about gendered division of labour in relation to politics and economics.
4. To prepare the students against gender violence.
5. To prepare the students to work and live together a sequals.

UNIT I
UNDERSTANDING GENDER:

Gender: Why Should We Study It? (Towards a World of Equals: Unit -1)
Socialization: Making Women, Making Men (Towards a World of Equals: Unit -2) Introduction. Preparing for Womanhood. Growing up Male. First lessons in Caste. Different Masculinities.

UNIT II
GENDER AND BIOLOGY:

Missing Women: Sex Selection and Its Consequences (Towards a World of Equals: Unit -4) Declining Sex Ratio. Demographic Consequences.
Gender Spectrum: Beyond the Binary (Towards a World of Equals: Unit -10) Two or Many? Struggles with Discrimination.

UNIT III
GENDER AND LABOUR:

Housework: the Invisible Labour (Towards a World of Equals: Unit -3) “My Mother doesn’t Work.” “Share the Load”.
Women’s Work: Its Politics and Economics (Towards a World of Equals: Unit -7)
Fact and Fiction. Unrecognized and Unaccounted work. Additional Reading: Wages and Conditions of Work.

UNIT IV
ISSUES OF VIOLENCE:

Sexual Harassment: Say No! (Towards a World of Equals: Unit -6)

Sexual Harassment, not Eve-teasing- Coping with Everyday Harassment- Further Reading: "Chupulu".
Domestic Violence: Speaking Out (Towards a World of Equals: Unit -8)

Is Home a Safe Place? -When Women Unite [Film]. Rebuilding Lives. Additional Reading: New Forums for Justice.
Thinking about Sexual Violence (Towards a World of Equals: Unit -11)
Blaming the Victim-"I Fought for my Life…." - Additional Reading: The Caste Face of Violence.

UNIT V
GENDER: CO – EXISTENCE:

Just Relationships: Being Together as Equals (Towards a World of Equals: Unit -12)

Mary Kom and Onler. Love and Acid just do not Mix. Love Letters. Mothers and Fathers. Additional Reading: Rosa Parks-The Brave Heart.

TEXT BOOK:

1.Towards a World of Equals: A Bilingual Textbook on Gender,A. Suneetha, Uma Bhrugubanda, DuggiralaVasanta, Rama Melkote, Vasudha Nagaraj, Asma Rasheed, GoguShyamala, Deepa Sreenivas and Susie Tharu ,Telugu Akademi, Hyderabad,Telangana State in the year 2015.

REFERENCE BOOKS:

1. Seeing like a feminist, Menon, Nivedita, New Delhi, Zubaan-PenguinBooks-2012
I fought for my life and won, Abdulali Sohaila, Available online at: http://www.thealternative.in/lifestyle/i-fought-for-my-lifeand-won-sohaila-abdulal/

B. Tech. III Year I Semester

S. No.	Course Category	Course Title	L	T	P	Credits
1	H&S – 3	Managerial Economics and Financial Analysis	3	0	0	3
2	PC – 8	Power Systems- II	3	0	0	3
3	PC – 9	Power Electronics	3	0	0	3
4	PC – 10	Microprocessors and Interfacing Devices	3	0	0	3
5	PE – 1	AI Techniques in Electrical Engineering/ Integrated Circuits and Applications/ Electrical Energy Conservation and Auditing	3	0	0	3
6	OE – 1	OPEN ELECTIVE – 1	3	0	0	3
7	PC Lab – 5	Electrical Machines-II Lab	0	0	2	1
8	PC Lab – 6	Advanced Communication Skills Lab	0	0	2	1
9	VAC – 1	Personality Development & Behavioral Skills	2	0	0	1
Total			**20**	**0**	**4**	**21**

MANAGERIAL ECONOMICS AND FINANCIAL ANALYSIS

B. Tech. III Year I Semester

L	T	P	C
3	0	0	3

Course Outcomes: At the end of the course, the student should be able to

1. Analyze the scope of managerial economics.
2. Apply managerial tools and techniques to attain optimal decisions.
3. Analyze how production function is carried out to achieve maximum output.
4. Analyze changing business environment in post liberalization scenario.
5. Evaluate and interpret the financial statements to make informed decisions.

UNIT I
INTRODUCTION TO BUSINESS AND ECONOMICS:

Business: Structure of Business Firm, Theory of Firm, Types of Business Entities, Limited Liability Companies, Sources of Capital for a Company, Non-Conventional Sources of Finance.
Economics: Significance of Economics, Micro and Macro Economic Concepts, Concepts and Importance of National Income, Inflation, Money Supply in Inflation, Business Cycle, Features and Phases of Business Cycle. Nature and Scope of Business Economics, Role of Business Economist, Multidisciplinary nature of Business Economics.

UNIT II
DEMAND AND SUPPLY ANALYSIS:

Elasticity of Demand: Elasticity, Types of Elasticity, Law of Demand, Measurement and Significance of Elasticity of Demand, Factors affecting Elasticity of Demand, Elasticity of Demand in decision making, Demand Forecasting: Characteristics of Good Demand Forecasting, Steps in Demand Forecasting, Methods of DemandForecasting.
Supply Analysis: Determinants of Supply, Supply Function & Law of Supply.

UNIT III
PRODUCTION, COST, MARKET STRUCTURES & PRICING:

Production Analysis: Factors of Production, Production Function, Production Function with one variable input, two variable inputs, Returns to Scale. Cost analysis: Types of Costs. Market **Structures**: Nature of Competition, Features of Perfect competition, Monopoly, Oligopoly, and Monopolistic Competition. Pricing: Types of Pricing, Product Life Cycle based Pricing, Break Even Analysis, and Cost Volume Profit Analysis.

UNIT IV
FINANCIAL ACCOUNTING:

Accounting concepts and Conventions, Accounting Equation, Double-Entry system of Accounting, Rules for maintaining Books of Accounts, Journal, Posting to Ledger, Preparation of Trial Balance, and Preparation of Final Accounts.

UNIT V
FINANCIAL ANALYSIS THROUGH RATIOS:

Concept of Ratio Analysis, Liquidity Ratios, Turnover Ratios, Profitability Ratios, Proprietary

Ratios, Solvency, Leverage Ratios (simple problems).

TEXT BOOKS:

1. Business economics, theory and applications, D. D. Chaturvedi, S. L. Gupta, International Book House Pvt.Ltd.
2. Financial accounting, Dhanesh K Khatri, Tata McGrawHill.

REFERENCE BOOKS:

1. Financial accounting for management, Paresh Shah, Oxford Press, 2015- 2nd edition.
2. Financial accounting, S. N. Maheshwari, Sunil K Maheshwari, Sharad K Maheshwari, Vikas Publications-5th edition.

POWER SYSTEMS – II

B. Tech. III Year I Semester

L	T	P	C
3	0	0	3

Course Outcomes: At the end of the course, the student will be able to

CO1. Understand transmission line parameters.
CO2. Observe the performance of transmission lines.
CO3. Analyze transient behavior of transmission lines.
CO4. Evaluate mechanical design of transmission lines.
CO5. Understand the construction, grading and capacitance of underground cables.

UNIT - I

TRANSMISSION LINE PARAMETERS: Types of conductors, calculation of resistance for solid conductors, Calculation of inductance for single phase and three phase, single and double circuit lines, concept of GMR & GMD, symmetrical and asymmetrical conductor configuration with and without transposition, Numerical Problems. Calculation of capacitance for 2 wire and 3 wire systems, effect of ground on capacitance, capacitance calculations for symmetrical and asymmetrical single and three phase, single and double circuit lines, Numerical Problems.

UNIT - II

PERFORMANCE OF SHORT, MEDIUM AND LONG LENGTH TRANSMISSION LINES: Classification of Transmission Lines Short, medium and long line and their model representations Nominal-T, Nominal-Pie A, B, C, D Constants for symmetrical & Asymmetrical Networks, Numerical Problems. Mathematical Solutions to estimate regulation and efficiency of all types of lines, Numerical Problems. **Long Transmission Line**: Rigorous Solution, evaluation of A,B,C,D Constants, Interpretation of the Long Line Equations, Surge Impedance and SIL of Long Lines, Wave Length and Velocity of Propagation of Waves - Representation of Long Lines - Equivalent-T and Equivalent Pie network models (numerical problems).

UNIT - III

POWER SYSTEM TRANSIENTS: Types of System Transients - Travelling or Propagation of Surges - Attenuation, Distortion, Incident, Reflected and Refracted Waves - Reflection and Refraction Coefficients - Termination of lines with different types of conditions - Open Circuited Line, Short Circuited Line, T-Junction, Lumped Reactive Junctions (Numerical Problems). Bewley's Lattice Diagrams (for all the cases mentioned with numerical examples).

UNIT - IV

FACTORS GOVERNING THE PERFORMANCE OF TRANSMISSION LINES, TRANSMISSION LINE INSULATORS, SAG AND TENSION CALCULATIONS: Skin and Proximity effects - Description and effect on Resistance of Solid Conductors - Ferranti effect-Charging Current - Effect on Regulation of the Transmission Line. Corona - Description of the phenomenon, factors affecting corona, critical voltages and power loss, Radio Interference. Types of Insulators, String efficiency and Methods for improvement, Numerical Problems voltage distribution, calculation of string efficiency, Capacitance grading and Static Shielding. Sag and Tension Calculations with equal and unequal heights of towers, Effect of Wind and Ice on weight of Conductor, Numerical Problems - Stringing chart and sag template and its applications.

UNIT - V

UNDERGROUND CABLES: Types of Cables, Construction, Types of Insulating materials, Calculations of Insulation resistance and stress in insulation Numerical Problems. Capacitance of Single

and 3-Core belted cables, Numerical Problems. Grading of Cables Capacitance grading, Numerical Problems, Description of Inter-sheath grading.

TEXT BOOKS:

1. Electrical power systems, C. L. Wadhwa, New Age International (P) Limited, Publishers.
2. Principles of Power Systems, V. K. Mehta and Rohit Mehta, S. Chand Company Pvt. Ltd, 2005.

REFERENCE BOOKS:

1. A Text Book on Power System Engineering, M.L.Soni, P.V. Gupta, U.S. Bhatnagar, A. Chakrabarthy, Dhanpat Rai & Co Pvt. Ltd.
2. Power System Engineering, I.J. Nagarath and D.P. Kothari, TMG.
3. Power System Analysis and Design, Dr. B. R. Gupta, S. Chand & Company Limited.

POWER ELECTRONICS

B. Tech. III Year I Semester

L	T	P	C
3	0	0	3

Course Outcomes: At the end of the course, the student will be able to

CO1. Understand about various power electronic devices and their commutation procedure.
CO2. Discuss the operation of various single phase-controlled converters.
CO3. Examine operation of various three phase-controlled converters and AC voltage controllers.
CO4. Identify the operation of DC-DC converters.
CO5. Analyze the operation of DC-AC converters.

