SRI KRISHNADEVARAYA UNIVERSITY :: ANANTAPUR
College of Engineering & Technology
Academic Regulations 2015 (R15) for
B. Tech (Regular-Full time)

(With effect from the Academic Year 2015-16 for the students admitted into I year I semester)

1. Award of B.Tech. Degree

A student will be declared eligible for the award of the B.Tech. Degree if he/she fulfils the following academic regulations:

i. Pursue a course of study for not less than four academic years and in not more than eight academic years. However, for the students of availing Gap year facility this period shall be extended up to 2 year at the most and these two years would not be counted for the maximum time for graduation.

ii. Register for 228 credits and secure all 228 credits.

iii. Students, who fail to fulfill all the academic requirements for the award of the degree within Eight (Ten for GAP year students) academic years from the year of their admission, shall forfeit their seat in B.Tech. course and their admission stands cancelled.

2. Courses of study

The following courses of study are offered at present under B. Tech. program with effect from the academic year 2015-16.

S. No.	Branch
01.	Civil Engineering
02.	Computer Science & Engineering
03.	Electrical and Electronics Engineering
04.	Electronics and Communication Engineering
05.	Mechanical Engineering

and any other course as approved by the authorities of the University from time to time.

The entire course of study is of four academic years in semester pattern (for regular students) and of three academic years in semester pattern (for lateral entry students).

3. Credits

	Semester	
	Periods/Week	Credits
Theory	04	04
Practical	03	02
Drawing	03	02
	06	04
Online examination	-	02
Project	12	8

4. Course pattern:

i. The entire course of study is of four academic years on semester pattern.

ii. A student eligible to appear for the end examination in a subject, but absent in it or has failed in the end examination may appear for that subject at the next supplementary examination offered.

iii. When a student is detained due to lack of credits / shortage of attendance, he may be re-admitted when the semester / year is offered next after fulfillment of academic regulations.

5. Distribution and Weightage of Marks

i. The performance of a student in each semester for academic year I, II, III, IV shall be evaluated subject wise with a maximum of 100 marks for theory and 75 marks for practical subject. In addition Mini Project, Seminar, Comprehensive Viva Voce and Project Work shall be evaluated for 50, 50, 100 and 150 marks respectively.

ii. For theory subjects the distribution shall be 30 marks for Internal Evaluation (25 marks for internal test and 05 marks for assignments) and 70 marks for the External Examination.

iii. For theory subjects, during the semester there shall be 2 midterm examinations. Each midterm examination consists of subjective paper for 25 marks with duration of 1hour 30 minutes.

First midterm examination shall be conducted for the first half of the syllabus in the middle of the semester and second midterm examination shall be conducted for the second half of the syllabus towards the end of the semester. A weightage of 0.75 for better score and 0.25 for the other score will be considered for awarding the sessional marks in both the midterm examinations. There shall be two assignments in each semester for award of 05marks so that midterm component will be 30marks (25 for midterm examinations + 05 marks for assignments).

iv. For practical subjects there shall be a continuous evaluation during the semester for 25 sessional marks and 50 end examination marks. Day-to-day work in the laboratory shall be evaluated for 25 marks by the concerned laboratory teacher based on the report of experiments/jobs. The end examination shall be conducted by the laboratory teacher and another internal examiner.

v. The Engineering Drawing/Graphics course, offered is to be treated as a Theory Course. Evaluation method adopted shall be same as for any other Theory Course. The Internal evaluation for sessionals will be 15 marks for day-to-day work in the class that shall be evaluated by the concerned subject teacher based on the reports/submissions prepared in the class. And there shall be two mid term exams in a semester for a duration of 2 hrs each, evenly distributed over the syllabi, for 15 marks giving a weightage of 0.75 for the better score and 0.25 for the other score will be considered. The sum of day to day evaluation and the internal tests will be the final sessionals for the subject.

vi. There shall be a seminar presentation in IV year II Semester. For the seminar, the student shall collect the information on a specialized topic and prepare a technical report, showing his understanding over the topic, and submit to the department before presentation. The report and the presentation shall be evaluated by the Departmental committee consisting of Head of the department, seminar supervisor and a senior faculty member. The seminar shall be evaluated for 50 marks. There shall be no external examination for seminar.

vii. There shall be two comprehensive online examinations conducted internally, one in II-II and another in III-II. A student is supposed to secure minimum of 35% marks to secure 2 credits.

viii. There shall be two choice based credit courses (for other branch students), one in II- I and another in III-II. Each department shall offer a minimum of 3 subjects in such courses. A student shall be given a choice to select any one subject from the list of subjects offered by all faculties under choice based credit courses.

ix. There shall be two choice based credit courses (same branch students) in IV- I semester. A minimum of six courses must be offered, out of which 2 courses shall be selected by the students.

x. Massive Open Online Courses (MOOCs) are to be introduced. There shall be 2 MOOCs in the entire course duration.

xi. A minimum of six online courses (MOOCs) must be offered, out of which 2 courses shall be selected by the students in any each semester as stated above. The students shall register for the opted online courses at the college or offered by authorized institutions/Agencies. The Certificate issued by the college/institution/agency after successful completion of the course shall be considered for the award of credits by the College.

xii. Out of a total of 150 marks for the project work, 50 marks shall be for Internal Evaluation and 100 marks for the End Semester Examination. The End Semester Examination (viva-voce) shall be conducted by Board of Examiners consisting of Project Supervisor, Head of Department and an External Examiner. The evaluation of project work shall be conducted at the end of the IV year II Semester. The Internal Evaluation shall be on the basis of two seminars of each 25 marks, one will be presented to the project supervisor and another will be presented to the Department committee compromising Head of the Department, Project Supervisor, and one senior faculty of the Department.

xiii. Comprehensive Viva Voce will be conducted by the Board of Examiners at the time of evaluation of the Project Work, to test the overall subject knowledge of the entire course.

6. Attendance Requirements:

i. A student shall be eligible to appear for University examinations if he acquires a minimum of 75% of attendance in aggregate of all the subjects in a semester/ I year.

ii. Shortage of Attendance below 62% in aggregate shall in NO case be condoned.

iii. Shortage of attendance in aggregate up to 13% (62% and above and below 75%) in each semester may be granted by the College Academic Committee valid on Genuine grounds with supporting evidence.

iv. Students whose shortage of attendance is not condoned in any semester are not eligible to take their end examination of that class and their registration shall stand cancelled.

v. A student will not be promoted to the next semester unless he satisfies the attendance requirements of the present semester, as applicable. They may seek re-admission for that semester when offered next.

vi. A stipulated fee shall be payable towards condonation of shortage of attendance to the University.

7. Minimum Academic Requirements:

The following academic requirements have to be satisfied in addition to the attendance requirements mentioned in item no.**6**

i. A student shall be deemed to have satisfied the minimum academic requirements and earned the credits allotted to each theory, practical, design, drawing subject or project if he secures not less than 35% of marks in the end examination and a minimum of 40% of marks in the sum total of the internal evaluation and end examination taken together. For the Seminar he should secure 40% in the internal evaluation.

ii. A student shall be promoted from II to III year only if he fulfills the academic requirement of securing **40** credits from the preceding regular and supplementary examinations.

iii. A student shall be promoted from third year to fourth year only if he fulfils the academic requirements of securing **68 c**redits from the preceding regular and supplementary examinations.

iv. Lateral Entry students shall be promoted from third year to fourth year only if he fulfills the academic requirements of securing **40 credits** from the preceding regular and supplementary examinations.

v. Students who fail to earn 228 credits as indicated in the course structure within eight academic years (10 years for Gap year students) from the year of their admission shall forfeit their seat in B.Tech course and their admission shall stand cancelled.

8. Transitory Regulations:

Candidates who have been detained for want of attendance or not fulfilled academic requirements or who have failed after having undergone the course in earlier regulations or have discontinued and wish to continue the course are eligible for admission into the unfinished semester from the date of commencement of class work with the same or equivalent subjects as and when subjects are offered, subject to Section 1.1.

Candidates who have been detained for want of attendance or not fulfilled academic requirements or who have failed after having undergone the course in earlier regulations or have discontinued and wish to continue the course are eligible for admission into the unfinished semester from the date of commencement of class work with the same or equivalent subjects as and when subjects are offered, and they will be in the academic regulations into which the candidate is presently readmitted.

Candidate who were permitted with GAP year shall be eligible for rejoining into the succeeding year of their B.Tech from the commencement of class work and they will be in the academic regulations into which the candidate is presently rejoining.

9. With–holding of results:

If the candidate has any dues not paid to the College or if any case of indiscipline or malpractice is pending against him/her, the result of the candidate shall be withheld and he/she will not be allowed / promoted into the next higher semester. The issue of awarding degree is liable to be withheld in such cases.

10. GAP Year: Concept of Student Entrepreneur in Residence shall be introduced and outstanding students who wish to pursue entrepreneurship are allowed to take a break of one year at any time after II year to pursue entrepreneurship full time. This period may be extended to two years at the most and these two years would not be counted for the time for the maximum time for graduation. The Head of the respective department shall forward such proposals submitted by the students to the College. An evaluation committee shall be constituted by the College to evaluate the proposal submitted by the student and the committee shall decide whether or not to permit student(s) to avail the Gap Year.

11. Award of Class:

After a student has satisfied the requirements prescribed for the completion of the program and is eligible for the award of B. Tech. Degree, he shall be placed in one of the following four classes:

Class Awarded	**% of marks to be secured**
First Class with Distinction	70% and above
First Class	Below 70% but not less than 60%
Second Class	Below 60% but not less than 50%
Pass Class	Below 50% but not less than 40%

(The marks in internal evaluation and end examination shall be shown separately in the marks memorandum). If any candidate passes through supplementary examinations beyond the duration of the course, he/she may be awarded class based on the % of marks secured as above, except distinction.

i. Grading System is to be introduced. After each subject is evaluated for 100 marks, the marks obtained in each subject will be converted to a corresponding letter grade as given below, depending on the range in which the marks obtained by the student fall.

Table – Conversion into Grades and Grade Points assigned

Range in which the marks in the subject fall	Grade	Grade points Assigned
≥ 90	S (Superior)	10
80-89	A+ (Excellent)	9
70-79	A (Very Good)	8
60-69	B (Good)	7
50-59	C(Average)	6
40-49	D (Satisfactory)	5
< 40	F (Fail)	0
Absent	Ab (Absent)	0

12. The minimum instruction days including exams for each semester shall be 90 days.

13. There shall be no branch transfers after the completion of admission process.

14. The academic regulations should be read as a whole for purpose of any interpretation.

15. In the case of any doubt or ambiguity in the interpretation of the above rules, the decision of the University is final.

16. The University may change or amend the academic regulations or syllabi at any time and the changes or amendments shall be made applicable to all the students on roles with effect from the dates notified..