UNIT - I

POWER SEMI CONDUCTOR DEVICES & COMMUNICATION CIRCUITS:

THYRISTORS: Silicon Controlled Rectifiers (SCR's), BJT, Power MOSFET, Power IGBT, their characteristics and other thyristors. Basic theory of operation of SCR, Static characteristics, Turn on and turn off methods. Dynamic characteristics of SCR - Turn on and Turn off times -Salient points. Two transistor analogy. UJT firing circuit, Series and parallel connections of SCR's, Snubber circuit details – Specifications .Ratings of SCR's, BJT and IGBT - Line Commutation and Forced Commutation circuits. Numerical problems

UNIT - II

AC-DC CONVERTERS (1-PHASE CONTROLLED RECTIFIERS): Phase control techniques, Single phase Line commutated converters, Midpoint and Bridge connections, half controlled converters with R, RL and RLE loads. Derivation of average load voltage and current-Active and Reactive power inputs to the converters without and with Freewheeling Diode Numerical problems. Fully controlled converters, Midpoint and Bridge connections with Resistive, RL loads and RLE load Derivation of average load voltage and current Line commutated inverters -Active and Reactive power inputs to the converters without and with Freewheeling Diode, Effect of source inductance- Derivation of load voltage and current. Numerical problems.

UNIT - III

AC-DC CONVERTERS (3-PHASE CONTROLLED RECTIFIERS):

THREE PHASE CONVERTERS: Three pulse and six pulse converters, Midpoint and bridge connections- average load voltage With R and RL loads, effect of Source inductance. Dual converters (both single phase and three phase) Waveforms. Numerical Problems.

AC-AC CONVERTERS (AC VOLTAGE CONTROLLERS) & FREQUENCYCHANGERS (CYCLO-CONVERTERS):

AC VOLTAGE CONTROLLERS: Single phase two SCR's in anti-parallel with R and RL loads. Modes of operation of Triac, Triac with R and RL loads - Derivation of RMS load voltage, current and power factor wave forms. Firing circuits -Numerical problems –**CYCLOCONVERTERS:** Single phase mid-point cyclo-converters with Resistive and inductive loads. (Principle of operation only) Bridge configuration of single phase cyclo- converter (Principle of operation only) Waveforms.

UNIT IV

DC-DC CONVERTERS (CHOPPERS): CHOPPERS: Time ratio control and Current limit control strategies. Step down choppers- Derivation of load voltage and currents with R, RL and RLE loads. Step up Chopper – load voltage expression. Jones chopper, AC Chopper, Problems. Switched Mode Regulator - SMPS (Basic Principle of Operation).

UNIT V

DC-AC CONVERTERS (INVERTERS): INVERTERS: Single phase inverter, basic series inverter, parallel inverter - operation and waveforms .Three phase inverters (180, 120 degrees conduction modes of operation). Voltage control techniques for inverters, Pulse width modulation techniques. Numerical problems.

TEXT BOOKS:

1. Power electronics, Dr. P. S. Bimbhra, Khanna Publishers, 3rd edition.
2. Power electronics, circuits, devices and applications, M. H. Rashid, Prentice Hall of India, 4th edition.

REFERENCE BOOKS:

1. Power electronics devices, circuits and industrial applications, V. R. Moorthi, Oxford University Press.
2. Power electronics, M. D. Singh &K. B. Kanchandhani, Tata McGraw - Hill Publishing Company, 1998,
3. Power electronics, Vedam Subramanyam, New Age International (P) Limited Publishers, 2nd edition.

MICROPROCESSORS AND INTERFACING DEVICES

B. Tech. III Year I Semester

Course Code: A45213

L	T	P	C
3	0	0	3

Course Outcomes

At the end of the course the student will be able to

1. Illustrate the internal architecture of 8086 and 8051
2. Understand and apply the fundamentals of assembly level programming of microprocessors and microcontroller.
3. Explain the use of interrupts with suitable examples.
4. Demonstrate the interfacing of various peripheral devices with the microprocessor 8086.
5. Design electrical circuitry to the Microcontroller I/O ports in order to interface the controller to external devices.

UNIT-I

8086 Microprocessor: Introduction to 8085 microprocessor- 8086 architecture- Functional Diagram- Register Organization- Memory segmentation- Memory addresses- physical memory organization- Signal descriptions of 8086- common function signals- Minimum and Maximum mode operation- Timing diagrams- Interrupt structure.

UNIT-II

Assembly Language Programming using 8086: Instruction formats- addressing modes- instruction set- assembler directives-procedures-macros- Simple programs.

UNIT-III

Interfacing with 8086 Microprocessor: 8255 Programmable Peripheral Interface-Various Modes of Operation-Interfacing Keyboard- Display-Stepper motor- ADC-DAC-8259 Programmable Interrupt Controller -8257DMA controller.

UNIT-IV

Communication Interface: Serial communication standards- serial data transfer schemes- 8251 USART architecture and Interfacing- RS-232-TTL to RS 232C and RS232C to TTL conversion. Simple programs on serial data transfer-IEEE-488

UNIT-V

Introduction to Microcontrollers: Overview of 8051 microcontroller- Architecture- I/O ports and Memory organization- addressing modes and instruction set of 8051- Simple programs

TEXT BOOKS

1. Advanced Microprocessors and Peripherals, A. K. Ray and K.M. Bhurchandani, TMH- 2nd Edition 2006.
2. Microprocessor and Interfacing, DV Hall, , Mc Graw Hill, 2006

REFERENCES

1. The 8051Microcontrollers- Architecture and Programming and Applications, K.Uma Rao & Andhe Pallavi, Pearson- 2009.
2. The 8051 Micro controller, Kenneth. J. Ayala, Cengage Learning, 2004.

ARTIFICIAL INTELLIGENCE TECHNIQUES IN ELECTRICAL ENGINEERING
(Professional Elective-1)

L	T	P	C
3	0	0	3

B. Tech. III Year I Semester

Course Outcomes: At the end of the course, the student will be able to

CO1. Understand artificial neural networks.
CO2. Generalize feed forward neural networks, feedback neural networks and learning techniques.
CO3. Identify fuzziness involved in various systems and fuzzy set theory.
CO4. Discover fuzzy logic control for applications in electrical engineering.
CO5. Interpret genetic algorithm for applications in electrical engineering.

UNIT - I

ARTIFICIAL NEURAL NETWORKS: Introduction, Models of Neuron Network-Architectures Knowledge representation, Artificial Intelligence and Neural networks–Learning process-Error correction learning, Hebbian learning Competitive learning-Boltzman learning, supervised learning-Unsupervised learning. Reinforcement learning - Learning tasks.

UNIT- II

ANN PARADIGMS: Multi-layer perceptron using Back propagation Algorithm (BPA), Self – Organizing Map (SOM), Radial Basis Function Network-Functional Link Network (FLN), Hopfield Network.

UNIT - III

FUZZY LOGIC: Introduction: Fuzzy versus crisp, Fuzzy sets-Membership function –Basic Fuzzy set operations, Properties of Fuzzy sets. Fuzzy Cartesian Product, Operations on Fuzzy relations Fuzzy logic, Fuzzy Quantifiers, Fuzzy Inference-Fuzzy Rule based system, Defuzzification methods.

UNIT - IV

GENETIC ALGORITHMS: Introduction-Encoding Fitness Function-Reproduction operators, Genetic Modeling Genetic operators-Cross over-Single site cross over, Two point cross over Multi point cross over Uniform cross over, Matrix cross over-Crossover Rate-Inversion & Deletion, Mutation operator Mutation Mutation Rate-Bit-wise operators, Generational cycle-convergence of Genetic Algorithm.

UNIT V

APPLICATIONS OF AI TECHNIQUES: Load forecasting, Load flow studies, Economic load dispatch, Load frequency control, Single area system and two area system, Reactive power control, Speed control of DC and AC Motors.

TEXT BOOKS:

1. Neural networks, fuzzy logic and genetic algorithms, S.Rajasekaran and G.A.V.Pai PHI, New Delhi.
2. Neural networks: A comprehensive foundation, Simon O Haykin, International Edition-2nd Edition.

REFERENCE BOOKS:

1. Neural computing theory & practice, P.D.Wasserman & Van Nostrand Reinhold, New York.
2. Neural network & fuzzy system, Bart Kosko, PrenticeHall.
3. Genetic algorithms, D.E.Goldberg, Pearson Education.

INTEGRATED CIRCUITS AND APPLICATIONS
(Professional Elective-1)

B. Tech. III Year I Semester

L	T	P	C
3	0	0	3

Course Outcomes: At the end of the course, the student should be able to

CO1. Remember the characteristics of different integrated circuits families.
CO2. Infer the different applications of operational amplifiers under different configurations.
CO3. Recognize the importance of special function integrated circuits on different engineering applications.
CO4. Interpret the need for data converters for real time applications.
CO5. Design and analysis of first order active filter and waveform generators using operational amplifiers.

UNIT - I

INTEGRATED CIRCUITS: Classification, chip size and circuit complexity, Classification of Integrated circuits, comparison of various logic families, standard TTL NAND Gate-Analysis & characteristics, TTL open collector O/Ps, Tristate TTL, MOS & CMOS open drain and tri-state outputs, CMOS transmission gate, IC interfacing- TTL driving CMOS & CMOS driving TTL.

UNIT - II

OP-AMP AND APPLICATIONS: Basic information of OP-AMP, ideal and practical OP-AMP, internal circuits, OP-AMP characteristics, DC and AC characteristics, 741 OP-AMP and its features, modes of operation- inverting, non-inverting, differential. Basic application of OP-AMP, instrumentation amplifier, ac amplifier, V to I and I to V converters, sample & hold circuits, multipliers and dividers, Differentiators and Integrators, Comparators, introduction to voltage regulators.

UNIT - III

ACTIVE FILTERS & OSCILLATORS: Introduction, 1st order LPF, HPF filters, Band pass, Band reject and all pass filters. Oscillator types and principle of operation RC, Wien and quadrature type, waveform generators triangular, saw tooth, square wave and VCO.

UNIT - IV

TIMERS & PHASE LOCKED LOOPS: Introduction to 555 timer, functional diagram, monostable and astable operations and applications, Schmitt Trigger. PLL introduction, block schematic, principles and description of individual blocks of 565.

UNIT - V

D-A AND A-DCONVERTERS: Introduction, basic DAC techniques, weighted resistor DAC, R-2R ladder DAC, inverted R-2R DAC, Different types of ADCs - parallel comparator type ADC, counter type ADC, successive approximation ADC and slope ADC. DAC and ADC specifications.

TEXT BOOKS:

1. Linear integrated circuit, D. Roy Chowdhary, New Age International(p) Ltd-2nd Edition
2. Op-amps and linear Integrated Circuits, Ramakanth A. Gayakwad, PHI.

REFERENCES BOOKS:

1. Operational amplifiers and linear integrated circuits, R.F. Coughlin & Fredrick F. Driscoll, PHI.
2. Operational amplifiers and linear integrated circuits: Theory & Applications, Denton J. Daibey,TMH.
3. Digital fundamentals - Floyd and Jain, Pearson Education-8th Edition

ELECTRICAL ENERGY CONSERVATION AND AUDITING
(Professional Elective-1)

L	T	P	C
3	0	0	3

B. Tech. III Year I Semester

Course Outcomes: After completion of this course, students are able to:

CO1. Know the current energy scenario and importance of energy auditing.
CO2. Understand the concepts of energy auditing.
CO3. Evaluate the performance of existing engineering systems
CO4. Explore the methods of improving energy efficiency in different engineering systems
CO5. Design different energy efficient devices.

UNIT- I

Basics of Energy and its various forms: Overview of engineering, elements Solar energy, electricity generation methods using solar energy, PV cell, elements of wind energy, electricity generation using wind energy, elements of bio energy, bio mass energy conservation, elements of geothermal energy, sources of geothermal energy, sources of chemical energy, fuel cells, Energy Scenario in India

UNIT- II

Energy Auditing-1: Introduction: Need for energy audit, directions for the study of energy auditing, inclusions for energy auditing, types of energy audit: preliminary audit, general/mini audit, investment-grade/ comprehensive audit. Major energy consuming equipments and systems, energy audit team, energy auditing methodology: preliminary and detailed. Process flow diagram, energy audit report format

UNIT- III

Energy Auditing-2: For buildings: Energy auditing instruments, energy efficiency, energy auditing for buildings: stages in programs, surveying, measurements and model analysis. Energy audit form of commercial buildings, checklist for energy saving measures

UNIT - IV

Energy Efficient Technologies-I: Importance of energy efficiency for engineers, Energy efficient technology
in mechanical engineering: Heating, ventilation and air-conditioning, boiler and steam distribution systems
Energy efficient technology in civil engineering: future of roads, harnessing road and transport infrastructure;

UNIT - V

Energy Efficient Technologies-II : Energy efficient technology in electrical engineering: Electricity billing, electrical load management and maximum demand control, power factor improvement and its benefit, selection and location of capacitors; Energy efficient technology in chemical engineering: green chemistry, low carbon cements, recycling paper

TEXT BOOKS:

1. Energy Management, Umesh Rathore,, Kataria publications, 2nd ediiton, 2014.
2. Guide books for National Certification Examination for Energy Manager / Energy Auditors Book-1, General Aspects

REFERENCES:

1. Hargroves, K., Gockowiak, K., Wilson, K., Lawry, N., and Desha, C. (2014) An Overview of Energy Efficiency Opportunities in Mechanical/civil/electrical/chemical Engineering, The University of Adelaide and Queensland University of Technology.
2. Success stories of Energy Conservation by BEE, New Delhi (www.bee-india.org)

ELECTRICAL MACHINES – II LAB

B. Tech. III Year I Semester

L	T	P	C
0	0	2	1

Course Outcomes: Upon the completion of Laboratory course, the student will be able to

CO1. Understand the basic working principle of a transformer; obtain the equivalent circuit parameters, estimate efficiency & regulation at various loads of 1-Φ transformers.
CO2. Examine load sharing of transformers & conversion of 3- Φ to 2- Φ supply.
CO3. Determine the equivalent circuit parameters of a single phase induction motor; determine the performance characteristics and efficiency by direct and indirect methods of three phase induction motor.
CO4. Analyze the regulation of an alternator by various methods at different power factors.
CO5. Assess synchronous motor performance curves at various power factors and field currents.

Any Ten of the following experiments are required to be conducted.

1. Sumpner's test on a pair of single phase transformer.
2. Separation of core losses of a single phase transformer.
3. Scott connection of transformer and Parallel operation of single phase transformer.
4. No-load & Blocked rotor tests on three phase induction motor.
5. Regulation of a three – phase alternate by synchronous impedance M.M.F methods.
6. V and inverted V curves of a three – phase synchronous motor.
7. Equivalent circuit of a single phase induction motor.
8. Determination of Xd and Xq of a salient pole synchronous machine.

In addition to the above eight experiments at least any two of the following experiments are required to be conducted from the following list.

9. Regulation of three phase alternator by Z.P.F. and A.S.A methods.
10. Determination of sequence impedances of a three-phase alternator.
11. Determination of sequence impedances of a three-phase transformer.
12. Speed control of three phase slip ring Induction Motor.

ADVANCED COMMUNICATION SKILLS (ACS) LAB

B. Tech. III Year I Semester

L	T	P	C
0	0	2	1

Course Outcomes: Upon the completion of Laboratory course, the student should be able to

1. Develop sound communication skills in various situations with the help of enriched vocabulary.
2. Practice reading techniques for a faster and better comprehension.
3. Exhibit strong writing skills to express ideas effectively.
4. Demonstrate effective presentation skills.
5. Use appropriate verbal and non-verbal skills for a successful career.

UNIT I

ACTIVITIES ON FUNDAMENTALS OF INTER-PERSONAL COMMUNICATION AND BUILDING VOCABULARY:

Starting a conversation responding appropriately and relevantly using the right body language - Role Play in different situations & Discourse Skills using visuals Synonyms and antonyms, word roots, one word substitutes, prefixes and suffixes, study of word origin, business vocabulary, analogy, idioms and phrases, collocations & usage of vocabulary.

UNIT II

ACTIVITIES ON READING COMPREHENSION:

General Vs Local comprehension, reading for facts, guessing meanings from context, scanning, skimming, inferring meaning, critical reading & effective googling.

UNIT III

ACTIVITIES ON WRITING SKILLS:

Structure and presentation of different types of writing letter writing/Resume writing/ Statement of purpose E-correspondence/Technical report writing/Portfolio writing planning for writing improving one's writing.

UNIT IV

ACTIVITIES ON PRESENTATION SKILLS:

Oral presentations (individual and group) through JAM sessions/seminars/PPTs and written presentations through posters/projects/reports/e-mails/assignments etc.

UNIT V

ACTIVITIES ON GROUP DISCUSSION AND INTERVIEW SKILLS:

Dynamics of group discussion, intervention, summarizing, modulation of voice, body language, relevance, fluency and organization of ideas and rubrics for evaluation. Concept and process, pre-interview planning, opening strategies, answering strategies, interview through tele-conference & video – conference and Mock Interviews.

REFERENCE BOOKS:

1. Technical communication, Meenakshi Raman & Sangeeta Sharma, Oxford University-2nd Edition.
2. Functional English for success, OrientLongman.

PERSONALITY DEVELOPMENT AND BEHAVIOURAL SKILLS

B. Tech. III Year I Semester

L	T	P	C
2	0	0	1

Course Outcomes: At the end of the course, the student should be able to

1. Practice optimistic attitude for an efficient socially viable and multi-faceted personality.
2. Demonstrate functions of non-verbal communication in formal context.
3. Build effective individual & team dynamics for professional accomplishments.
4. Analyze appropriate strategic Interpersonal Skills for productive workplace relationships.
5. Correspond in multiple contexts, for varied audiences, across genres and modalities.

UNIT I
PERSONALITY DEVELOPMENT:

Definition - Various Aspects of Personality Development - Behavioral Traits. Importance of Soft Skills for personal and professional development - Success stories.

UNIT II
NON VERBAL COMMUNICATION:

Kinesics, Haptics, Proxemics, Vocalics, Oculesics
Body Language in formal contexts such as Group Discussions, Presentations and Interviews.

UNIT III
TEAM DYNAMICS:

Different Types of Teams – Role of an individual – Communicating as a group or team leader. Individual Presentations/Team Presentation - Project Presentations- Case Studies.

UNIT IV
INTERPERSONAL SKILLS:

Time Management - Stress Management - Emotional Intelligence - Conflict Management - Relationship Management.

UNIT V
DIGITAL CORRESPONDENCE:

Role of Multimedia in Communication - Communication in a Digital Edge (Video Conference Etc.)
Social Networking: Importance and Effects.

TEXT BOOKS:

1. Personality Development and Soft Skills, Preparing for Tomorrow, Shikha Kapoor-2nd Edition, 2020.

REFERENCE BOOKS:

1. Personality Development and Soft Skills, Barun, K Mitra, Oxford University Press-2nd Edition, 2016
2. Professional Ethics. R Subramanian, Oxford University Press-2nd Edition,2015

B. Tech. III Year II Semester

S. No.	Course Category	Course Title	L	T	P	Credits
1	ES – 7	Essentials of Computer Networks	3	0	0	3
2	PC – 11	Computer Methods in Power Systems	3	0	0	3
3	PC – 12	Power Semiconductor Drives	3	0	0	3
4	PC – 13	Switch Gear and Protection	3	0	0	3
5	PE – 2	Modern Power Electronics/ Advanced Control Systems / System Design using Verilog HDL	3	0	0	3
6	OE – 2	OPEN ELECTIVE – 2	3	0	0	3
7	PC Lab – 7	Control Systems and Simulation Lab	0	0	2	1
8	PC Lab – 8	Power Electronics and Simulation Lab	0	0	2	1
9	VAC - 2	Quantitative Methods & Logical Reasoning	2	0	0	1
Total			**20**	**0**	**4**	**21**

ESSENTIALS OF COMPUTER NETWORKS

B. Tech. IV Year I Semester

L	T	P	C
3	0	0	3

Course Outcomes:

At the end of the course, student will be able to

1. Understand the scenario of reference models.
2. Illustrate various sub protocols in multi access protocols.
3. Outline various routing algorithms and their operations.
4. Analyze transport protocols for the given scenario.
5. Identify the protocols and functionalities in application layer

UNIT - I:

Introduction to Data Communication

Overview of the Internet: Definition of networks, Topology, Protocol, Layering Scenario, TCP/IP Protocol Suite: The OSI Model, Internet history, Comparison of the OSI and TCP/IP reference model.

UNIT - II:

Data Link Layer - Design issues, Elementary Data Link Layer Protocols.

Medium Access Protocols - ALOHA, CSMA, Ethernet- Physical Layer, Ethernet, Mac Sub layer – CSMA/CD, Fast, Gigabit, 10-Gigabit Ethernets, Data link layer repeaters, hubs, bridges, switches, routers and gateways.

UNIT - III:

Network Layer: Network Layer Design issues, Routing algorithms - shortest path, flooding and Distance Vector Routing.

Internetworking: IP addresses, IPv4, IPv6 Protocol, subnetting

UNIT - IV:

Transport Layer: Introduction to TCP and UDP, difference between TCP & UDP, The TCP Connection Management Modeling, and The TCP Congestion Control.

UNIT - V:

Application Layer- Introduction, providing services, Applications layer paradigms, Client server model, Standard client-server application-HTTP, DNS.

TEXT BOOKS:

1. Data Communications and Networking - Behrouz A. Forouzan, TMH, 2013, Fifth Edition
2. Computer Networks - Andrew S Tanenbaum, Pearson Education, 4th Edition

REFERENCE BOOKS:

1. An Engineering Approach To Computer Networks-S.Keshav, Pearson Education,2nd Edition
2. Understanding Communications And Networks, W.A.Shay, Cengage Learning, 3rd Edition.
3. Introduction To Computer Networks And Cyber Security, Chwan-Hwa (John)Wu, J.David Irwin, CRC Press.

COMPUTER METHODS IN POWER SYSTEMS

L	T	P	C
3	0	0	3

B. Tech. III Year II Semester

Course Outcomes: At the end of the course, the student will be able to

CO1. Demonstrate the knowledge and ability to develop Y-bus and Z-bus matrices.
CO2. Apply the concepts of load flow studies.
CO3. Analyze different types of faults
CO4. Identify power system steady state stability of power system.
CO5. Investigate methods to improve transient state stability of power system.