B.Tech I Year I Semester Course Structure

S.No.	Abbreviation	Subject	Periods / Week		Credits
			L	P	
1.		Functional English	4	-	4
2.		Mathematics	4	-	4
3.		Engineering Physics	4	-	4
4.		Problem Solving and Programming	4	-	4
5.		Engineering Graphics	2	3	4
6.		Physics Lab	-	3	2
7.		Programming Lab	-	3	2
8.		Engineering Workshop & IT Workshop	-	3	2
		Total			26

L – Lecture, P – Practical

B.Tech I Year II Semester Course Structure

S.No.	Abbreviation	Subject	Periods / Week		Credits
			L	P	
1.		Communicative English	4	-	4
2.		Mathematical Methods	4	-	4
3.		Engineering Chemistry	4	-	4
4.		Electronic Devices and Circuits	4	-	4
5.		Electrical Circuits-I	4	-	4
6.		Communication Skills Lab	-	3	2
7.		Chemistry Lab	-	3	2
8.		Electronic Devices and Circuits Lab	-	3	2
					26

L – Lecture, P – Practical

B.Tech II Year I Semester Course Structure

S.No.	Abbreviation	Subject	Periods / Week			Credits
			L	T	P	
1.		Complex Analysis	4	1	-	4
2.		Electrical machines - I	4	1	-	4
3.		Fluid mechanics and Hydraulic machines	4	1	-	4
4.		Electrical circuits – II	4	1	-	4
5.		Managerial Economics and Financial Analysis	4	1	-	4
6.		**Choice Based Credit Courses (For Non EEE Students)*** 1. Principles of Electrical Engg 2. Electrical Engg Materials 3. Electrical Measuring Instruments	4	1	-	4
7.		Fluid mechanics and Hydraulic machines Lab	-	-	3	2
8.		Electrical circuits lab	-	-	3	2
9.		Human Values and Professional Ethics	2			
		TOTAL	26	6	6	28

L – Lecture, T – Tutorial, P - Practical

B.Tech II Year II Semester Course Structure

S.No.	Abbreviation	Subject	Periods / Week			Credits
			L	T	P	
1.		Electromagnetic Fields	4	1	-	4
2.		Generation of Electric Power	4	1	-	4
3.		Electrical Machines - II	4	1	-	4
4.		Switching theory and Logic design	4	1	-	4
5.		Analog Electronic Circuits	4	1	-	4
6.		Control Systems	4	1	-	4
7.		Electrical Machines Lab-I	-	-	3	2
8.		Analog Electronics Circuits Lab	-	-	3	2
9.		Comprehensive Online Examination				2
		TOTAL	24	6	6	30

L – Lecture, T – Tutorial, P - Practical

B.Tech III Year I Semester Course Structure

S.No.	Abbreviation	Subject	Periods / Week			Credits
			L	T	P	
1.		Transmission of electric power	4	1	-	4
2.		Basic Power electronics	4	1	-	4
3.		Electrical machines-III	4	1	-	4
4.		Environmental Science	4	1	-	4
5.		Electrical and Electronic Measurements	4	1	-	4
6.		Linear and Digital IC Applications	4	1	-	4
7.		Electrical Machines Lab - II	-	-	3	2
8.		Control Systems and Simulation Lab	-	-	3	2
9.		Advanced Communication Skills Practice			3	
		TOTAL	24	6	9	28

L – Lecture, T – Tutorial, P – Practical

B.Tech III Year II Semester Course Structure

S.No.	Abbreviation	Subject	Periods / Week			Credits
			L	T	P	
1.		Management Science	4	1	-	4
2.		Microprocessors and Microcontrollers	4	1	-	4
3.		Power Semiconductor Drives	4	1	-	4
4.		Computer Aided Power system Analysis	4	1	-	4
5.		Switch Gear and Protection	4	1	-	4
6.		**Choice Based Credit Courses: (For Non EEE Students)*** 1. Renewable Energy Sources 2. Power Electronics 3.Signals and Systems	4	1	-	4
7.		Electrical and Electronics Measurements Lab	-	-	3	2
8.		Power Electronics and Simulation Lab	-	-	3	2
9.		Comprehensive Online Examination				2
		TOTAL	24	6	6	30

L – Lecture, T – Tutorial, P - Practical

B.Tech IV Year I Semester Course Structure

S.No.	Abbreviation	Subject	Periods / Week			Credits
			L	T	P	
1.		Principles of DSP	4	1	-	4
2.		Power System operation and Control	4	1	-	4
3.		Distribution of Electrical Power	4	1	-	4
4.		Utilization of Electrical Energy	4	1	-	4
5.		**Choice Based Credit Courses;: (for EEE students)** 1.Renewable Energy Sources 2.Power System Stability 3. Electrical Energy Conservation	4	1	-	4
6.		**Choice Based Credit Courses;: (for EEE students)** 1. Instrumentation 2. High Voltage Engineering 3. Soft Computing Techniques	4	1	-	4
7.		Micro Processors and micro controllers Lab	-	-	3	2
8.		Power System Simulation Lab	-	-	3	2
		Mini Project	-	-	-	2
		TOTAL	24	6	6	30

L – Lecture, T – Tutorial, P – Practical

B.Tech IV Year II Semester Course Structure

S.No.	Abbreviation	Subject	Periods / Week			Credits
			L	T	P	
1.		Fundamentals of HVDC and FACTS devices	4	1		4
2.		Reliability Engineering	4	1		4
3.	MOOCs-I	**Massive Open Online Courses-I** 1. Neural Networks and Fuzzy logic 2. Energy auditing and Demand side Management 3. Principles of Power Quality	4		-	4
4.	MOOCs-II	**Massive Open Online Courses-II** 1. Smart Grid Technologies 2. Management of Deregulated Power Sytems 3. Special Electrical Machines	4		-	4
5.		Project Work	-	-	-	8
6.		Seminar	-	-	-	2
7.		Comprehensive Viva-Voce	-	-	-	4
		TOTAL	8	2	-	30

L – Lecture, T – Tutorial, P – Practical

B.Tech I Year I Semester Course Structure

S.No.	Abbreviation	Subject	Periods / Week		Credits
			L	P	
1.		Functional English	4	-	4
2.		Mathematics	4	-	4
3.		Engineering Physics	4	-	4
4.		Problem Solving and Programming	4	-	4
5.		Engineering Graphics	2	3	4
6.		Physics Lab	-	3	2
7.		Programming Lab	-	3	2
8.		Engineering Workshop & IT Workshop	-	3	2
					26

L – Lecture, P – Practical

B.Tech I Year I Sem	FUNCTIONAL ENGLISH	T	C
	(Common for CSE, ECE, EEE, Civil & Mechanical)	4	4

UNIT – I

Environmental Consciousness

Green Cover, Pollution

Tenses, Prepositions, Prepositional Phrases, Writing Letters

UNIT – II

Emerging Technologies

Solar Thermal Power, Cloud Computing

Subject-Verb Agreement, Prefixes and Suffixes, Compound Nouns, Imperatives

UNIT – III

Global Issues

Child Labour, Food Crisis

Synonyms & Antonyms, Verbs: Regular & Irregular, Homonyms, Homophones and Homographs, Direct and Indirect Speech

UNIT – IV

Global Issues

E-Waste, Assistive Technology

Articles, Collocations, Conjunctions, Note-Making, Making Recommendations, If Conditional

UNIT – V

Space Trek

Hubble Telescope, A Home in the Sky

Degrees of Comparisons, Voice, Question Tags

UNIT – VI

Media Matters

The Evolution of Media, Ten Developments in Media, Advertisements

Paragraph Writing, Effective Writing, Writing Reports, Expansion of Proverbs and Idioms, Commonly Confused Words

TEXT BOOKS:

1. Mindscapes: English for Technologists and Engineers, Paper Back 2012 by Anna University.

B.Tech I Year I Sem	MATHEMATICS	T	C
	(Common for CSE, ECE, EEE, Civil & Mechanical)	4	4

Unit-I

Exact,linear and Bernoullis equations,Orthogonal trajectories.Non-homogeneous linear differential equations of second and higher order with constant coefficients with RHS term of the type e^{ax},Sinax,Cosax,polynomials in x, $e^{ax}V(x)$,$xV(x)$.Method of variation of parameters.

Unit-II

Taylor's and Maclaurin's series-Functions of several variables-Jacobian-Maxima and Minima of functions of two variables,Lagranges method of undetermined multipliers with three variables only.Radius of curvature.

Unit-III

Multiple integral-Double and triple integrals-Change of variables-Change of order of integration.

Unit-IV

Vector Calculus:Gradient-Divergence-Curl.Vector Integration-Line integral-Area-Surface and Volume integrals.Vector integral theorems: Green's theorem-Stoke's theorem-Gauss Divergence theorem (With out proofs).Applications of Green's, Stoke's and Gauss Divergence theorems.

Unit-V

Laplace Transforms:Definition-Transform of elementary functions-Properties of Laplace Transforms-Transform of derivatives-Transform of integrals-Unit step fuction-multiplication by t^n –Division by t-Evaluation of integrals by Laplace Transforms-Laplace Transform of periodic functions.

Unit-VI

Inverse Laplace Transforms-Partial fractions-Other methods of finding inverse transforms-Convolution theorem-Applications of Laplace transforms to Ordinary differential equations of first and second order.

TEXT BOOKS:

1. A Text Book of Engineering Mathematics,Vol.1,T.K.V.Iyengar,B.Krishna Gandhi and others, S.Chand and Company.
2.Higher Engineering Mathematics,B.S.Grewal,Khanna publishers.
3.Engineerin Mathematics-I,E.Rukmangadachari & E.Keshava Reddy,Pearson Publisher.

REFERENCES:

1.Advanced Engineering Mathematics, by Erwin Kreyszig,Wiley India.
2. Higher Engineering Mathematics, by B.V.Ramana,Mc Graw Hill Publishers.
3.Advanced Engineering Mathematics,by Alan Jeffrey,Elsevier.

B.Tech I Year I Sem	ENGINEERING PHYSICS (Common for CSE, ECE & EEE)	T	C
		4	4

UNIT I

OPTICS: Interference- Interference in thin film by reflection-Newton's rings-Diffraction-Fraunhofer diffraction due to single slit-Fraunhofer diffraction due to double slit and diffraction grating.

UNIT II

CRYSTALLOGRAPHY: Introduction-Space lattice- Unit cell-Lattice parameters –Bravias lattice-Crystal system-Packing fraction of SC, BCC and FCC –Directions and planes in crystals-Miller indices-Interplanar spacing in cubic crystals-X-ray diffraction–Bragg's law.

UNIT III

QUANTUM MECHANICS: Matter waves-de Broglie hypothesis and properties-Heisenberg's uncertainty principle-Schrödinger's time dependent and independent wave equations-Physical significance of wave function-Particle in one dimensional infinite potential well.

UNIT IV

SEMICONDUCTORS: Intrinsic and Extrinsic semiconductors-Drift and Diffusion currents and Einstein's equation-Hall effect-Formation of p-n junction.

MAGNETIC MATERIALS: Basic definitions- Classification of magnetic materials into dia, para, ferro, antiferro and ferri magnetic materials-Hysteresis- Soft and Hard magnetic materials.

UNIT V

SUPERCONDUCTIVITY: Introduction-General properties-Meissner effect-Penetration depth-Effect of magnetic field-Type I and Type II superconductors-Flux quantization-Josephson effects-Application of superconductors.

UNIT VI

LASERS: Introduction- Spontaneous and stimulated emission of radiation-Einstein's coefficients-Population inversion-Ruby laser-He-Ne laser-Application of lasers.

FIBER OPTICS: Introduction-Principle of optical fiber-Acceptance angle and Acceptance cone-Numerical aperture-Types of Optical fibers-Application of optical fibers.

Text Books:

1. Engineering Physics-K. Thyagarajan, MacGraw Hill Education (India) Private Limited, New Delhi, 2015.
2. Engineering Physics- K. Vijay Kumar, S. Chand & Co. Ltd.