UNIT - I

POWER SYSTEM NETWORK MATRICES: Graph Theory: Definitions, Bus Incidence Matrix, Y-bus formation by Singular Transformation Methods and Direct Inspection methods, Numerical Problems.

FORMATION OF Z-BUS: Partial network, Algorithm for the Modification of Z-bus Matrix for addition element for the following cases: Addition of element from a new bus to reference, Addition of element from a new bus to an old bus, Addition of element between an old bus to reference and Addition of element between two old busses (Numerical Problems). Modification of Z-bus for the changes in network (Problems).

UNIT - II

POWER FLOW STUDIES: Necessity of Power Flow Studies Data for Power Flow Studies Derivation of Static load flow equations, classification of Buses and their relevance to Power Flow.

LOAD FLOW SOLUTION USING GAUSS SEIDEL METHOD: Acceleration Factor, Load flow solution without and with P-V buses, Algorithm and Flowchart. Numerical Load flow Solution for Simple Power Systems (Max. 3- Buses): Determination of Bus Voltages, Injected Active and Reactive Powers (Sample One Iteration only) and finding Line Flows/Losses for the given Bus Voltages.

NEWTON RAPHSON METHOD IN RECTANGULAR AND POLAR CO-ORDINATES FORM: Load Flow Solution without and with PV Busses- Derivation of Jacobian Elements, Algorithm and Flowchart (Max. 3-Buses).

DECOUPLED AND FAST DECOUPLED METHODS: Comparison of Different Methods DC load Flow.

UNIT - III

SHORT CIRCUIT ANALYSIS: PER-UNIT SYSTEM OF REPRESENTATION: Per-Unit equivalent reactance network of a three phase Power System, Numerical Problems. Needs and assumptions for short circuit analysis.

SYMMETRICAL FAULT ANALYSIS: Short Circuit Current and MVA Calculations, Fault levels, Application of Series Reactors, Numerical Problems.

SYMMETRICAL COMPONENT THEORY: Symmetrical Component Transformation, Positive, Negative and Zero sequence components: Voltages, Currents and Impedances. Sequence Networks: Positive, Negative and Zero sequence Networks, Numerical Problems.

UNSYMMETRICAL FAULT ANALYSIS: LG, LL, LLG faults without and with fault impedance, Numerical Problems.

UNIT - IV

STEADY STATE STABILITY ANALYSIS: Elementary concepts of Steady State, Dynamic and Transient Stabilities. Description of Steady State Stability Power Limit, Transfer Reactance, Synchronizing Power Coefficient, Power Angle Curve and Determination of Steady State stability and methods to improve steady state stability.

UNIT - V

TRANSIENT STABILITY ANALYSIS: Derivation of Swing Equation. Determination of Transient Stability by Equal Area Criterion, Application of Equal Area Criterion, Case study sudden loss of parallel lines, Critical Clearing Angle Calculation Solution of Swing Equation: Point-by-Point Method. Methods to improve Stability Application of Auto Reclosing and Fast Operating Circuit Breakers.

TEXT BOOKS:

1. Power system analysis, Dr. N. V. Ramana, Pearson Education India.
2. Computer methods in power system analysis, Stagg and EL-Abiad, McGrawHill

REFERENCE BOOKS:

1. Modern power system analysis, I. J. Nagrath & D.P. Kothari, Tata McGraw Hill Publishing Company-4thEdition
2. Power system analysis, A. Nagoorkani, RBA Publications-3rdEdition
3. Power system analysis and stability, S. S. Vadhera, Khanna Publications

POWER SEMICONDUCTOR DRIVES

B. Tech. III Year II Semester

L	T	P	C
3	0	0	3

Course Outcomes: At the end of the course, the student will be able to

CO1. Understand the concepts of the dynamics of electric drives and speed control of different types of DC drives.
CO2. Examine four quadrant operation to control speed of DC drives using dual converters.
CO3. Classify four quadrant operation to control speed of DC drives using choppers.
CO4. Compare speed control methods of induction motor drives.
CO5. Investigate speed control methods of synchronous motor drives.

UNIT - I

CONTROL OF DC MOTORS THROUGH PHASE CONTROLLED RECTIFIERS:

Introduction to Thyristor controlled Drives, Single Phase semi and fully controlled converters connected to DC separately excited and DC series motors -continuous current operation output voltage and current waveforms- Speed and Torque expressions Speed Torque Characteristics- Problems on Converter fed DC motors. Three phase semi and fully controlled converters Connected to DC separately excited and DC series motors output voltage and current waveforms Speed and Torque expressions Speed Torque characteristics - Problems.

UNIT- II

FOUR QUADRANT OPERATIONS OF DC DRIVES THROUGH DUAL CONVERTERS:

Introduction to Four quadrant operation Motoring operations, Electric Braking Plugging, Dynamic and Regenerative Braking operations, Four quadrant operation of D C motors by dual converters Closed loop operation of DC motor (Block Diagram Only).

UNIT - III

CONTROL OF DC MOTORS BY CHOPPERS (1, 2, 4 QUADRANT OPERATIONS):

Single quadrant, Two quadrant and four quadrant chopper fed separately excited and series exacted motors Continuous current operation Output voltage and current wave forms Speed torque expressions speed torque characteristics Problems on Chopper fed DC Motors Closed Loop operation (Block Diagram Only).

UNIT - IV

CONTROL OF INDUCTION MOTORS: Variable voltage& Frequency Characteristics: Control of Induction Motor by AC Voltage Controllers Waveforms speed torque characteristics. Variable frequency control of induction motor by Voltage source and current source Inverter and cyclo-converters- PWM control - Comparison of VSI and CSI operations Speed torque Characteristics numerical problems on induction motor drives Closed loop operation of induction motor delves (Block Diagram Only).

Static rotor resistance control: Slip power recovery Static Scherbius drive Static Kramer Drive their performance and speed torque characteristics advantages applications - problems.

UNIT - V

CONTROL OF SYNCHRONOUS MOTORS: Separate control & self-control of synchronous motors Operation of self-controlled synchronous motors by VSI and CSI Cycloconverters. Load commutated CSI fed Synchronous Motor - Operation Waveforms speed torque characteristics Applications -Advantages and Numerical Problems Closed Loop control operation of synchronous motor drives (Block Diagram Only), variable frequency control, Cycloconverter, PWM, VFI, CSI. Principle of operation of BLDC motor drive.

TEXT BOOKS:

1. Fundamentals of electrical drives, G. K. Dubey, Alpha Science International Limited-2nd Edition.
2. Power Semiconductor Drives, J. Gnanavadivel, Anuradha Publications.

REFERENCE BOOKS:

1. Power semiconductor drives, PV Rao, BS Publications.
2. Thyristor control of electric drives, Vedam Subramanyam, Tata McGraw Hill Publications.
3. A first course on electrical drives, S K Pillai, New Age International (P) Ltd-2ndEdition

SWITCH GEAR AND PROTECTION

B. Tech. III Year II Semester

Course Outcomes: At the end of the course, the student will be able to

CO1. Understand basic working of circuit breaker and classification of circuit breakers.
CO2. Examine different types of circuit breakers in power systems.
CO3. Analyze Principle of operation of over current, directional, differential and distance relays.
CO4. Design protection schemes for alternators, transformers, bus-bars.
CO5. Assess over voltage protection and insulation level

L	T	P	C
3	0	0	3

UNIT - I

CIRCUIT BREAKERS: Circuit Breaker (CB): Elementary principles of arc interruption, Recovery and Recovery voltages - Restriking phenomenon, average, maximum RRRV and numerical Problems. Current chopping and Resistance switching. CB ratings and specifications: Types and Numerical problems. Auto reclosing. Description and operation of following types Circuit Breakers: Minimum Oil Circuit Breaker, Air Blast Circuit Breaker, Vacuum and SF6 circuit breaker.

UNIT - II

ELECTROMAGNETIC, STATIC RELAYS & NUMERICAL RELAYS: Principle of operation and construction of attracted armature, balanced beam, induction disc and induction cup relays-classification. Instantaneous DMT and IDMT types, Applications of relays**:** Over current/under voltage relays, Directional relays, percentage differential relays. Distance relays**:** Impedance, Reactance, Mho and offset Mho relays and Characteristics of distance relays. Comparison of numerical relays & static relays with electromagnetic relays.

UNIT - III

GENERATOR & TRANSFORMER PROTECTION: Protection of generators against stator faults, Rotor faults and abnormal conditions. Restricted earth fault and inter turn fault protection. Numerical examples on percentage of winding unprotected. Protection of transformers**:** Percentage and differential protection, Numerical problems on Design of CT's ratios and Buchholz relay protection.

UNIT - IV

FEEDER AND BUS BAR PROTECTION& GROUNDING PROTECTION OF LINES:
Over current earth fault**,** Carrier current and three zone distance protection using impedance relays– Translay relay Protection of bus bars and Differential protection.

NEUTRAL GROUNDING
Grounded & ungrounded neutral systems. Effects of ungrounded neutral system performance. Methods of neutral grounding: Solid resistance, reactance, Arcing grounds& grounding practices.

UNIT - V

PROTECTION AGAINST OVER VOLTAGE AND GROUNDING: Generation of over voltages in power systems, Protection against lightning over voltages, Valve type and zinc–Oxide lighting arresters, Insulation coordination, BIL– impulse ratio. Earthing Practices in Substations.

TEXT BOOKS:

1. Power system protection and switch gear, Badriram, D. N. Viswakarma Tata McGraw Hill Education-2nd Edition.
2. Switchgear and protection, Sunil. S. Rao, Khanna publishers.

REFERENCE BOOKS:

1. Electrical power systems, C. L. Wadhwa, New age international (P) limited-4th Edition.
2. A Textbook on power system engineering, M. L. Soni, P. V. Gupta, U. S. Bhatnagar, A. Chakrabarthy, Dhanapat Rai & Co. pvt.ltd.
3. Principles of power system, V.K. Mehtha & Rohit Mehtha, S. Chand company Pvt. Ltd - 4th Edition.

MODERN POWER ELECTRONICS
(Professional Elective-2)

B. Tech. III Year II Semester

L	T	P	C
3	0	0	3

Course Outcomes: At the end of the course, the student will be able to

CO1. Define the advances in power electronic devices.
CO2. Articulate power electronic resonant converters in power control applications.
CO3. Evaluate the design and control of multi-level inverters.
CO4. Articulate DC power supplies in Power electronic applications
CO5. Evaluate the design and control of AC power supplies and uninterruptable power supplies.

UNIT - I

Modern power semiconductor devices: Modern power semiconductor devices- MOS turn Off Thyristor (MTO) - Emitter Turn Off Thyristor (ETO) Integrated Gate- Commutated Thyristor (IGCTs)-MOS-controlled Thyristors (MCTs)-Static Induction circuit comparison of their features.

UNIT - II

Resonant Pulse Inverters: Resonant pulse inverters-series resonant inverters-series resonant inverters with unidirectional switches series resonant inverters with bidirectional Switches analysis of half bridge resonant inverter - evaluation of currents and Voltages of a simple resonant inverter-analysis of half bridge and full bridge resonant inverter with bidirectional switches.

UNIT - III

Multilevel Inverters: Multi level concept-Classification of multilevel inverters- Diode clamped multilevel inverter- principle of operation-main features improved diode - Clamped inverter-principle of operation-Flying capacitors multilevel inverter principle of operation-main features.

UNIT - IV

DC Power Supplies: DC power supplies-classification-switched mode dc power supplies-fly back Converter -forward converter- push pull converter-half bridge converter-Full bridge converter-Resonant dc power supplies-bidirectional dc power supplies-Applications.

UNIT - V

AC Power Supplies: AC power supplies classification-switched mode ac power supplies. Resonant AC power supplies-bi directional ac power supplies-multi stage conversions-control circuits - applications. Introduction-power line disturbances-power conditioners - uninterruptible Power supplies applications.

TEXT BOOKS

1. Power Electronics -Mohammed H. Rashid, Pearson Education - Third Edition
2. Power Electronics - Ned Mohan, Tore M. Undeland and William P. Robbins - John Wiley and Sons Second Edition.

ADVANCED CONTROL SYSTEMS

B. Tech. III Year II Semester

L	T	P	C
3	0	0	3

Course Outcomes: At the end of the course, the student will be able to

CO1. Understand mathematical preliminaries for advanced control systems.
CO2. Realize state variable models for linear time invariant systems.
CO3. Analyze Non linearities in control Systems.
CO4. Evaluate stability using Lyapunov theorems.
CO5. Assess optimal control for control problems.

UNIT–I

Mathematical Preliminaries: Fields, Vectors and Vector Spaces – Linear combinations and Bases – Linear Transformations and Matrices – Scalar Product and Norms – Eigen-values, Eigen Vectors and a Canonical form representation of Linear operators – The concept of state – State Equations for Dynamic systems – Time invariance and Linearity – Non-uniqueness of state model – State diagrams for Continuous-Time State models.

UNIT-II

State Variable Analysis: Linear Continuous time models for Physical systems–Solutions of Linear Time Invariant Continuous-Time State Equations – State transition matrix and its properties. General concept of controllability – General concept of Observability – Controllability tests for Continuous-Time Invariant Systems – Observability tests for Continuous-Time Invariant Systems – Controllability and Observability of State Model in Jordan Canonical form – Controllability and Observability Canonical forms of State model.

UNIT-III

Non Linear Systems: Introduction – Non Linear Systems – Types of Non-Linearities – Saturation – Dead-Zone – Backlash – Jump Phenomenon etc;– Singular Points – Introduction to Linearization of nonlinear systems, Properties of Non-Linear systems – Describing function–describing function analysis of nonlinear systems – Stability analysis of Non-Linear systems through describing functions. Introduction to phase-plane analysis, Method of Isoclines for Constructing Trajectories, singular points, phase-plane analysis of nonlinear control systems.

UNIT-IV

Stability Analysis: Stability in the sense of Lyapunov, Lyapunov's stability, and Lypanov's instability theorems – Stability Analysis of the Linear continuous time invariant systems by Lyapunov second method Generation of Lyapunov functions – Variable gradient method – Krasooviski's method. State feedback controller design through Pole Assignment – State observers: Full order and Reduced order.

UNIT-V

Optimal Control: Introduction to optimal control – Formulation of optimal control problems – calculus of variations – fundamental concepts, functional, variation of functional – fundamental theorem of theorem of Calculus of variations – boundary conditions – constrained minimization.

TEXT BOOKS:

1. Modern Control System Theory by M.Gopal – New Age International -1984
2. Control System Engineering, Nagrath and Gopal – New Age International – Fourth Edition

REFERENCES:

1. Optimal control by Kirck , Dover Publications
2. Advanced Control Theory A. Nagoor Kani, RBA Publications, 1999
3. Modern Control Engineering by Ogata. K – Prentice Hall – 1997

SYSTEM DESIGN USING VERILOG HDL
(Professional Elective-2)

B. Tech. III Year II Semester
Course Code: A46225
Course Outcomes:

L	T	P	C
3	0	0	3

By the end of this course, students will be able to

1. Understand the process of simulation and synthesis of Digital Circuit using Verilog HDL.
2. Demonstrate gate level, data flow of digital systems.
3. Implement behavioural and switch level modelling of digital systems.
4. Compare different modelling techniques for digital systems.
5. Develop test benches for combinational and sequential circuits

UNIT - I
Introduction to VeriLog HDL:

Verilog as HDL, Levels of Design Description, Concurrency, Simulation and Synthesis, Function Verification, System Tasks, Programming Language Interface, Module, Simulation and Synthesis Tools

Language Constructs and Conventions: Introduction, Keywords, Identifiers, White Space, Characters, Comments, Numbers, Strings, Logic Values, Strengths, Data Types, Scalars and Vectors, Parameters and operators.

UNIT - II
Gate Level Modelling:

Introduction, AND Gate Primitive, Module Structure, Other Gate Primitives, Illustrative Examples, Tristate Gates, Array of Instances of Primitives, Design of Flip-Flops with Gate Primitives, Delay, Strengths and Construction Resolution, Net Types, Design of Basic Circuit.

Modelling at Dataflow Level: Introduction, Continuous Assignment Structure, Delays and Continuous Assignments, Assignment to Vector, Operators.

UNIT - III
Behavioural Modelling:

Introduction, Operations and Assignments, Functional Bifurcation, 'Initial' Construct, Assignments with Delays, 'Wait' Construct, Multiple Always Block, Behavioural Level, Blocking and Non-Blocking Assignments, The 'Case' Statement, Simulation Flow, 'If' an 'if-Else' Constructs, 'Assign- De-Assign' Constructs, 'Repeat' Construct, for loop, 'The Disable' Construct, 'While Loop', Forever Loop, Parallel Blocks, Force-Release, Construct, Event.

UNIT - IV
Switch Level Modeling:

Basic Transistor Switches, CMOS Switches, Bidirectional Gates, Time Delays with Switch Primitives, Instantiation with 'Strengths' and 'Delays' Strength Contention with Trireg Nets.

System Tasks, Functions and Compiler Directives: Parameters, Path Delays, Module Parameters. System Tasks and Functions, File Based Tasks and Functions, Computer Directives, Hierarchical Access, User Defined Primitives.

UNIT - V

Sequential Circuit Description:

Sequential Models - Feedback Model, Capacitive Model, Implicit Model, Basic Memory Components, Functional Register, Static Machine Coding, Sequential Synthesis.

Components Test and Verification: Test Bench - Combinational Circuits Testing,

Sequential Circuit Testing, Test Bench Techniques, Design Verification, Assertion Verification.

TEXT BOOKS

1. Design through Verilog HDL , T.R. Padmanabhan, B Bala Tripura Sundari, Wiley 2009.
2. Verliog Digital System Design ,Zainalabdien Navabi, , TMH, 2005

REFERENCE BOOKS

1. Fundamentals of Digital Logic with Verilog Design ,Stephen Brown, Zvonkoc Vranesic, , TMH, 2007
2. Advanced Digital Logic Design using Verilog , Sunggu Lee , , State Machines & Synthesis for FPGA, Cengage Learning, 2012.

CONTROL SYSTEMS AND SIMULATION LAB

L	T	P	C
0	0	2	1

B. Tech. III Year II Semester

Course Outcomes: Upon the completion of Laboratory course, the student will be able to

1. Examine the time response of second order systems, Synchros, and truth tables verification by PLC.
2. Design of AC servomotor and DC servomotor to find out their transfer function practically.
3. Design of DC motor, DC generator, and finding out their transfer function practically.
4. Analyze magnetic amplifier characteristics.
5. Explain stability analysis through bode, Nyquist and root locus plots using Simulation Software.

Any Ten of the following experiments are to be conducted

1. Time response of Second order system.
2. Characteristics of Synchros.
3. Programmable logic controller – Study and verification of truth tables of logic gates, simple. Boolean expressions and application of speed control of motor.
4. Effect of feedback on DC servomotor.
5. Transfer function of DC motor.
6. Transfer function of DC Shunt generator.
7. Characteristics of magnetic amplifiers.
8. Characteristics of AC servomotor.
9. Simulation of Op-Amp based Integrator and Differential circuits.
10. Linear system analysis (Time domain analysis, Error analysis).
11. Stability analysis (Bode, Root Locus, Nyquist) of Linear Time Invariant system using simulation software.
12. State space model for classical transfer function– Verification using simulation software.

POWER ELECTRONICS AND SIMULATION LAB

L	T	P	C
0	0	2	1

B. Tech. III Year II Semester

Course Outcomes: Upon the completion of Laboratory course, the student will be able to

CO1. Examine the characteristics of SCR, MOSFET, & IGBT, and analyze triggering circuits.
CO2. Analyze input and output chrematistics of AC-DC converters.
CO3. Synthesize input and output chrematistics of Cycloconverters.
CO4. Examine input and output chrematistics of DC-DC Converters.
CO5. Design of converters and inverters using P-Spice software.

Any ten of the following experiments are required to be conducted.

1. Study of the characteristics of SCR, MOSFET &IGBT.
2. Gate Firing Circuits for SCRs (R- Triggering, RC Triggering & UJT Triggering).
3. Single Phase AC voltage Controller with R & RL Loads.
4. Single Phase fully Controlled Bridge Converter with R& RL Loads.
5. DC Jones Chopper with R & RL Loads.
6. Single Phase Parallel Inverter with R& RL Loads.
7. Single Phase Cycloconverter with R& RL Loads.
8. Single Phase Series Inverter with R& RL Loads.
9. Single Phase Half controlled converter with R Load.
10. Simulation of single-phase full converter using RLE loads and single-phase AC voltage controller using RLE loads.
11. Simulation of resonant pulse commutation circuit and Buck Chopper.
12. Simulation of single phase Inverter with PWM control.

B. Tech. IV Year I Semester

S.No.	Course Category	Course Title	L	T	P	Credits
1	PC -14	Electrical Measurements & Instrumentation	3	0	0	3
2	PC -15	Power Systems Operation and Control	3	0	0	3
3	PE – 3	Electric Vehicles/ Power Quality and FACTS/ Embedded Systems & IOT	3	0	0	3
4	PE – 4	Advanced Control of Electric Drives/ Programmable Logic Controllers & SCADA/ Smart Grids	3	0	0	3
5	OE-3	OPEN ELECTIVE – 3	3	0	0	3
6	PC Lab - 9	Microprocessors and Interfacing Lab	0	0	2	1
7	PC Lab - 10	Electrical Measurements Lab	0	0	2	1
8	PW-1	Industry Oriented Mini Project	0	0	0	3
9	PC – 17	Renewable Energy and Energy Storage Technologies	3	0	0	3
		Total	**18**	**0**	**4**	**23**

ELECTRICAL MEASUREMENTS AND INSTRUMENTATION

B. Tech. IV Year I Semester

L	T	P	C
3	0	0	3

Course Outcomes: At the end of the course, the student will be able to

CO1. Understand all types of measuring instruments and error compensations.
CO2. Discuss the operation of DC Crompton potentiometer; compare the CT and PT with phasor diagram.
CO3. Describe the concepts of power and energy measurement by using wattmeter and energy meter.
CO4. Outline the concept of DC and AC bridges for the measurement of resistance, inductance & capacitance.
CO5. Analyze the concepts of transducers and cathode ray oscilloscopes.