References:

1. Engineering Physics-P.K. Paliniswamy, 2nd Edition, SciTech Publications
2. Engineering Physics-S. Maninaidu-Pearson Education Private Ltd.
3. Physics for Engineers-N.K. Verma, 1st Edition, PHI Learning Private Ltd.

B.Tech I Year I Sem **PROBLEM SOLVING AND PROGRAMMING** **T C**
(Common for CSE, ECE, EEE, Civil & Mechanical) **4**
4

Unit I- Overview of Computers and Programming - Electronic Computers then and Now, Computer Hardware, Computer Software, Algorithm, Flowcharts, Software Development Method, Applying the Software Development Method.

Unit II- Introduction to C Language - C Language Elements, Variable Declarations and Data Types, Executable Statements, General Form of a C Program, Arithmetic Expressions, Formatting Numbers in Program Out, Interactive Mode, Batch Mode and Data Files.

Unit III- Selection Structures : Control Structures, Conditions, The if Statement, if Statements with Compound Statements, Decision Steps in Algorithms, Nested if Statements and Multiple-Alternative Decisions, The switch Statement. Repetition and Loop Statements: Repetition in Programs, Counting Loops and the while Statement, Computing a Sum or a Product in a Loop, The for Statement, Conditional Loops, Loop Design, Nested Loops, The do-while Statement and Flag-Controlled Loops.Simple Data Types: Representation and Conversion of Numeric Types, Representation and Conversion of Type char, Enumerated Types, Iterative Approximations

Unit IV- Top Down Design with Functions: Building Programs from Existing Information, Library Functions, Top-Down Design and Structure Charts, Functions without Arguments, Functions with Input Argument. Modular Programming (Functions): Functions with Simple Output Parameters, Multiple Calls to a Function with Input/Output Parameters, Scope of Names, Formal Output Parameters as Actual Arguments, A Program with Multiple Functions. Arrays: Declaring and Referencing Arrays, Array Subscripts, Using for Loops for Sequential Access, Using Array Elements as Function Arguments, Array Arguments, Searching and Sorting an Array, Multidimensional Arrays.

Unit V- Pointers - Introduction, Features of Pointers, Pointer Declaration, Arithmetic Operations With Pointers, Pointers and Arrays, Pointers and Two-Dimensional Arrays, Array of Pointers, Pointers to Pointers, Void Pointers, Memory Allocation Functions, Programming Applications, Pointer to Functions, Command- Line Arguments.Strings: String Basics, String Library Functions: Assignment and Substrings, Longer Strings: Concatenation and Whole-Line Input, String Comparison, Arrays of Pointers, Character Operations, String-to-Number and Number-to-String Conversions.

Unit VI- Recursion: The Nature of Recursion, Tracing a Recursive Function, Recursive Mathematical Functions, Recursive Functions with Array and String Parameters, Problem Solving with Recursion, A Classic Case Study in Recursion: Towers of Hanoi. Structure and Union: User-Defined Structure Types, Structure Type Data as Input and Output Parameters, Functions Whose Result Values Are Structured, Problem Solving with Structure Types, Parallel Arrays and Arrays of Structures, Union Types.

Unit VII- Files - Introduction, Streams and File Types, Steps for File Operations, File I/O Structures, Read and Write, Other File function, Searching Errors in Reading/Writing of Files, Low Level Disk I/O, Command Line Arguments, Application of Command Line Arguments, File Status functions (error handling).

Unit VIII- Dynamic Memory Allocation, Introduction to Data Structures: Linear and Non Linear Data Structures, Searching and Sorting: Bubble Sort, Selection Sort, Linear Search, Binary Search.

.TEXT BOOKS :

1. Problem Solving and Programming Design in C, J.R.Hanly & ElliotB..Koffman 5th Edition, Pearson Addison Wessley.

REFERENCES :

2. Programming in C and DataStructures, J.R.Hanly, Ashok.N.Kamthane & A.AnandaRao, Pearson Education.
3. Programming in C – Stephen G. Kochan, III Edition, Pearson Eductaion.
4. C Programming with problem solving, J.A. Jones & K. Harrow, Dreamtech Press
5. C and Data Structures, a snapshot oriented treatise with live engineering examples, Dr.N.B.Venkateswarlu, Dr. E.V.Prasad, S. Chand
6. C and Data Structures, E.Balaguruswamy, Tata Mc Graw Hill
7. C Programming & Data Structures, B.A.Forouzan and R.F. Gilberg, Third Edition, Cengage Learning

B.Tech I Year I Sem	ENGINEERING GRAPHICS	T	P	C
	(Common for CSE, ECE & EEE)	2	3	4

UNIT I

Introduction to Engineering Drawing: Principles of Engineering Graphics and their Significance-Conventions in Drawing-Lettering – BIS Conventions. Scales: Plain, Diagonal and Vernier;

UNIT II

Curves used in Engineering Practice.

a) Conic Sections including the Rectangular Hyperbola- General method only, b) Cycloid, Epicycloid and Hypocycloid.

UNIT III

Projection of Points: Principles of orthographic projection – Convention – First angle projections, projections of points.

Projections of Lines: lines inclined to one or both planes, Problems on projections, Finding True lengths.

UNIT IV

Projections of Planes: Projections of regular plane surfaces- plane surfaces inclined to both planes.

UNIT V

Projections of Solids: Projections of Regular Solids with axis inclined to one plane.

UNIT VI

Isometric and Orthographic Projections: Principles of isometric projection- Isometric Scale-Isometric Views- Conventions- Isometric Views of lines, Planes, Simple solids (cube, cylinder and cone). Conversion of isometric Views to Orthographic Views.

Text Books:

1. Engineering Drawing, N.D. Bhatt, Charotar Publishers
2. Engineering Drawing, K.L. Narayana& P. Kannaih, Scitech Publishers, Chennai

References:

1. Engineering Drawing, Johle, Tata McGraw-Hill Publishers
2. Engineering Drawing, Shah and Rana,2/e, Pearson Education
3. Engineering Drawing and Graphics, Venugopal/New age Publishers
4. Engineering Graphics, K.C. John, PHI,2013
5. Engineering Drawing, B.V.R. Guptha, J.K. Publishers

B.Tech I Year II Semester Course Structure

S.No.	Abbreviation	Subject	Periods / Week		Credits
			L	P	
1.		Communicative English	4	-	4
2.		Mathematical Methods	4	-	4
3.		Engineering Chemistry	4	-	4
4.		Electronic Devices and Circuits	4	-	4
5.		Electrical Circuits-I	4	-	4
6.		Communication Skills Lab	-	3	2
7.		Chemistry Lab	-	3	2
8.		Electronic Devices and Circuits Lab	-	3	2
					26

L – Lecture, P – Practical

B.Tech I Year II Sem	COMMUNICATIVE ENGLISH	T	C
	(Common for CSE, ECE, EEE, Civil & Mechanical)	4	4

UNIT – I

Lessons from the Past

The Importance of History, The Mother of Modern Corporatism

Pure Vowels, Just-A-Minute, Designing Posters

UNIT – II

Energy

In Search of Our Energy Solutions, Wind Energy

Diphthongs, Role Play, Making Conversation/Situational Dialogues

UNIT – III

Engineering Ethics

Learning from Disasters, Biotechnology: Ethical Questions

Consonant Sounds, Debate, Blog Making

UNIT – IV

Travel and Tourism

Ten Reasons Why Travel is a Waste of Time, Atithi Devo Bhava

Syllables, Word Stress Rules, Group Discussion

UNIT – V

Getting Job Ready

Boeing, Arvind Mills

Presentation Skills, Writing Emails, Creativity: Thinking and Writing

UNIT – VI

Getting Job Ready

Toyota Production System, Preparing for the Interviews

Types of Interviews, Mock Interviews, Personality Development.

TEXT BOOKS:

1. Mindscapes: English for Technologists and Engineers, Paper Back 2012 by Anna University.

B.Tech I Year II Sem	MATHEMATICAL METHODS (Common for CSE, ECE, EEE, Civil & Mechanical)	T	C
		4	4

UNIT -I

Matrices: Elementary row transformations – Rank – Echelon from, normal – Solution of Liner System of Homogenous and Non Homogeneous equations –Eigen values, Eigen vectors – (Excluding proofs of Properties). Cayley – Hamilton Therorem(Excluding proof) – Inverse and powers of a matrices by Cayley-Hamilton therem – Diagonolization of matrix. Calculation of powers of matrix.

UNIT-2

Numerical solution of Ordinary Differential equations: Solution by Taylor's series-Picard's Method of successive Approximations-Euler's Method-Runge-Kutta method - Milne's Predictor-Corrector Method.

UNIT-3

Fourier series:Determination of Fourier coefficients- Fourier series of Even and odd functions- Fourier series in an arbitrary interval-Even and odd periodic continuation- Half range Fourier sine and cosine expansions.

UNIT-4

Fourier integral thorem (statement only) – Fourier sine and cosine integrals. Fourier transform- Fourier sine and cosine transforms- Properties- Inverse transforms- Finite Fourier transforms.

UNIT-5

Formation of partial differential equations by elimination of arbitrary constants and arbitrary functions-Method of separation of variables-Solutions of one dinesional wave equation, heat equation and two-dimensionsal Laplace equation under initial and boundary conditions.

UNIT-6

z-transform –inverse z-transform-Properties-Damping rule –shifting rule- Initial and final value theorems. Convolution theorem-Solution of difference equations by transforms.

TEXT BOOKS:

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

REFERNCES:

1. Numerical Methods for Scientific and Engineering Communication, M.K.Jain,S.R.K. Iyengar& R.K.Jain, New Age international Publishers.
2. Mathematical Methods –Pal –Oxford.
3. Introduction to Numerical Analysis –S.S.Sastry Printice Hall of India
4. Mathematical Methods, S.K.V.S.Sri Ramachary, M. Bhujanga Rao, P.B.Bhaskar Rao & P.S.Subramanyam, BS Publications..

Unit –I :- Water

Types Of Impurities In Water, Hardness Of Water And Its Units, Disadvantages Of Hard Water. Estimation Of Hardness By Edta Method. Analysis Of Water- Dissolved Oxygen. Problems On Hardness Of Water. Water Treatment For Domestic Purpose. Sterilisation:- Chlorination, Bleaching Powder, Ozonization. Water For Industrial Purpose:-For Steam Generation, Boilen Troubles – Carry Over (Priming & Foaming) Boiler Coreriosion – Scales And Sludges, Caustic Emfrittlement. Water Treatment :-Internal Treatment :- Colloidal Phospatc, Calgon, Carlronatic, Sodium Aluminates Treatment. External Treatment :- Ion – Exchange And Permutit Process Demineralisation Of Brakish Water – Reverse Osmosis And Electrodialysis.

Unit –II :- Polymers

Basic Concepts Of Polymerisation, Types Of Polymerisation Addition And Condensation Polymerisation.
Plastomers :- Thermosetting And Therimoplastics Compasiti On Properties And Engineering Applications Of Pvc, Teflon, Bakelite And Nylons. Rubber – Processing Of Natural Rubber And Compounding Elastomers – Unas, Buna N, Polynmethane Rubber, Polysulphide Rubber. Conducting Polymers; Synthesis And Applications Of Polyacetylenc And Polyaniline. Liquid Crystals Definition, Properties, Suitable Examples And Engineering Applications.