UNIT - I

INTRODUCTION TO MEASURING INSTRUMENTS: Classification-deflection, control and damping torques- Ammeters and Voltmeters- PMMC and moving iron type instruments- expression for the deflecting torque and control torque- Errors and compensations, extension of range using shunts and series resistance. Electrostatic Voltmeters, electrometer type and attracted disc type voltmeters.

UNIT - II

POTENTIOMETERS& INSTRUMENT TRANSFORMERS: Principle and operation of D.C. Crompton's potentiometer - standardization, Measurement of unknown resistance, current and voltage. A.C. Potentiometers: polar and coordinate types, standardization and applications. CT and PT- Ratio and Phase angle errors (of CT only).

UNIT - III

MEASUREMENT OF POWER & ENERGY: Single phase dynamometer, LPF and UPF watt meters, Double element and three element dynamometer watt meter- expression for deflecting and control torques, extension of range of wattmeter using instrument transformers. Measurement of reactive power. Single phase Induction type energy meter- driving and braking torques-errors and compensations, testing by phantom loading using RSS meter. Three phase energy meter- Maximum demand meters.

UNIT - IV

D.C BRIDGES & A.C BRIDGES: Methods of measuring low, medium and high resistances, sensitivity of wheat- stone Bridge, Carey foster's Bridge, Kelvin's double bridge for measuring low resistance, measurement of high resistance - loss of charge method. Measurement of Inductance and Q Factor - Maxwell's Bridge, Hay's bridge, Anderson's bridge and Owen's bridge. Measurement of capacitance and loss angle – Desauty's Bridge and Schering Bridge. Wien's Bridge.

UNIT - V

TRANSDUCERS & OSCILLOSCOPES: TRANSDUCERS: Definition of transducer, classification of transducers, advantages of electrical transducers, characteristics and choice of transducers. Principle of operation of LVDT and capacitor transducers, LVDT Applications, Strain guage and its principle of operation, guage factor, Thermistors, Thermo-couples, Piezo-electric transducers, photo-voltaic, photo-conductive cells and photo-diodes.

OSCILLOSCOPES - Cathode Ray Oscilloscope (CRO)- Cathode Ray tube, time base generator, horizontal and vertical amplifiers and Lissajous Patterns.

TEXT BOOKS:

1. A course in electrical and electronic measurements and instrumentation by A. K. Sawhney, Puneet Sawhney, Dhanpat Rai & Co.
2. Electrical & electronic measurements and instrumentation, R. K. Rajput, S. Chand & Company Ltd.

REFERENCE BOOKS:

1. Electrical measurements and measuring instruments, Golding E.W, Widdis F.C, Publisher: AH Wheeler &Company.
2. Electrical and electronic measurements, G.K. Banerjee, PHI Learning Pvt. Ltd.
3. Electrical Measurements and Measuring Instruments, N. V. Suryanarayana, Tata McGraw Hill.

POWER SYSTEM OPERATION AND CONTROL

B. Tech. IV Year I Semester

L	T	P	C
3	0	0	3

Course Outcomes: At the end of the course, the student will be able to

CO1. Understand economic operation of power systems.
CO2. Analyze and compute optimal loading of generators for a particular load demand.
CO3. Develop mathematical models of turbines and governors.
CO4. Address load frequency control problem.
CO5. Explain how series and shunt compensation helps in reactive power control.

UNIT - I

ECONOMIC OPERATION OF POWER SYSTEMS: Optimal operation of Generators in Thermal Power Stations – Heat rate Curve - Cost Curve - Incremental fuel and Production costs, input-output characteristics, Optimum generation allocation with line losses neglected. Optimum generation allocation including the effect of transmission line losses - Loss Coefficients, General transmission line loss formula.

UNIT - II

HYDROTHERMAL SCHEDULING: Optimal scheduling of Hydrothermal System: Hydroelectric power plant models, scheduling problems- Short term hydrothermal scheduling problem.

UNIT - III

MODELING: Modeling of Turbine: First order Turbine model, Block Diagram representation of Steam Turbines and Approximate Linear Models.
Modeling of Governor: Mathematical Modeling of Speed Governing System - Derivation of small signal transfer function.
Modeling of Excitation System: Fundamental Characteristics of an Excitation system, Transfer function, Block Diagram Representation of IEEE Type-1 Model

UNIT - IV

LOAD FREQUENCY CONTROL: Single Area Load Frequency Control: Necessity of keeping frequency constant. Definitions of Control area – Single area control – Block diagram representation of an isolated power system – Steady state analysis – Dynamic response – Uncontrolled case. Load frequency control of 2-area system – uncontrolled case and controlled case, tie-line bias control.
Load Frequency Controllers: Proportional plus Integral control of single area and its block diagram representation, steady state response – Load Frequency Control and Economic dispatch control.

UNIT - V

REACTIVE POWER CONTROL: Overview of Reactive Power control – Reactive Power compensation in transmission systems– advantages and disadvantages of different types of compensating equipment for transmission systems. Load compensation–Specifications of load compensator, Uncompensated and compensated transmission lines: Shunt and Series Compensation.

TEXT BOOKS:

1. Modern Power System Analysis, I.J. Nagarath & D.P. Kothari, Tata McGraw Hill Publishing Company Ltd -4th Edition.
2. Power systems analysis and stability, S.S Vadhera, Khanna Publications- 4thEdition.

REFERENCE BOOKS:

1. Power generation, operation and control, Allen J. Wood, Bruce F. Wollenberg, Gerald B. Sheble, Wiley -3rd Edition.
2. Power system stability and control, Prabha Kundur, McGraw Hill companies-Indean Edition.
3. Power system operation and control, Dr. K. Uma Rao, Wiley India Pvt. Ltd.

ELECTRIC VEHICLES
(Professional Elective – 3)

L	T	P	C
3	0	0	3

B. Tech. IV Year I Semester

Course Outcomes: At the end of the course, the student will be able to

CO1. Understand the components of Electric Vehicles and Fundamentals of Electric Vehicles.
CO2. Explain the types of batteries and principles of operation of batteries.
CO3. Analyze the control techniques of Electric motors which are used in Electric vehicles.
CO4. Apprehend the transmission of the drive system and the components of transmission.
CO5. Assess various modes of Hybrid vehicles for different conditions.

UNIT- I

ELECTRIC VEHICLES: Introduction to Electric Vehicles - History of Electric and Hybrid Vehicles - Component's vehicle mechanics - Roadway fundamentals - vehicle kinetics - Dynamics of vehicle motion - Propulsion System Design.

UNIT -II

BATTERIES: Basics Types -Parameters - Capacity- Discharge rate - State of charge - State of Discharge -Depth of Discharge - Technical characteristics - Battery pack - Design Properties of Batteries -Fuel Cells - Types - Fuel Cell -Electric Vehicle.

UNIT - III

DC & AC ELECTRICAL MACHINES (Speed control Techniques): Motor and Engine rating - Requirements - Speed control techniques of DC machines in Electric Vehicles - Speed control techniques of three phase A/c machines, Induction machines, Permanent Magnet Machines, Switched Reluctance Machines.

UNIT - IV

ELECTRIC VEHICLE DRIVE TRAIN: Transmission configuration Components, gears, differential, clutch, brakes, regenerative braking- motor sizing, Gear Ratio, Torque- speed characteristics, EV Motor Sizing, Initial Acceleration, Rated Vehicle Velocity, Maximum Velocity – Maximum Gradability.

UNIT - V

HYBRID ELECTRIC VEHICLES: Types of Hybrid Vehicles- series and parallel Hybrid Electric Vehicles, series- parallel configuration, Internal Combustion Engines -Reciprocating Engines- Practical and Air-Standard Cycles Air- Standard Otto Cycle Air-Standard Diesel Cycle Example IC Engines in HEVs Design Drive train sizing of components.

TEXT BOOKS:

1. Electric & hybrid vehicles Design Fundamentals, Iqbal Hussain, CRC Press 2nd Edition.
2. Electric vehicle technology explained, James Larminie, John Lowry, Wiley& Sons-2nd Edition.

REFERENCE BOOKS:

1. Modern electric, hybrid electric, and fuel cell vehicles: fundamentals, theory and design, Mehrdad Ehsani, Yimin Gao, Ali Emadi, CRC Press - 2nd Edition.
2. Electric vehicle battery systems, Sandeep Dhameja – Kindle Edition.

POWER QUALITY AND FACTS
(Professional Elective-3)

B. Tech. IV Year I Semester

L	T	P	C
3	0	0	3

Course Outcomes: After completion of this course, the student will be able to

CO1. Understand the severity of power quality problems in distribution system
CO2. Illustrate the concept of transmission line reactive power compensation
CO3. Choose proper shunt compensators for reactive power compensation
CO4. Apply the control circuits of static series compensators for various functions
CO5. Classify combined compensators.

UNIT - I

POWER QUALITY PROBLEMS IN DISTRIBUTION SYSTEMS: Power Quality problems in distribution systems: Transient and Steady state variations in voltage and frequency. Unbalance, Sags, Swells, Interruptions, Wave-form Distortions: harmonics, noise, notching, dc-offsets, fluctuations. Flicker and its measurement.

UNIT- II

TRANSMISSION LINES AND SERIES/SHUNT REACTIVE POWER COMPENSATION: Basics of AC Transmission. Analysis of uncompensated AC transmission lines. Passive Reactive Power compensation. Shunt and series compensation at the mid-point of an AC line. Comparison of Series and Shunt Compensation.

UNIT- III

STATIC SHUNT COMPENSATORS: Objectives of shunt compensation, Methods of controllable VAR generation, Static Var Compensator, its characteristics, TCR, TSC, FC-TCR configurations, STATCOM, basic operating principle, control approaches and characteristics

UNIT- IV

STATIC SERIES COMPENSATORS: Objectives of series compensator, variable impedance type of series compensators, TCSC, TSSC-operating principles and control schemes, SSSC, Power Angle characteristics, Control range and VAR rating, Capability to provide reactive power compensation, external control

UNIT-V:

COMBINED COMPENSATORS: Introduction to Unified Power Flow Controller, Basic operating principles, Conventional control capabilities, independent control of real and reactive power.

TEXT BOOKS:

1. Electrical Power Systems Quality, Dugan Roger C, Santoso Surya, Mc Granaghan, Marks F.Beaty and H. Wayre, Mc Graw Hill
2. Power Systems Quality Assessment, J. Arillaga, N.R. Watson, S.Clon, John Wiley.

REFERENCE BOOKS:

1. Power Quality, C.Sankaran, CRC Press 4. Understanding power quality problems, Math H.Bollen, IEEE press.
2. Understanding FACTS –Concepts and Technology of Flexible AC Transmission Systems, Narain G.Honorani, Laszlo Gyugyi

EMBEDDED SYSTEMS & IOT

(Professional Elective-3)

B. Tech. IV Year I Semester

L	T	P	C
3	0	0	3

Course Outcomes

At the end of the Course, the student will be able to

1. Understand the differences between the embedded system and general computing system identify the purpose of embedded systems.
2. Implement embedded systems using different memory devices and communications interfaces
3. Solve the communication/Synchronization issues with a view to choose the best RTOS
4. Understand the concepts of IoT
5. Design IoT devices for real time applications

UNIT I:
INTRODUCTION TO EMBEDDED SYSTEMS:

Definition of Embedded System, Embedded Systems Vs General Computing Systems, History of Embedded Systems, Classification, Major Application Areas, Purpose of Embedded Systems, Characteristics and Quality Attributes of Embedded Systems.