Unit – III :-Electrochemistry

Electrochemical Cells :- Measurement Of Emf, Standard Electrode Potential, Concentration Cells, Batteries (Ni-Cell), Lithium Batteries. Fuel Cells: (Hydrogen Oxygen Fuel Cell Adn Methanol Fuel Cell. Insulators :- Definition, Properties And Characteristics Of Insulating Materials, Engineering Applications. Corrosion:- Introduction, Type Of Corrosion (Dry Corrosion (Direct Chemical Attack), Hlet Corrosion, Theorics Of Corresion. And Mechanism, Electrochemical Theory Of Corrosion. Galranic Series, Galronic Corrosion Concentration Cell Corrosion, Oxygen Absorption Type. Factors Influencing Corrision – Control Of Corrosion- Cathodic Protection. (Sacrificial Anode And Impressed Current), Inhilitors (Anodic And Cathodic), Electroplating And Electrolese Plating.

Unit – IV:- Nano Materials

Definition, Properities And Applications; Explosives And Propellants : Explosives, Classification, Precantions During Storage, Blasting Fuses, Important Explosives Rocket Propellants, Classification Of Propellants. Lubricants : - Principlesa And Function Of Lubricants – Classification And Properties Of Lubricants – Viscosity, Flash And Fire Points, Cloud And Pour Points, Aniline Point, Neutralisation Number And Mechanical Strength.

Unit –V:- Fuels And Combustion

Definition And Classification Of Fuels. Solid Liquid And Gaseous Fuels, Characteristics Of A Good Fuel.
Metallergical Coke – Characteristics And Manifacture (Otto – Halfmann). Petroleum: Refining Of Petroleum, Gasoline – Octane Number, Diesel -Cetane Number. Petroleum – Refining – Synthetic Petrol. Calorific Value And Its Determination (Bomb Calorimeter – Junkers Gas Calorimeter. Combustion: Flue Gas Analysis By Orsats Apparatus.

Unit –VI:- Chemistry Of Engineering Meterials

Cement : Composition Of Portland Cement, Classification, Preparation (Dry And Wet Processes), Setting And Handling Refractorics :- Definition, Classification With Examples Criteria Of A Good Refractory Material; Causes For The Failure Of A Refractory Material Carbon Clusters: - Fullerenes And Carbon Nano Tubes.

B.Tech I Year II Sem **ELECTRONIC DEVICES & CIRCUITS** **T** **C**
4 **4**

UNIT -I

SEMICONDUCTOR DIODE CHARACTERISTICS: PN junction Diode equation, VI characteristics of p-ndiode, Static and Dynamic Resistances, Temperature dependence of VI characteristic, Diode equivalent circuits, Diode capacitances, Breakdown Mechanisms in Semi Conductor Diodes, Zener diode characteristics, Principle of operation and Characteristics of Tunnel Diode with the help of energy band diagrams, Varactar Diode, Schottky Barrier Diode, Thermistor.

UNIT- II

RECTIFIERS, FILTERS AND REGULATORS: PNjunctionasaRectifier,Half wave rectifier, ripple factor,full wave rectifier, Bridge rectifier, Harmonic components in a rectifier circuit, Inductor filter, Capacitor filter, L- section filter, Π- section filter, comparison of various filter circuits in terms of ripple factors, Simple circuit of a regulator using Zener diode.

UNIT- III

BJT TRANSISTORS: Operation of BJT, Transistor as an amplifier, Junction transistor, Detailed study ofcurrents in a transistor, Input and Output characteristics of transistor in CB, CE, and CC configurations, Relation between Alpha, Beta and Gamma.BJT specification, Transistor as an Amplifier. Principle of operation and characteristics of SCR.

UNIT-IV

TRANSISTOR BIASING AND STABILISATION : DC and AC Load lines, Operating point, Importance ofBiasing,Fixed bias, Collector to Base, Voltage Divider bias, Bias stability, Stabilization factors, (S, S', S''), Compensation techniques, (Compensation against variation in VBE, Ico,) Thermal run away, Thermal stability in CE configuration.

UNIT- V

FET TRANSISTORS: operation and characteristics, Pinch-Off voltage, Small signal model of JFET,MOSFET characteristics (Enhancement and depletion mode), Symbols of MOSFET, Comparison of Transistors (BJT,FET, and MOSFET). Principle of operation and Characteristics of UJT.

UNIT-VI

OSCILLATORS: Condition for Oscillations. RC and LC type Phase Shift oscillators. Hartley and Colpittsoscillators, Wein bridge oscillator, Crystal oscillators, Frequency and amplitude stability of Oscillators.

TEXT BOOKS :

1. Electronic Devices and Circuits – J.Millman, C.C.Halkias, and SatyabrathaJit Tata McGraw Hill, 2nd Ed., 2007.
2. Electronic Devices and Circuits – R.L. Boylestad and Louis Nashelsky, Pearson/Prentice Hall, 9th Edition, 2006.
3. Electronic Devices and Circuits- David A. Bell, 5th Edition, 2008, Oxford University Press.

REFERENCES :

1. Electronic Devices and Circuits – T.F. Bogart Jr., J.S.Beasley and G.Rico, PearsonEducation, 6th edition, 2004.
2. Principles of Electronic Circuits – S.G.Burns and P.R.Bond, Galgotia Publications, 2nd Edn.., 1998.
3. Microelectronics – Millman and Grabel, Tata McGraw Hill, 1988.
4. Electronic Devices and Circuits – Dr. K. Lal Kishore, B.S. Publications, 2nd Edition, 2005.

UNIT-I : INTRODUCTION TO ELECTRICAL CIRCUITS

Cieuit concept R-L-C parameters- voltage and current sources- Independent and dependent sources - Source transformation- voltage current relationship for passive elements.

UNIT-II KIRCHOFF'S LAWS

Kirchoff's laws- network reduction techniques- series, parallel, star-to-delta or delta-to-star transformation, current division, voltage division.

UNIT-III METHODS OF ANALYSING CIRCUITS

Mesh analysis, super mesh analysis, Nodal analysis, Super node analysis with dependent and independent sources.

UNIT-IV MAGNETIC CIRCUITS

Magnetic circuits – Faradays laws of electromagnetic induction- Concept of self and mutual inductance- Dot connection- Co-efficient of coupling- composite magnetic circuits- analysis of series and parallel magnetic circuits.

UNIT-V NETWORK THEOREMS FOR DC EXCITATION

Superposition, Thevinin's , Nortones , Maximum power transfer, Tellegen's, millimance and compensation theorems for DC excitations, Duality and dual networks.

UNIT-VI NETWORK TOPOLOGY

Definitions – Graph-Tree, Basic cutest and basic Tie set matrices for planar networks.

TEXT BOOKS :

1. Engineering circuit analysis - by William Hayt and Jack E. Kemmerly, Mc Graw Hill Company, 6th edition.
2. Network Theory : N.C. Jagan & C.Lakshminarayana, B.S Publications .

REFERENCES :

1. Network Analysis by Vanvalkenburg, PHI.
2. Linear circuit analysis (time domain phasor ,and Laplace transform approaches). Second edition by RAYMOND A.DeCARLO and PEN-MIN-LIN, Oxford University Press. Second edition 2004.
3. "Circuits" by Carlson, Thomson Publishers.
4. Network Analysis: - C.K. Mithal, Khanna Publishers.
5. Electric Circuits by A. Chakrabarthy, Dhanipat Rai & Sons.
6. Electric Circuit theory by K. Rajeswaran, Pearson Education,2004

B.Tech II Year I Semester Course Structure

S.No.	Abbreviation	Subject	Periods / Week			Credits
			L	T	P	
1.		Complex Analysis	4	1	-	4
2.		Electrical machines - I	4	1	-	4
3.		Fluid mechanics and Hydraulic machines	4	1	-	4
4.		Electrical circuits – II	4	1	-	4
5.		Managerial Economics and Financial Analysis	4	1	-	4
6.		**Choice Based Credit Courses (For Non EEE Students)*** 1. Principles of Electrical Engg 2. Electrical Engg Materials 3. Electrical Measuring Instruments	4	1	-	4
7.		Fluid mechanics and Hydraulic machines Lab	-	-	3	2
8.		Electrical circuits lab	-	-	3	2
9.		Human Values and Professional Ethics	2			
		TOTAL	26	6	6	28

L – Lecture, T – Tutorial, P – Practical

B.Tech II Year I Sem **COMPLEX ANALYSIS** **T 4+1*** **C 4**

UNIT - I

Functions of a complex variable–Continuity–Differentiability–Analyticity–Properties–Cauchy-Riemann equations in Cartesian and polar coordinates.Harmonic and conjugate harmonic functions–Milne –Thompson method. Elementary functions: Exponential, trigonometric, hyperbolic functions and their properties-General power Zc (c is complex), principal value.

UNIT-II

Complex integration: Line integral-evaluation along a path by indefinite integration-Cauchy's integral theorem-Cauchy's integral formula-Generalized integral formula.

UNIT-III

Complex power series: Radius of convergence-Expansion in Taylor's series, Maclaurin's series and Laurent series. Singular point-Isolated singular point-pole of order m-essential singularity.

UNIT-IV

Residue- Evaluation of residue by formula and by Laurent series–Residue theorem. Evaluation of integrals of the type :a) improper real integrals $\int_{-\infty}^{\infty} f(x)dx$ b) $\int_0^{2\pi} f(\cos\theta, \sin\theta)$ c) $\int_{-\infty}^{\infty} e^{imx} f(x)dx$ d) integrals by indentation..

UNIT-V

Argument principle–Rouche's Theorem–determination of number of zeros of complex polynomials-Maximum Modulus principle-Fundamental theorem of Algebra, Liouville's Theorem.

UNIT-VI

Con formal mapping: Transformation by ez, ln z ,z2, zn (n positive integer)sin z,cosz, z + a/z, Translation,rotation, inversion and bilinear transformation–fixed -points-cross ratio-properties-invariance of circles and cross ratio–determination of bilinear transformation mapping 3 given point

TEXT BOOKS:

1) A Text book of Engineering Mathematics, Vol – III by T.K.V. Iyengar, B. Krishna Gandhi and others,S. Chand and company.
2) Higher Engineering Mathematics by B.S.Grewal, Khanna Publishers.
3) Engineering Mathematics by B.V. Ramana, Tata McGraw Hill.

REFERENCES:

1) Advanced Engineering Mathematics by Erwin Kreyszig - Wiley Publications.
2) Engineering Mathematics – III A by Dr.M.K. Venkataraman – The National Publishing co.
3) A text book of Engineering Mathematics by N.P.Bali, Iyengar – Lakshmi Publications (Pvt ltd)

B.Tech II Year I Sem **ELECTRICAL MACHINES-I** **T C**
4+1* 4

UNIT-I

D.C GENERATORS: Principle of operation-Elementary Generator - Constructional details - types of armature windings - E.M.F. equation - Types of DC generators - Power division - problems Armature reaction-ATd/Pole,ATc/Pole -simple problems -Remedies for field distortion –- Compensating winding - commutation - methods of improving commutation.

UNIT-II

D.C GENERATORS- CHARACTERISTICS: Characteristics of DC generators - building up of e.m.f of self excited dc shunt generator - causes for failure - critical field resistance and critical speed - characteristics of shunt, series and compound generators

UNIT III

PARALLEL OPERATIONS OF DC GENERATOR: applications of DC generators - parallel operation of DC generators -reasons for paralleling - requirements - paralleling of shunt, compound generators - use of equalizer bar

UNIT - IV

DC MOTORS: Principle of operation - back or counter e.m.f - comparison between motor and generator action - torque developed - Mechanical power developed by a DC motor -types of DC motors - motors characteristics - comparison of DC motor characteristics

UNIT-V

SPEED CONTROL OF DC MOTORS: applications of DC motors - speed control of DC motors. Starting of dc motors - starters for shunt , series and compound motors, -calculation of starter steps for DC shunt motor.

UNIT-VI

LOSSES, EFFICIENCY AND TESTING OF DC MACHINES: Losses & efficiency - losses-copper, iron, mechanical - efficiency of DC machines - condition for maximum efficiency-Braketest-Swinburne's test-Hopkinson's test - Retardation test - Field's test.

TEXT BOOKS:

1. "Electric Machines" - R.K Rajput (1998), Laxmi Publicationd (P) Ltd.
2. Theory & performance of Electrical Machines- J.B.Gupta, S.K.Kataria & Sons, 2009

REFERENCES:

1. Electric Machinery-A.E. Fritzgerald, C. Kingsley and S. Umans, Mc Graw Hill companies, 5th edition
2. H.Cotton (1997), "Advanced Electrical Technology", Wheeler Publishers.
3. I.J.Nagrath & D.P. Kothari (2002), "Electric Machines", TMH.

B.Tech II Year I Sem FLUID MECHANICS AND HYDRAULIC MACHINES T C
4+1* 4

UNIT I

Fluid Statics: Dimensions and units: Physical properties of fluids-specific gravity, viscosity, surface tensionvapor pressure and their influence on fluid motion- atmospheric gauge and vacuum pressure - measurement of pressure- Piezometer, U-tube and differential manometers. Hydrostatic force on a plane area

UNIT II

Fluid Kinematics: Stream line, path line and streak lines and stream tube, classification of flows-steady & unsteady, uniform, non uniform, laminar, turbulent, rotational, and irrotational flows-equation of continuity for one dimensional flow. **Fluid dynamics:** Surface and body forces -Euler's and Bernoulli's equations for flow along a stream line, momentum equation and its application on force on pipe bend.

UNIT III

Closed conduit flow: Laminar and turbulent flow through pipes: Reynolds experiment significance of Reynold's number, formulae for laminar flow through circular pipes, Turbulent flow-Darcy Weisbach equation, friction factor and Mody's diagram - Minor losses in pipes- pipes in series and pipes in parallel- total energy line-hydraulic gradient line. Measurement of flow: pilot tube, venturimeter, and orifice meter.

UNIT IV

Basics of Turbo Machinery: Hydrodynamic force of jets on stationary and moving flat, inclined, and curved vanes, jet striking centrally and at tip, velocity diagrams, work done and efficiency, flow over radial vanes.

UNIT V

Hydraulic Turbines : Introduction to hydroelectric power station-heads and efficiencies-Classification of turbines, impulse and reaction turbines, Pelton wheel, Francis turbine and Kaplan turbine-working proportions, work done, efficiencies , hydraulic design -draft tube theory-functions and efficiency. **Performance of Hydraulic Turbines:** Geometric similarity, Unit and specific quantities, characteristic curves, governing of turbines, cavitation, selection of type of turbine.

UNIT VI:

Centrifugal Pumps: Classification, working, Work done and efficiency, loss of head; specific speed, minimum starting speed and characteristic curves for centrifugal pumps. Pumps in series and parallel, NPSH. **Reciprocating Pumps:** Working, Discharge, slip, indicator diagrams, Characteristic curves.

TEXT BOOKS:

1. Hydraulics, fluid mechanics and Hydraulic machinery MODI and SETH.
2. Fluid Mechanics and Hydraulic Machines by R. K. Rajput.
3. Fluid Mechanics and Hydraulic Machines by R.K. Bansal

REFERENCES:

1. Fluid Mechanics and Fluid Power Engineering by D.S. Kumar, Kotaria & Sons.
2. Fluid Mechanics and Machinery by D. Rama Durgaiah, New Age International.
3. Hydraulic Machines by Banga & Sharma, Khanna Publishers.
4. Instrumentation for Engineering Measurements by James W. Dally, William E. Riley, John Wiley & Sons Inc. (Chapter 12 - Fluid Flow Measurements).

B.Tech II Year I Sem **ELECTRICAL CIRCUITS -II** **T** **C**
4+1* **4**

UNIT - I Single Phase A.C Circuits-I :

R.M.S and Average values and form factor for different periodic wave forms, Steady state analysis of R, L and C (in series, parallel and series parallel combinations) with sinusoidal excitation - Concept of Reactance, Impedance, Susceptance and Admittance - Phase and Phase difference - concept of power factor, Real and Reactive powers - J-notation, Complex and Polar forms of representation.

UNIT – II Single Phase A.C Circuits-II

Complex power - Locus diagrams - series R-L, R-C, R-L-C and parallel combination with variation of various parameters - Resonance - series, parallel circuits, concept of band width and Q factor.

UNIT - III Three Phase Circuits :

Three phase circuits: Phase sequence - Star and delta connection - Relation between line and phase voltages and currents in balanced systems - Analysis of balanced and Unbalanced 3 phase circuits - Measurement of active and reactive power.

UNIT – IV Network theorems

For AC excitation: Duality & Dual networks. Tellegen's, Superposition, Reciprocity, Thevenin's, Norton's, MaximumPowerTransfer, Millman's and Compensation theorems for d.c. and a.c. excitations.

UNIT - V Transient Analysis :

Transient response of R-L, R-C, R-L-C circuits (Series and Parallel combinations) for d.c. and sinusoidal excitations - Initial conditions – Classical method and laplace transforms methods of solutions.

UNIT – VI Network parameters

Two port network parameters - Z, Y, ABCD and hybrid parameters and their relations -concept of transformed network - 2-port network parameters using transformed variables.

TEXT BOOKS :

1. Engineering circuit analysis - by William Hayt and Jack E. Kemmerly, Mc Graw Hill Company, 6th edition.
2.Network Theory : N.C. Jagan & C.Lakshminarayana, B.S Publications . REFERENCES :
1. Network Analysis by Vanvalkenburg, PHI.
2. Linear circuit analysis (time domain phasor ,and Laplace transform approaches). Second edition by RAYMOND A.DeCARLO and PEN-MIN-LIN, Oxford University Press. Second edition 2004.
3. "Circuits" by Carlson, Thomson Publishers.
4. Network Analysis: - C.K. Mithal, Khanna Publishers.
5. Electric Circuits by A. Chakrabarthy, Dhanipat Rai & Sons.
6. Electric Circuit theory by K. Rajeswaran, Pearson Education,2004.

B.Tech II Year I Sem **MANAGERIAL ECONOMICS & FINANCIAL ANALYSIS** **T** **C**
4+1* **4**

UNIT I

Introduction to Managerial Economics: Definition, Nature and Scope of Managerial Economics–Demand Analysis: Demand determinants, Law of Demand and its exceptions.

UNIT II

Elasticity of Demand: Definition, Types, Measurement and Significance of Elasticity of Demand. Demand Forecasting, Factors governing demand forecasting, methods of demand forecasting (survey methods, statistical methods, expert opinion method, test marketing, controlled experiments, judgmental approach to demand forecasting)

UNIT III

Business & New Economic Environment: Characteristic features of Business, Features and evaluation of Sole Proprietorship, Partnership, Joint Stock Company, Public Enterprises and their types, Changing Business Environment in Post-liberalization scenario.

UNIT IV

Capital and Capital Budgeting: Capital and its significance, Types of Capital, Estimation of Fixed and Working capital requirements, Methods and sources of raising finance.

Nature and scope of capital budgeting, features of capital budgeting proposals, Methods of Capital Budgeting: Payback Method, Accounting Rate of Return (ARR) and Net Present Value Method (simple problems)

UNIT V

Introduction to Financial Accounting: Double-Entry Book Keeping, Journal, Ledger, Trial Balance- Final Accounts (Trading Account, Profit and Loss Account and Balance Sheet with simple adjustments).

UNIT VI

Financial Analysis through ratios: Computation, Analysis and Interpretation of Liquidity Ratios (Current Ratio and quick ratio), Activity Ratios (Inventory turnover ratio and Debtor Turnover ratio), Capital structure Ratios (Debt- Equity ratio, Interest Coverage ratio), and Profitability ratios (Gross Profit Ratio, Net Profit ratio, Operating Ratio, P/E Ratio and EPS).

TEXT BOOKS:

1. Aryasri: Managerial Economics and Financial Analysis, 2/e, TMH, 2005.
2. Varshney & Maheswari: Managerial Economics, Sultan Chand, 2003.

REFERENCES:

1. Ambrish Gupta, Financial Accounting for Management, Pearson Education, New Delhi.
2. H. Craig Peterson & W. Cris Lewis, Managerial Economics, PHI, 4th Ed.
3. Suma Damodaran, Managerial Economics, Oxford University Press.
4. Lipsey & Chrystel, Economics, Oxford University Press.
5. S. A. Siddiqui & A. S. Siddiqui, Managerial Economics & Financial Analysis, New age International Space Publications.
6. Domnick Salvatore: Managerial Economics In a Global Economy, 4th Edition, Thomson.
7. Narayanaswamy: Financial Accounting—A Managerial Perspective, PHI.
8. Raghunatha Reddy & Narasimhachary: Managerial Economics& Financial Analysis, Scitech.
9. S.N.Maheswari & S.K. Maheswari, Financial Accounting, Vikas.
10. Truet and Truet: Managerial Economics:Analysis, Problems and Cases, Wiley.Dwivedi:ManagerialEconomics, 6th Ed., Vikas

B.Tech II Year I Sem PRINCIPLES OF ELECTRICAL ENGINEERING (CBCC) T C
(For non EEE Students) 4+1* 4

UNIT – I Introduction to Electrical Engineering : Essence of electricity, Conductors, semiconductors and insulators (elementary treatment only); Electric field; electric current, potential and potential difference, electromotive force, electric power, ohm's law, basic circuit components, electromagnetism related laws, Kirchhoff's laws. Simple problems.

UNIT-II Network Analysis : Basic definitions, types of elements , types of sources, resistive networks, inductive networks, capacitive networks, series parallel circuits, star delta and delta star transformation , Network theorems- Superposition , Thevenins's, Maximum power transfer theorems and simple problems.

UNIT-III Alternating Quantities : Principle of ac voltages , waveforms and basic definitions, relationship between frequency, speed and number of poles, root mean square and average values of alternating currents and voltage, form factor and peak factor, phasor representation of alternating quantities, the J operator and phasor algebra, analysis of ac circuits with single basic network element, single phase series circuits, single phase parallel circuits, single phase series parallel circuits, power in ac circuits.

UNIT-IV Direct current machines : Principle of operation of dc machines, armature windings, e.m.f equation in a dc machine, Torque production in a dc machine, Operation of a dc machine as a generator, operation of a dc machine as a motor.

UNIT-V A.C Machines : Transformers : Principles of operation, Constructional Details, Ideal Transformer and Practical Transformer, Losses, Transformer Test, Efficiency and Regulation Calculations (All the above topics are only elementary treatment and simple problems). Three phase induction motor, principle of operation, slip and rotor frequency, torque (simple problems). Synchronous Machines: Principle of operation, EMF equation (Simple problems on EMF). Synchronous motor principle and operation (Elementary treatment only)

UNIT VI Basic Instruments : Introduction, classification of instruments, operating principles, essential features of measuring instruments, Moving coil permanent magnet (PMMC) instruments, Moving Iron of Ammeters and Voltmeters (elementary Treatment only)

Text Books:

1. Basic Electrical Engineering - By M.S.Naidu and S. Kamakshiah – TMH.
2. Basic Electrical Engineering –By T.K.Nagasarkar and M.S. Sukhija Oxford University Press.