UNIT II:
TYPICAL EMBEDDED SYSTEM:
Core of the Embedded System: General Purpose and Domain Specific Processors, ASICs, PLDs, Commercial Off-The-Shelf Components (COTS), Memory: ROM, RAM, Memory according to the type of Interface, Memory Shadowing, Memory selection for Embedded Systems, Sensors and Actuators, Communication Interface: Onboard and External Communication Interfaces.

UNIT III:
RTOS &TASK COMMUNICATION:

RTOS: OS Basics-Tasks, Process and Threads, Multiprocessing and Multitasking, Task Scheduling.
Task Communication: Shared Memory, Message Passing, Remote Procedure Call and Sockets, Task Synchronization: Task Communication/Synchronization Issues, Task Synchronization Techniques, Device Drivers, How to Choose an RTOS.

UNIT IV:
INTRODUCTION TO IOT AND ARCHITECTURE

Introduction, Characteristics, Physical design, Logical design, Evolution of IoT, enabling technologies, IoT Levels, Domain Specific IoTs, IoT and Machine to machine communication, Need for cloud in IoT

UNIT V:
IoT COMMUNICATION PROTOCOLS AND IOT SYSTEMS USE CASES

IoT nodes, IoT Edge, 6LOWPAN, ipv4/ipv6, MQTT, COAP, Smart cities, smart homes, automotive, agriculture, Healthcare, Activity Monitoring, and Industrial IoT

TEXT BOOKS:

1. Embedded Systems: Architecture, Programming and Design , Raj Kamal , Tata McGraw-Hill, 2011
2. 'Technologies Sensors for the Internet of Things Businesses & Market Trends 2014 -2024', Dr. Guillaume Girardin , Antoine Bonnabel, Dr. Eric Mounier, Yole Development Copyrights ,2014

REFERENCE BOOKS:

1. Introduction to Embedded Systems, Shibu K V**,** McGraw-Hill Education**,** 2009.
2. 'Learning Internet of Things', Peter Waher, Packt Publishing, 2015
3. 'Internet of Things – From Research and Innovation to Market, Editors OvidiuVermesan Peter Friess,

ADVANCED CONTROL OF ELECTRIC DRIVES
(Professional Elective - 3)

B.Tech. IV Year I Semester

L	T	P	C
3	0	0	3

Course Outcomes: At the end of the Course, the student will be able to:

1. Understand the operation of power electronic converters and their control strategies.
2. Apply the vector control strategies for ac motor drives
3. Examine the control of Synchronous Motor Drives
4. Analyze the speed control of Permanent Magnet motors and Switched Reluctance Motors.
5. Distinguish the implementation of the control strategies using digital signal processors.

UNIT - I

POWER CONVERTERS FOR AC DRIVES: PWM control of inverter, selected harmonic elimination, space vector modulation, current control of VSI, three level inverter, Different topologies, SVM for 3 level inverter, Diode rectifier with boost chopper, PWM converter as line side rectifier, current fed inverters with self-commutated devices. Control of CSI, H Bridge as a 4-Q drive.

UNIT - II

INDUCTION MOTOR DRIVES: Different transformations and reference frame theory, modeling of induction machines, voltage fed inverter control-v/f control, vector control, direct torque and flux control (DTC).

UNIT - III

SYNCHRONOUS MOTOR DRIVES: Modeling of synchronous machines, open loop v/f control, vector control, direct torque control, CSI fed synchronous motor drives.

UNIT - IV

PERMANENT MAGNET MOTOR DRIVES: Introduction to various PM motors, BLDC and PMSM drive configuration, comparison, block diagrams, Speed and torque control in BLDC and PMSM.

Switched Reluctance Motor Drives: Evolution of switched reluctance motors- various topologies for SRM drives, comparison, closed loop speed and torque control of SRM.

UNIT - V

DSP BASED MOTION CONTROL: Use of DSPs in motion control, various DSPs available, and realization of some basic blocks in DSP for implementation of DSP based motion control.

TEXT BOOKS:

1. Modern Power Electronics and AC Drives, B. K. Bose, Pearson Education, Asia, 2003.
2. Analysis of Electric Machinery and Drive Systems, P. C. Krause, O. Wasynczuk and S. D. Sudhoff, John Wiley & Sons, 2013.

REFERENCE BOOKS:

1. H. A. Taliyat and S. G. Campbell, “DSP based Electromechanical Motion Control”, CRC press, 2003.
2. R. Krishnan, “Permanent Magnet Synchronous and Brushless DC motor Drives”, CRC Press,2009.

Programmable Logic Controllers & SCADA
(Professional Elective-4)

B. Tech. IV Year I Semester

L	T	P	C
3	0	0	3

Course Outcomes: At the end of this course, students will be able to

CO1. Understand the concepts of PLC.
CO2. Illustrate the fundamentals of PLC for electrical devices
CO3. Analyze the operation of counters
CO4. Apply instructions in PLCs.
CO5. Investigate implementation of SCADA.

UNIT- I

Programmable Logic Controllers: Introduction, parts of PLC, principles of operation, modifying the operation, PLCs versus computers, PLC size and application.

PLC Hardware Components: The I/O section, discrete I/O modules, analog I/O modules, special I/O modules, I/O specifications, central processing unit (CPU), memory design, memory types, programming terminal devices, recording and retrieving data human machine interfaces (HMIs).

Basics of PLC programming: Processor memory organization, program scan, PLC programming languages, relay-type instructions, instruction addressing, branch instructions, internal relay instructions, programming examine if-closed and if-open instructions, entering the latter diagram.

UNIT - II

Developing fundamental PLC wiring diagrams and ladder logic programs: Electromagnetic control relays, contactors, motor starters, manually operated switches, mechanical operated switches, sensors, output control devices, seal-in circuits, latching relays, converting relay schematics into PLC ladder programs.

UNIT - III

Programming counters: Counter's instructions, up-counter, down-counter, cascading counters, incremental encoder-counter applications, combining counter and timer functions.

Program control instructions: Master control reset instruction, jump instruction, subroutine functions, immediate input and immediate output instructions, forcing external I/O addresses, safety circuitry, fault routine, temporary end instruction, suspend instruction.

UNIT - IV

Data manipulation instructions: Data manipulation, data transfer operation, data compare instructions, data manipulation programs, numerical data I/O interfaces, closed-loop control.

Math instructions: Match instructions, addition instruction, subtraction instruction, multiplication instruction, division instruction, file arithmetic operations.

UNIT V:

Sequencer and shift register instructions: Mechanical sequencers, sequencer instructions, sequencer programs, bit shift registers, word shift operations.

Process control network system and SCADA: Types of processes, structure of control systems, ON/OFF control PID control, Motion control, data communications, supervisory control and data acquisition (SCADA).

TEXT BOOKS:

1. Programmable Logic Controllers, W. Bolton, 5th edition, Newnes ELSEVIER, 2009
2. PLCs & SCADA: Theory and Practice, Rajesh Mehra, Laxmi Publications, 2012.

REFERENCE BOOKS:

1. Industrial applications of programmable logic controllers and SCADA, Kunal Chakraborty, Palash De, Indranil Roy, Anchor Academic Publishing, 2016
2. Ladder logic programming fundamentals, A.J. Wright, 2nd edition, AB Prominent publisher, 2020

SMART GRIDS
(Professional Elective-4)

B. Tech. IV Year I Semester

L	T	P	C
3	0	0	3

Course Outcomes: At the end of the course, the student will be able to

CO1. Understand the features of Smart Grid.
CO2. Illustrate the smart grid architecture.
CO3. Explain tools and techniques for smart grid and Distribution systems.
CO4. Justify operation and importance of PMUs, WAMS.
CO5. Imagine control techniques for micro grid and smart grid.

UNIT - I

INTRODUCTION TO SMART GRID: Introduction to Smart Grid - Working - definitions of Smart Grid and Associated Concepts - Smart Grid Functions -Traditional Power Grid and Smart Grid - New Technologies for Smart Grid - Advantages - Indian Smart Grid - Key Challenges for Smart Grid.

UNIT - II

SMART GRID ARCHITECTURE: Components and Architecture of Smart Grid Design - Review of the proposed architectures for Smart Grid, fundamental components of Smart Grid designs, Transmission Automation, Distribution Automation - Renewable energy Integration.

UNIT - III

COMPUTATIONAL TECHNIQUES FOR SMART GRIDS:

Tools and Techniques for Smart Grid: Computational Techniques Static and Dynamic Optimization Techniques, Computational Intelligence Techniques, Evolutionary Algorithms and Artificial Intelligence techniques.

Distribution Generation Technologies: Introduction to Renewable Energy Technologies- Micro grids - Storage Technologies -Electric Vehicles and plug in hybrids Environmental impact and Climate Change Economic Issues.

UNIT - IV

COMMUNICATION TECHNOLOGIES AND SMART GRID: Introduction to Communication Technology - Synchro-Phasor Measurement Units (PMUs) - Wide Area Measurement Systems (WAMS) - Introduction to Internet of Things (IOT) - Applications of IOT in Smart Grid.

UNIT - V

CONTROL OF SMART POWER GRID SYSTEM: Load Frequency Control (LFC) in Micro Grid System - Voltage Control in Micro Grid System -Reactive Power Control in Smart Grid, Case Studies and Test beds for the Smart Grids.

TEXT BOOKS:

1. Smart grids, infrastructure, technology and solutions, Stuart Borlase, CRC Press - 1st Edition.
2. Renewable and efficient electric power system, Gil Masters, Wiley IEEE Press 2nd Edition.

REFERENCE BOOKS:

1. Synchronized Phasor measurements and their applications, A.G. Phadke and J.S Thorp, Springer 2nd Edition.
2. Wind power in power systems, T. Ackermann, Hoboken, NJ, USA, John Wiley 2nd Edition.

ELECTRICAL MEASUREMENTS LAB

B. Tech. IV Year I Semester

L	T	P	C
0	0	2	1

Course Outcomes: Upon the completion of Laboratory course, the student will be able to

CO1. Calibrate voltmeters, ammeters and single phase energy meter.
CO2. Design the scale of PMMC voltmeter, LPF wattmeter, LVDT and resistance strain gauge.
CO3. Calculate resistance, inductance and capacitance using bridges.
CO4. Compute 3-Φ reactive power.
CO5. Test single phase energy meter and dielectric strength of oil of transformers.

Any ten of the following experiments are required to be conducted

1. Calibration and Testing of single phase energy Meter.
2. Calibration of dynamometer type power factor meter.
3. Crompton D.C. Potentiometer - Calibration of PMMC ammeter and PMMC voltmeter.
4. Kelvin's double Bridge - Measurement of resistance - Determination of Tolerance.
5. Dielectric oil testing using H.T. testing Kit.
6. Schering Bridge & Anderson Bridge.
7. Measurement of 3 Phase reactive power with single-phase wattmeter.
8. Measurement of parameters of a choke coil using 3 voltmeter and 3 ammeter methods.
9. LVDT and capacitance pickup - characteristics and Calibration.
10. Resistance strain gauge - strain measurements and Calibration.
11. Transformer turns ratio measurement using A.C. Bridge.
12. Measurement of ratio error and phase angle of given C.T. by comparison.