References:

1. Theory and Problems of Basic Electrical Engineering by D.P.Kothari & I.J. Nagrath PHI.
2. Principles of Electrical Engineering by V.K Mehta, S.Chand Publications.
3. Essentials of Electrical and Computer Engineering by David V. Kerns, JR. J. David Irwin Pearson.

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B.Tech II Year I Sem **ELECTRICAL ENGINEERING MATERIALS (CBCC)** **T** **C**
(For non EEE Students) **4+1*** **4**

UNIT I: Conductors

Classification: High conductivity, high resistivity materials, fundamental requirements of high conductivity materials and high resistivity materials, mobility of electron in metals, commonly used high conducting materials, copper, aluminum, bronze brass, properties, characteristics, constantan, platinum, nichrome, properties, characteristics and applications, materials used for contacts.

UNIT II: Semi-Conductors

General concepts, energy bands, types of semiconductors, Fermi Dirac distribution, intrinsic Semi-conductors, extrinsic Semi-conductors, hall effect, drift, mobility, diffusion in Semiconductors,
Semi-conductors and their applications, superconductors.

UNIT IIi: Insulators

solid electrical insulating materials, fibrous, paper boards, yarns, cloth tapes, sleeving wood, impregnation, plastics, filling and bounding materials, fibrous, film, mica, rubber, mica based materials, ceramic materials, classification of insulation (solid) and application in AC and DC machines.

UNIT IV: Dielectrics

Properties of gaseous, liquid and solid dielectric, dielectric as a field medium, electric conduction in gaseous, liquid and solid dielectric, breakdown in dielectric materials, mechanical and electrical properties of dielectric materials, effect of temperature on dielectric materials, polarization, loss angle and dielectric loss, petroleum based insulating oils, transformer oil, capacitor oils, properties.

UNIT V: Magnetic Materials

Soft and hard magnetic materials, diamagnetic, paramagnetic and ferromagnetic materials, electric steel, sheet steel, cold rolled grain oriented silicon steel, hot rolled grain oriented silicon steel, hot rolled silicon steel sheet, hystersis loop, hystersis loss, magnetic susceptibility, coercive force, curie temperature, magneto-striction.

UNIT VI: Optical Properties of Solids

Photo emission, photo emission materials, electro luminescence junction diode, photo emitters, photo transistor, photo resistors, injunction lasers, optical properties of semiconductors, application of photo sensitive materials (CRT, Tube light, photo panels etc.).

Text Books:

1. “Electrical Engineering Materials”,Dekker,PHI Pbs.
2. “Electrical Engineering Materials”, Indulkar,S.Chand

Reference Books:

1. “Electrical Engineering Materials”, Tareev
2. “Electrical Engineering Materials”, Yu. Koritsky.
3. “Electrical Engineering Materials”, R.K.Rajput, Laxmi Pbs.

B.Tech II Year I Sem ELECTRICAL MEASURING INSTRUMENTS (CBCC) T C
(For non EEE Students) 4+1* 4

UNIT-I MEASURING INSTRUMENTS

Classification – deflecting, control and damping torques – Ammeters and Voltmeters – PMMC, Dynamometer, moving iron type instruments – expression for the deflecting torque and control torque – Errors and compensations, extension of range using shunts and series resistance.

CT and PT – Ratio and phase angle errors – design considerations. Types of P.F. Meters – dynamometer and moving iron type – 1-ph and 3-ph meters.

UNIT –II MEASUREMENT OF POWER

Single phase dynamometer wattmeter, LPF and UPF, Double element and three element dynamometer wattmeter, expression for deflecting and control torques.

UNIT –III MEASUREMENT OF ENERGY

Single phase induction type energy meter – driving and braking torques – errors and compensations. Three phase energy meter.

UNIT –IV POTENTIOMETERS

Principle and operation of D.C. Crompton's potentiometer – standardization – Measurement of unknown resistance, current, voltage. A.C. Potentiometers: polar and coordinate types standardization – applications.

UNIT – V D.C & A.C BRIDGES

Method of measuring low, medium and high resistance – sensitivity of Wheatstone's bridge – Kelvin's double bridge for measuring low resistance, measurement of high resistance – loss of charge method. Measurement of inductance - Maxwell's bridge, Anderson's bridge. Measurement of capacitance and loss angle - Desauty bridge. Wien's bridge – Schering Bridge.

UNIT – VI MAGNETIC MEASUREMENTS

Ballistic galvanometer – equation of motion – flux meter – constructional details, comparison with ballistic galvanometer. Determination of B-H Loop methods of reversals - six point method – A.C. testing – Iron loss of bar samples.

TEXT BOOK:

1. Electrical Measurements and measuring Instruments – by E.W. Golding and F.C. Widdis, 5th Edition, Reem Publications.
2. Electrical & Electronic Measurement & Instruments by A.K.Sawhney Dhanpat Rai & Co. Publications.
3. Electrical & Electronic Measurement & Instrumentation by R. K. Rajput, 2nd Edition, S. Chand & Co.
4. Electronic Instrumentation by H. S. Kalsi, Tata Grawhill Mc, 3rd Edition.

REFERENCE BOOKS:

1. Electrical Measurements – by Buckingham and Price, Prentice – Hall
2. Electrical Measurements: Fundamentals, Concepts, Applications – by Reissland, M.U, New Age International (P) Limited, Publishers

B.Tech II Year II Semester Course Structure

S.No.	Abbreviation	Subject	Periods / Week			Credits
			L	T	P	
1.		Electromagnetic Fields	4	1	-	4
2.		Generation of Electric Power	4	1	-	4
3.		Electrical Machines - II	4	1	-	4
4.		Switching theory and Logic design	4	1	-	4
5.		Analog Electronic Circuits	4	1	-	4
6.		Control Systems	4	1	-	4
7.		Electrical Machines Lab-I	-	-	3	2
8.		Analog Electronics Circuits Lab	-	-	3	2
9.		Comprehensive Online Examination				2
		TOTAL	24	6	6	30

L – Lecture, T – Tutorial, P – Practical

UNIT-I

Electrostatics-I: Coulomb's law and electrical field intensity: Coulomb's law, Field due to different charge distributions. Electric flux density, Gauss's law and divergence: Concept of electric flux density, Gauss's law and its applications, Maxwell's first eqn. and divergence theorem for electric flux density. Electrical potential & Dipole: Energy expanded in moving a point charge in electrical field, Line integral,Definition of potential difference and potential, Potential field of a point charge and system of charges,Potential gradient, Electric Dipole, potential and EFI due to an electric dipole, Torque on an Electric dipole in an electric field.

UNIT-II

Electrostatics-II: Conductors, dielectrics and capacitance: Definition of currents and current density, Continuity equation, Behavior of conductors inside an electric field, Dielectric materials, Characteristics, Dielectric polarization, Boundary conditions, Energy density in electrostatic field, Capacitance of a parallel plate capacitor, Coaxial cable and spherical capacitors. Poisson's and Laplace equation, Examples of solution of Laplace and Poisson's equations

UNIT-III

Magneto statics: Biot-savart Law and its applications: Magnetic field intensity - Biot-savart Law-Magnetic field due to straight conductors, circular loop and solenoid current Carrying wire -Magnetic flux density (B) - B in free space, Maxwell's second Equation.

Ampere's circuital law and its 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, Maxwell's third equation, Curl (H)=Jc, Field due to a circular loop, rectangular and square loops.

UNIT-IV

Magnetic forces: Lorentz Law of force ,Force on a moving charge, Force on a differential current element, Force on a straight and a long current carrying conductor in a magnetic field, Force between two straight long and parallel current carrying conductors ,Force and torque on a close circuit.

UNIT-V

Magnetic potential and inductance: Scalar Magnetic potential and its limitations, vector magnetic potential and its properties, vector magnetic potential due to simple configurations, vector Poisson's equations.Self and Mutual inductance, Neuman's formulae, Determination of self-inductance of a solenoid and toroid and mutual inductance between a straight long wire and a square loop wire in the same plane,energy stored and density in a magnetic field.

UNIT-VI

Electro Dynamic Fields: Faraday's laws and its integral and point forms, induced emf - Transformer and motional EMF -Maxwell's equations (differential and integral forms) - Displacement current - Relation between field theory and circuit theory - Modification of Maxwell's equations for time varying fields, Poynting Theorem and Poynting vector.

Text Books:

1. " Electromagnetic Fields"- Sadiku, Oxford Publications
2. Engineering Electromagnetics- William H.Hayt & John.A.Buck Mc.Graw-Hill Companies 7th edition - 2006

References:

1. Schaums Outline of Theory and Problems of Electromagnetics- EDMINISTER JOSEPH. A

B.Tech II Year II Sem **GENERATION OF ELECTRIC POWER** **T** **C**
4+1* **4**

UNIT-1
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.

UNIT II
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.

UNIT III
Hydropower Stations: Introduction - Applications- Advantages and Disadvantages, Selection of Site, Essential features of Hydroelectric power stations, Classifications, Hydraulic Turbines, Plant Layout.

UNIT IV
Diesel Engine Power Plant- Advantages and Disadvantages, Applications of Diesel power plant, Site Selection, Essential Components of a Diesel power plant, Operation of Diesel Power plant, layout of Diesel Power Plant. Gas Power Plant: Introduction, Simple Gas Turbine Plant, Advantages, Types of Plants, Components of Gas Turbine Plant, Layout.

UNIT V
Economic Aspects of Power Generation Load curve, load duration and integrated load duration curves-load, demand, diversity, capacity, utilization and plant use factors- Numerical Problems. Costs of Generation and their division into Fixed, Semi-fixed and Running Costs.

UNIT VI
Tariff Methods 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 by M.L.Soni, P.V.Gupta, U.S.Bhatnagar and A.Chakraborti, Dhanpat Rai & Co. Pvt. Ltd., 1999.
2. Principles of Power Systems by V.K Mehta and Rohit Mehta S.CHAND& COMPANY LTD., New Delhi 2004.
3. Power System Engineering by R. K. Rajput, Laxmi Publisher. **REFERENCE BOOKS**
1. Elements of Power Station design and practice by M.V. Deshpande, Wheeler Publishing.
2. Electrical Power Generation, Transmission and Distribution by S.N.Singh., PHI, 2003.
3. Non conventional energy sources by GD Rai

B.Tech II Year II Sem **ELECTRICAL MACHINES – II** **T** **C**
4+1* **4**

UNIT-I
TRANSFORMERS: General aspects - basic definitions - working principle - rating – types of transformers- construction - types windings, - transformer cooling - ideal transformer - e.m.f. equation - transformation ratio - operation on no-load, load - resistance and magnetic leakage - equivalent resistance and reactance - voltage drop in a transformer - regulation.

UNIT-II
TESTING OF TRANSFORMERS: Transformer tests - O.C and S.C tests - Sumpner's or Back to Back test Transformer losses, efficiency - All-day efficiency - Auto transformers - polarity of transformers - parallel operation of transformers.

UNIT -III
POLY PHASE TRANSFORMERS: Polyphase transformers - Polyphase connections - Y/Y, Y/Δ, Δ/Y, Δ/Δ and open Δ,- three winding transformers-tertiary windings- off load and on load tap changing; Scott connection.

UNIT - IV
POLY PHASE INDUCTION MOTORS: Poly phase induction motors-construction details of cage and wound rotor machines-production of a rotating magnetic field - principle of operation –Slip, rotor speed, rotor emf and rotor frequency - rotor reactance, rotor current and pf at standstill and during operation.

UNIT-V
CHARACTERISTICS AND TESTING OF INDUCTION MOTORS: Rotor power input, rotor copper loss and mechanical power developed and their inter relation-torque equation- expressions for starting torque, running torque and maximum torque - torque slip characteristic - crawling and cogging -double cage and deep bar rotors. Load test - Circle diagram-no load and blocked rotor tests-simple problems

UNIT-VI
SPEED CONTROL OF INDUCTION MOTOR- : Speed control-change of frequency - change of poles and methods of consequent poles- cascade connection-injection of an emf into rotor circuit - induction generator-principle of operation.

TEXT BOOKS:
1. Theory and Performance of Electrical machines- J.B.Gupta
2. Electrical Machinery by P.S.Bimbhra, Khanna Publishers
REFERENCE BOOKS:
1. Electric machinery - A.E. Fitzgerald, C.Kingsley and S.Umans, Mc Graw Hill Companies, 5th edition
2. Generalized theory of Electrical Machines by P.S.Bimbra
3. Electric Machines -by I.J.Nagrath & D.P.Kothari,Tata Mc Graw Hill, 7th Edition 2005.
4. Electrical Machines, 2nd edition - by Ashfaq Hussain

UNIT I NUMBER SYSTEMS & CODES

Philosophy of number systems - complement representation of negative numbers-binary arithmetic-binary codes-error detecting & error correcting codes -hamming codes

UNIT II BOOLEAN ALGEBRA & SWITCHING FUNCTIONS

Fundamental postulates of Boolean Algebra-Basic theorems and properties - switching functions-Canonical and Standard forms-Algebraic simplification digital logic gates, properties of XOR gates -universal gates-Multilevel NAND/NOR realizations.Map method, Prime implicants, Don't care combinations, Minimal SOP and POS forms, Tabular Method, Prime- Implicant chart.

UNIT III COMBINATIONAL LOGIC DESIGN

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

UNIT IV PROGRAMMABLE LOGIC DEVICES, THRESHOLD LOGIC

Basic PLD's-ROM, PROM, PLA, PLD Realization of Switching functions using PLD's. Capabilities and limitations of Threshold gate, Synthesis of Threshold functions, Multigate Synthesis.

UNIT V SEQUENTIAL CIRCUITS

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

UNIT VI ALGOROTHIMIC STATE MACHINES

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

TEXTBOOKS:

1. Switching & Finite Automata theory - Zvi Kohavi, TMH,2nd Edition.
2. Digital Design - Morris Mano, PHI, 3rd Edition, 2006.

REFERENCES:

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

UNIT-I

BJT AND FET AMPLIFIERS: Small signal low frequency transistor amplifier circuits, h-parameter representation of a transistor, Analysis of single stage transistor amplifier (CE, CB, and CC) using h-parameters: voltage gain, current gain, Input impedance and Output impedance. Comparison of transistor configurations in terms of AI , Ri , Av , Ro, Small signal model of JFET, Analysis of single stage FET amplifier (CS, CG, and CD) using h-parameters

UNIT- II

LARGE SIGNAL AMPLIFIERS: Class-A Power Amplifier, Maximum value of efficiency of Class-A Amplifier, Transformer coupled Amplifier - Push Pull Amplifier - Complimentary Symmetry Circuits (transformer less Class B power Amplifier) - Phase Inverters, Transistor Power Dissipation, Thermal Runaway, Heat sinks

UNIT- III

FEEDBACK AMPLIFIERS: Concept of feedback, Classification of feedback amplifiers, Generalcharacteristics of negative feedback amplifiers, Effect of Feedback on input and output characteristics, Voltage series, voltage shunt, current series, and current shunt feedback amplifiers-simple problems

UNIT IV

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

UNIT V

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

UNIT VI

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

TEXT BOOKS

1. Electronic Devices and Circuits - R.L. Boylestad and Louis Nashelsky, Pearson/Prentice Hall,9th Edition, 2006.
2. Solid State Pulse circuits - David A. Bell, PHI, 4th Edn.., 2002 .

REFERENCES

1. Electronic Devices and Circuits - J.Millman, C.C.Halkias, and Satyabratha Jit Tata McGraw Hill, 2nd Ed., 2007
2. Pulse, Digital and Switching Waveforms - J. Millman and H. Taub, McGraw-Hill, 1991

B.Tech II Year II Sem **CONTROL SYSTEMS** **T C**
4+1* 4

UNIT – I INTRODUCTION AND TRANSFER FUNCTION REPRESENTATION

Concepts of Control Systems- Open Loop and closed loop control systems and their differences- Different examples of control systems- Classification of control systems, Feed-Back Characteristics, Effects of feedback. Mathematical models – Differential equations, Impulse Response and transfer functions - Translational and Rotational mechanical systems . 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-II- TIME RESPONSE ANALYSIS

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

UNIT – III STABILITY ANALYSIS IN S-DOMAIN

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

UNIT – 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.

UNIT – V STABILITY ANALYSIS IN FREQUENCY DOMAIN AND DESIGN TECHNIQUES

Polar Plots-Nyquist Plots-Stability Analysis. Compensation techniques – Lag, Lead, Lead-Lag Controllers design in frequency Domain, PID Controllers.

UNIT – VI State Space Analysis of Continuous Systems

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

TEXT BOOKS:

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

REFERENCE BOOKS:

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

B.Tech III Year I Semester Course Structure

S.No.	Abbreviation	Subject	Periods / Week			Credits
			L	T	P	
1.		Transmission of electric power	4	1	-	4
2.		Basic Power electronics	4	1	-	4
3.		Electrical machines-III	4	1	-	4
4.		Environmental Science	4	1	-	4
5.		Electrical and Electronic Measurements	4	1	-	4
6.		Linear and Digital IC Applications	4	1	-	4
7.		Electrical Machines Lab - II	-	-	3	2
8.		Control Systems and Simulation Lab	-	-	3	2
9.		Advanced Communication Skills Practice			3	
		TOTAL	24	6	9	28

L – Lecture, T – Tutorial, P – Practical

B.Tech III Year I Sem **TRANSMISSION OF ELECTRIC POWER** **T C**
4+1* 4

UNIT-I TRANSMISSION LINE PARAMETERS
Types of conductors - calculation of resistance for solid conductors - Calculation of inductance for single phase and three phase, 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, Numerical Problems.

UNIT-II PERFORMANCE TRANSMISSION LINES
Classification of Transmission Lines - Short, medium and long line and their model - representations - Nominal-T, Nominal-Pie and A, B, C, D Constants. 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– Equivalent T and Equivalent – π – surge Impedance and surge Impedance loading - wavelengths and Velocity of propagation – Ferranti effect , Charging current.

UNIT – III POWER SYSTEM TRANSIENTS
Types of System Transients - Travelling or Propagation of Surges - Attenuation, Distortion, 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: CORONA
Corona - Description of the phenomenon, factors affecting corona, critical voltages and power loss, Radio Interference.

UNIT-V: OVERHEAD LINE INSULATORS SAG AND TENSION CALCULATIONS
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-VI: 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. A Text Book on Power System Engineering by M.L.Soni, P.V.Gupta, U.S.Bhatnagar, A.Chakrabarthy, Dhanpat Rai & Co Pvt. Ltd.
2. Electrical power systems - by C.L.Wadhwa, New Age International (P) Limited, Publishers,1998.
3. Power System Engineering by R. K. Rajput, Laxmi Publications, 1st Edition.

REFERENCE BOOKS:

1. Power system Analysis-by John J Grainger, William D Stevenson, TMC Companies, 4th edition
2. Power System Analysis and Design by B.R.Gupta, S. Chand & Co, 6th Revised Edition, 2010.
3. Modern Power System Analysis by I.J.Nagarath and D.P.Kothari, Tata McGraw Hill, 2nd Edition.
4. Electric Power Transmission System Engineering: Analysis and Design, by Turan Gonen, 2nd Edition, CRC Press.
5. Electric Power Systems by S. A. Nasar, Schaum's Outline Series, Revised 1st Edition, TMH

B.Tech III Year I Sem **BASIC POWER ELECTRONICS** **T C**
4+1* 2

UNIT – I POWER SEMI CONDUCTOR DEVICES

Thyristors – Silicon Controlled Rectifiers (SCR's) – BJT – Power MOSFET – Power IGBT and their characteristics and other thyristors – Basic theory of operation of SCR – Static characteristics – Turn on methods- Dynamic characteristics of SCR - Turn on and Turn off times -Salient points.Two transistor analogy – SCR – R and RC Triggering - UJT firing circuit —– Series and parallel connections of SCR's – Snubber circuit details – Specifications of SCR's, BJT, IGBT - Numerical problems.

UNIT – II SINGLE PHASE CONTROLLED CONVERTERS

Phase control technique – Single phase Line commutated converters – Mid point and Bridge connections – Half controlled converters with Resistive, RL loads and RLE load– Derivation of average load voltage and current - Active and Reactive power inputs to the converters without and with Free wheeling Diode –Numerical problems

Fully controlled converters, Mid point and Bridge connections with Resistive, RL loads - Derivation of average load voltage and current – Line commutated inverters -Active and Reactive power inputs to the converters without and with Free wheeling Diode, Effect of source inductance – Derivation of load voltage and current – Numerical problems.

UNIT – III THREE PHASE LINE COMMUTATED CONVERTERS

Three phase converters – Three pulse and six pulse converters – Mid point 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.

UNIT – IV AC VOLTAGE CONTROLLERS & CYCLO CONVERTERS

AC voltage controllers – Single phase two SCR's in anti parallel – With R and RL loads – modes of operation of Triac –Firing circuits -Numerical problems -Cyclo converters – Single phase mid point cyclo converters with Resistive and inductive load (Principle of operation only) – Bridge configuration of single phase cyclo converter (Principle of operation only) – Waveforms

UNIT – V 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. Morgan chopper-Jones chopper(Principle of operation only) wave forms, Problems.

UNIT – VI INVERTERS

Inverters – Single phase inverter – Basic series inverter – Basic parallel Capacitor inverter bridge inverter – Waveforms – Simple forced commutation circuits for bridge inverters Voltage control techniques for inverters Pulse width modulation techniques – Numerical problems.

TEXT BOOKS :

1. Power Electronics – by M. D. Singh & K. B. Kanchandhani, Tata Mc Graw – Hill Publishing company, 1998.
2. Power Electronics : Circuits, Devices and Applications – by M. H. Rashid, Prentice Hall of India, 2nd edition, 1998.
3. Power Electronics - by V.R.Murthy , OXFORD University Press, 1st edition -2005.
4. Power Electronics-by P.C.Sen,Tata Mc Graw-Hill Publishing.

REFERENCE BOOKS :

1. Power Electronics – by Vedam Subramanyam, New Age International (P) Limited, 3rd Edition.
2. Thyristorised Power Controllers – by G. K. Dubey, S. R. Doradla, A. Joshi and R. M. K. Sinha, New Age International (P) Limited Publishers, 1996.
3. Principles of Power Electronics by John G. Kassakian, Martin F. Schlecht and George C. Verghese, Pearson.
4. Power Electronics - Essentials & Applications by L. Umanand, Wiley India Pvt. Ltd

UNIT – I CONSTRUCTION AND CHARACTERISTICS OF SYNCHRONOUS GENERATOR

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.– armature reaction - leakage reactance – synchronous reactance and impedance – experimental determination - phasor diagram – load characteristics.