INDUSTRY ORIENTED MINI PROJECT

B. Tech. IV Year I Semester

L	T	P	C
0	0	0	3

Course Outcomes: At the end of the course, the student should be able to

CO1. Undertake problem identification, formulation and solution.
CO2. Know the key stages in the devolvement of the project.
CO3. Inculcate software / hardware implementation skills
CO4. Understand methodologies and professional way of documentation and communication
CO5. Extend / use the idea of mini project for major project.

Three or four students constituting a batch, work on an industry oriented topic approved by the head of the department and prepare a comprehensive mini project report after completing the work to the satisfaction.

The progress of the project is evaluated based on a minimum of two reviews. The review committee may be constituted by the Head of the Department comprising of senior faculty covering all the domains of electrical and electronics engineering. The student is required to submit a mini project report at the end of the semester.

The project work done by the student is evaluated based on the report submitted along with an oral presentation, jointly by external and internal examiners constituted by the Head of the Department.

B. Tech. IV Year II Semester

S. No.	Course Category	Course Title	L	T	P	Credits
1	PC -16	Utilization of Electrical Energy	3	0	0	3
2	PC -17	Renewable Energy and Energy Storage Technologies	3	0	0	3
3	TS	Technical Seminar	0	2	0	2
4	CVV	Comprehensive Viva-Voce	0	0	0	2
5	PW-2	Major Project	0	0	20	10
Total			**6**	**2**	**20**	**20**

UTILIZATION OF ELECTRICAL ENERGY
(Professional Core – 16)

B. Tech. IV Year II Semester

L	T	P	C
3	0	0	3

Course Outcomes: At the end of the course, the student will be able to

CO1. Understand the importance of illumination and various illumination techniques.
CO2. Examine the performance of simple resistance furnaces, modern welding techniques.
CO3. Apply the concepts of Electrolytic process
CO4. Categorize different types of Electric Traction systems
CO5. Evaluate different types of traction mechanics

UNIT – I

ILLUMINATION: Definition – Laws of illumination – Polar curves – Calculation of MHCP and MSCP. Lamps: Incandescent lamp, Sodium Vapour lamp, Fluorescent lamp. Requirement of good lighting scheme – Types, Design and Calculation of illumination. Street lighting and Factory lighting – Numerical Problems.

UNIT – II

ELECTRICAL HEATING & ELECTRIC WELDING: Advantages, Methods of Electric heating – Resistance, arc, Induction and dielectric heating. Types of electric welding – Resistance, Electric arc, gas welding and Ultrasonic welding, Welding electrodes of various metals, Defects in welding.

UNIT – III

ELECTROLYTIC PROCESS: Basic principle of Electrolysis, Faradays laws of Electrolysis – Numerical problems, Applications of Electrolysis – Electro deposition-manufacturing of chemicals – anodizing – electro polishing – electro cleaning – electro parting – electro metallurgy, Power supply for Electrolysis.

UNIT – IV

ELECTRIC TRACTION: Introduction –Traction Systems, Systems of Electric Traction- Advantages of Electric Traction, Systems of Track Electrification, Desirable features of Traction Motors – Suitability of D.C. series motor, A.C. series motor, 3 phase induction motor and linear induction motor for traction. Electric Braking in traction - Plugging, Rheostatic and Regenerative types – Suitability of different motors for braking, Temperature Rise and Load Equalization.

UNIT – V

TRACTION MECHANICS: Types of services – urban – sub-urban and main line services, Speed-time curves of different services – trapezoidal and quadrilateral speed-time curves – Numerical Problems, Tractive effort, Power, Specific Energy Consumption- factors affecting Specific Energy Consumption, Mechanics of train movement - Adhesive weight and coefficient of adhesion – Problems.

TEXT BOOKS:

1. Utilization of Electric Power, Er. R. K. Rajput, Laxmi Publications, 2nd Edition
2. Utilization of Electric Power and Electric Traction, J.B. Gupta, S.K. Kataria and sons, Delhi. Art & Science of Utilization of electrical Energy – by H. Partab, Dhanpat Rai & Sons.

REFERENCE BOOKS:

1. Generation, Distribution and Utilization of Electrical Energy" by C. L. Wadhwa, Eastern . Wiley Ltd.
2. Utilization of Electrical Power including Electric drives and Electric traction – by N.V.Suryanarayana, New Age International (P) Limited Publishers, 1996.
3. A text book on Power System Engineering" by A. Chakraborti, M. L. Soni, P. V. Gupta, U.S.Bhatnagar, Dhanpat Rai and Co.(P) Ltd – Delhi.

RENEWABLE ENERGY AND ENERGY STORAGE TECHNOLOGIES
(Professional Core- 17)

B. Tech. IV Year II Semester

L	T	P	C
3	0	0	3

Course Outcomes: At the end of the course, the student will be able to

CO1. Discuss the energy scenario and the consequent growth of the power generation from renewable energy sources.
CO2. Explain the basic physics of wind and wind generation topologies
CO3. Describe the basics of solar power generation
CO4. Express the power electronic interfaces for solar PV generation.
CO5. Generalize the issues related to the grid-integration of solar and wind energy systems.

UNIT I

PHYSICS OF WIND POWER: History of wind power, Indian and Global statistics, Wind physics, Betz limit, Tip speed ratio, stall and pitch control, Wind speed statistics-probability distributions, Wind speed and power-cumulative distribution functions.

UNIT II

WIND GENERATOR TOPOLOGIES: Review of modern wind turbine technologies, Fixed and Variable speed wind turbines, Induction Generators, Doubly-Fed Induction Generators and their characteristics, Permanent- Magnet Synchronous Generators, Power electronics converters. Generator - Converter configurations, Converter Control.

UNIT III

THE SOLAR RESOURCE: Introduction, solar radiation spectra, solar geometry, Earth Sun angles, observer Sun angles, solar day length, Estimation of solar energy availability.

Solar thermal power generation:

Technologies - Parabolic trough, central receivers, parabolic dish, Fresnel, solar pond, elementary analysis

UNIT IV

SOLAR PHOTOVOLTAIC: Technologies - Amorphous, mono crystalline, polycrystalline; V-I characteristics of a PV cell, PV module, array, Power Electronic Converters for Solar Systems, Maximum Power Point Tracking (MPPT) algorithms. Converter Control.

UNIT V

ENERGY STORAGE TECHNOLOGIES: Role of Electrical Energy storage system -Electro chemical storage systems, secondary batteries, Management and control hierarchy of storage systems - Internal configuration of battery storage systems, design of electric energy storage system for solar and wind plants (block diagram).

TEXT BOOKS:

1. Renewable energy technologies: A practical guide for beginners, Chetan Singh Solanki, PHI,2008
2. Non Conventional Energy Sources , G.D.Rai, Khanna Publications

REFERENCE BOOKS:

1. Wind power in power systems, T. Ackermann, John Wiley and Sons Ltd.,2005.
2. Solar energy: Principles of thermal collection and storage, S.P.Sukhatme, McGraw Hill, 1984.
3. Renewable energy applications, G. N.Tiwari and M. K. Ghosal Narosa Publications, 2004.

TECHNICAL SEMINAR

B. Tech. IV Year II Semester

L	T	P	C
0	2	0	2

Course Outcomes: At the end of the course, the student should be able to

CO1. Identify promising new direction of various cutting edge technologies in electrical and electronics domain.
CO2. Do literature survey using library resources, internet, and technical journals for a thrust area.
CO3. Prepare a technical report and present with the latest tools of presentations.
CO4. Enhance the skills of self-study and lifelong learning.

METHOD OF EVALUATION:

There shall be a technical seminar presentation in IV year II semester, for which the student shall collect information on a specialized topic in the field of engineering and technology, prepare a technical report, and submit the same to the department. It shall be evaluated by the departmental review committee consisting of Head of the Department, seminar supervisor and three senior faculty members. Performance response with respect to technical seminar shall be evaluated for 50 internal marks by the above review committee. Assessment will be done for the following aspects of presentation.

S.No.	Assessment	Marks
1	Literature Review	10M
2	Subject Knowledge	10M
3	Communication Skills	10M
4	Presentation	10M
5	Report	10M
	Total	50M

There shall be no semester end examination for the seminar.

COMPREHENSIVE VIVA VOCE

B. Tech. IV Year II Semester

L	T	P	C
0	0	0	2

Course Outcomes: At the end of the course, the student should be able to

CO1. Acknowledge the understanding level in various areas of electrical and electronics engineering.
CO2. Prepare comprehensively to answer question from all the courses studied.
CO3. Attain oral presentation skills by answering question in precise and concise manner.
CO4. Preparedness to face interviews both in the academic and industrial sector.
CO5. Gain self-confidence and inter personal skills.

Comprehensive Viva-Voce will be conducted by a committee consisting of head of the department and two senior faculty members of the department. The Comprehensive Viva-Voce is intended to assess the student's competency on the subjects he/ she studied during the course of study. There are no internal marks for Comprehensive Viva Voce.

MAJOR PROJECT

B. Tech. IV Year II Semester

L	T	P	C
0	0	20	10

Course Outcomes: At the end of the course, the student should be able to

CO1. Develop comprehensive solution to issues identified in previous semester project work.
CO2. Formulate and develop a design proposal on a problem in area of interest.
CO3. Apply technical / managerial skills for analysis, design, simulation and modeling of various real time problems in the domain of electrical and electronic engineering.
CO4. Synthesize the results of detailed analytical studies conducted.
CO5. Present his or her work in a conference or publish work in a peer reviewed journal

A batch consisting of three or four students, are expected to design and implement on a topic of their interest under the guidance of a faculty member. The expertise of the guide has to match with the area chosen by the batch carrying out the project. Every batch is expected to deliver an abstract seminar on three different topics in the area chosen by them.

The department review committee examines if the quantum of the proposed implementation meets the requirement of Major Project which will be evaluated for 200 Marks. The Department Review Committee (DRC) may be constituted by the Head of the Department. The DRC conducts three reviews to assess the progress of the work carried out with respect to the following rubrics.

S.No.	PROJECT REVIEW I	MARKS
I	Understanding background and topic	3M
II	Specific Project goals	2M
III	Literature Survey	2M
IV	Project Planning	4M
V	Presentation skills	4M
	PROJECT REVIEW II	
I	Specific Project goals	2M
II	Specific testing platforms and bench mark systems	3M
III	Project Planning	2M
IV	Technical Design	3M
V	Summary of the findings of Project	2M
VI	Presentation Skills	3M
	FINAL PROJECT REVIEW	
I	Abstract	2M
II	Research Methodology	4M
III	Results obtained and performance Evaluation	5M
IV	Pre - final draft of entire project	5M
V	Presentation skills	4M
		50M

They are required to prepare a comprehensive project report after completing the work to the satisfaction of the supervisor. The project work is evaluated based on the project report submitted along with an oral presentation on the work done, jointly by external and internal examiners constituted by the Head of the Department.