UNIT – II REGULATION OF SYNCHRONOUS GENERATOR

Regulation by synchronous impedance method, M.M.F. method, Z.P.F. method and A.S.A. methods – salient pole alternators – two reaction analysis – experimental determination of X_d and X_q (Slip test) Phasor diagrams – Regulation of salient pole alternators.

UNIT – III PARALLEL OPERATION OF SYNCHRONOUS GENERATORS

Synchronizing alternators with infinite bus bars – synchronizing power torque – parallel operation and load sharing - Effect of change of excitation and mechanical power input. Analysis of short circuit current wave form – determination of sub-transient, transient and steady state reactances.

UNIT – IV SYNCHRONOUS MOTORS Theory of operation – phasor diagram – Variation of current and power factor with excitation – V and Inverted V Curves - Power developed – Synchronous Condenser.
Excitation and power circles – hunting and its suppression – Methods of starting – synchronous induction motor.

UNIT – V SINGLE PHASE MOTORS

Single phase induction motor – Constructional features - Double revolving field theory – Elementary idea of cross-field theory – split-phase motors – shaded pole motor.

UNIT – VI SPECIAL MOTORS

Principle & performance of A.C. Series motor-Universal motor – Principle of permanent magnet and reluctance motors.

TEXT BOOKS

1. Electric Machines – by I.J.Nagrath & D.P.Kothari, Tata Mc Graw-Hill Publishers, 4th Edition, 2010.
2. Electrical Machines – by P.S. Bimbra, Khanna Publishers.

REFERENCE BOOKS:

1. The Performance and Design of A.C.Machines – by M.G.Say, ELBS and Ptiman & Sons.
2. Electric Machinery – by A.E. Fitzgerald, C.Kingsley and S.Umans, Mc Graw-Hill Companies, 5th edition, 1990.
3. Theory of Alternating Current Machinery by Langsdorf, Tata Mc Graw-Hill, 2nd edition.
4. Electromachanics-III (Synchronous and single phase machines), S.Kamakashiah, Overseas publishers Pvt Ltd.
   Electric Machines - by M. S. Sarma and M. K. Pathak, CENGAGE Learning

UNIT-I

Introduction of Environmental Studies-Natural Resources: Definition, The Global environment and its segments; Structure and composition of atmosphere, hydrosphere, lithosphere and biosphere Scope and Importance of Environmental Studies – Need for Public Awareness. Renewable and non-renewable resources – Natural resources and associated problems – Forest resources: Introduction –deforestation, case studies –Timber extraction – Mining, dams and other effects on forest and tribal people – Water resources :Introduction–Floods, drought, conflicts over water, dams – benefits and problems – Mineral resources: Introduction,environmental effects of extracting and using mineral resources, case studies. Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies. - Land resources: Land as a resource, land degradation, man induced landslides, soil erosion and desertification.

UNIT – II

Ecosystems: Concept of an ecosystem. - Structure and function of an ecosystem. - Producers, consumers and decomposers. - Energy flow in the ecosystem - Ecological succession. - Food chains, food webs and ecological pyramids. - Introduction, types, characteristic features, structure and function of the following ecosystem: 1. Forest ecosystem. 2. Grassland ecosystem. 3. Desert ecosystem. 4. Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries)

UNIT – III

Biodiversity and its conservation: Introduction - Definition: genetic, species and ecosystem diversity. – Biogeographical classification of India - Value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values - . Biodiversity at global, National and local levels. - . India as a mega diversity nation - Hot-sports of biodiversity - Threats to biodiversity: habitat loss, poaching of wildlife, man wildlife conflicts. - Endangered and endemic species of India - Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity.

UNIT – IV

Environmental Pollution: Definition, Cause, effects and control measures of :1. Air pollution. 2. Water pollution 3. Soil pollution 4.Marine pollution 5. Noise pollution 6.Thermal pollution 7 Nuclear hazards Solid waste Management: Causes, effects and control measures of urban and industrial wastes. - Role of an individual in prevention of pollution. - Pollution case studies. - Disaster management: floods, earthquake, cyclone and landslides.

UNIT–V

Social Issues and the Environment: From Unsustainable to Sustainable development -Urban problems related to energy -Water conservation, rain water harvesting, and watershed management –Resettlement and rehabilitation of people; its problems and concerns. Case Studies -Environmental ethics: Issues and possible solutions. -Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust.Case Studies. -Wasteland reclamation. –Consumerism and waste products. –Environment Protection Act. –Air (Prevention and Control of Pollution) Act. -Water (Prevention and control of Pollution) Act -Wildlife Protection Act -Forest Conservation Act -Issues involved in enforcement of environmental legislation. -Public awareness.

UNIT–VI

Human Population and the Environment: Population growth, variation among nations. Population explosion - Family Welfare Programme. -Environment and human health. -Human Rights. -Value Education. -HIV/AIDS. ,Infectiousdeseases,-Tuber colossi,cancer,Water Borne Deseases-Malaria,Diheria -Women and Child Welfare. - Role of information Technology in Environment and human health. -Case Studies.

TEXT BOOKS:

1. Textbook of Environmental Studies for Undergraduate Courses by ErachBharucha for University Grants commission.
2. Environmental Studies by R. Rajagopalan, Oxford University Press.
3. A Basic Course in environmental Studies by S.Deswal and A.Deswal ,DhanpatRai& Co

B.Tech III Year I Sem ELECTRICAL AND ELECTRONIC MEASUREMENTS T C
4+1* 4

UNIT-I MEASURING INSTRUMENTS

Classification – deflecting, control and damping torques – Ammeters and Voltmeters – PMMC, Dynamometer, moving iron type instruments – expression for the deflecting torque and control torque – Errors and compensations, extension of range using shunts and series resistance. CT and PT – Ratio and phase angle errors – design considerations. Types of P.F. Meters – dynamometer and moving iron type – 1-ph and 3-ph meters.

UNIT –II MEASUREMENT OF POWER / ENERGY

Single phase dynamometer wattmeter, LPF and UPF, Double element and three element dynamometer wattmeter, expression for deflecting and control torques. Single phase induction type energy meter – driving and braking torques – errors and compensations. Three phase energy meter.

UNIT –III V POTENTIOMETERS

Principle and operation of D.C. Crompton's potentiometer – standardization – Measurement of unknown resistance, current, voltage. A.C. Potentiometers: polar and coordinate types standardization – applications.

UNIT – IV D.C & A.C BRIDGES

Method of measuring low, medium and high resistance – sensitivity of Wheatstone's bridge – Kelvin's double bridge for measuring low resistance, measurement of high resistance – loss of charge method. Measurement of inductance - Maxwell's bridge, Anderson's bridge. Measurement of capacitance and loss angle - Desauty bridge. Wien's bridge – Schering Bridge.

UNIT – V MAGNETIC MEASUREMENTS

Ballistic galvanometer – equation of motion – flux meter – constructional details, comparison with ballistic galvanometer. Determination of B-H Loop methods of reversals - six point method – A.C. testing – Iron loss of bar samples.

UNIT – VI OSCILLOSCOPE AND DIGITAL METERS

Cathode Ray Oscilloscope- Cathode Ray tube-Time base generator-Horizontal and Vertical amplifiers – application of CRO – Measurement of phase , frequency, current & voltage- Lissajous pattern.Digital Voltmeter-Successive approximation, ramp and integrating type-Digital frequency meter-Digital multimeter-Digital Tachometer

TEXT BOOK:

1. Electrical Measurements and measuring Instruments – by E.W. Golding and F.C. Widdis, 5th Edition, Reem Publications.
2. Electrical & Electronic Measurement & Instruments by A.K.Sawhney Dhanpat Rai & Co. Publications.
3. Electrical & Electronic Measurement & Instrumentation by R. K. Rajput, 2nd Edition, S. Chand & Co.
4. Electronic Instrumentation by H. S. Kalsi, Tata Grawhill Mc, 3rd Edition.

REFERENCE BOOKS:

1. Electrical Measurements – by Buckingham and Price, Prentice – Hall
2. Electrical Measurements: Fundamentals, Concepts, Applications – by Reissland, M.U, New Age International (P) Limited, Publishers

B.Tech III Year I Sem **LINEAR AND DIGITAL IC APPLICATIONS** **T** **C**
4+1* **4**

UNIT I INTEGRATED CIRCUITS
Classification, chip size and circuit complexity, 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.

UNIT II -OP-AMP APPLICATIONS
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, Schmitt trigger, Multivibrators, introduction to voltage regulators, features of 723.

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, sawtooth, square wave and VCO.
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 IV - D-A AND A- D CONVERTERS
Introduction, basic DAC techniques, weighted resistor DAC, R-2R ladder DAC, inverted R-2R DAC, and IC 1408 DAC, Different types of ADCs - parallel comparator type ADC, counter type ADC, successive approximation ADC and dual slope ADC. DAC and ADC specifications.

UNIT V- INTEGRATED CIRCUITS
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 tristate outputs, CMOS transmission gate, IC interfacing- TTL driving CMOS & CMOS driving TTL . Design using TTL-74XX & CMOS 40XX: series, code converters, decoders, Demultiplexers, decoders & drives for LED & LCD display. Encoder, priority Encoder, multiplexers & their applications, priority generators/checker circuits. Digital arithmetic circuits-parallel binary adder/subtractor circuits using 2's, Complement system. Digital comparator circuits.

UNIT VI-SEQUENTIAL CIRCUITS
Flip-flops & their conversions. Design of synchronous counters. Decade counter, shift registers & applications, familiarities with commonly available 74XX & CMOS 40XX series of IC counters.Memories: ROM architecture, types & applications, RAM architecture, Static & Dynamic RAMs, synchronous DRAMs.

TEXT BOOKS

1. Linear Integrated Circuits –D. Roy Chowdhury, New Age International (p) Ltd, 2nd Ed., 2003.
2. Op-Amps & Linear ICs – Ramakanth A. Gayakwad, PHI, 1987.
3. Digital Fundamentals – Floyd and Jain, Pearson Education,8th Edition, 2005.

REFERENCES:

1. Operational Amplifiers and Linear Integrated Circuits – R.F. Coughlin and Fredrick F. Driscoll, PHI, 1977.
2. Operational Amplifiers and Linear Integrated Circuits: Theory and Applications –Denton J. Daibey, TMH. Design with Operational Amplifiers and Analog Integrated Circuits - Sergio Franco, McGraw Hill, 3rd Ed., 2002

B.Tech III Year II Semester Course Structure

S.No.	Abbreviation	Subject	Periods / Week			Credits
			L	T	P	
1.		Management Science	4	1	-	4
2.		Microprocessors and Microcontrollers	4	1	-	4
3.		Power Semiconductor Drives	4	1	-	4
4.		Computer Aided Power system Analysis	4	1	-	4
5.		Switch Gear and Protection	4	1	-	4
6.		**Choice Based Credit Courses: (For Non EEE Students)*** 1. Renewable Energy Sources 2. Power Electronics 3.Signals and Systems	4	1	-	4
7.		Electrical and Electronics Measurements Lab	-	-	3	2
8.		Power Electronics and Simulation Lab	-	-	3	2
9.		Comprehensive Online Examination				2
		TOTAL	24	6	6	30

L – Lecture, T – Tutorial, P – Practical

B.Tech III Year II Sem **MANAGEMENT SCIENCE** **T C**
4+1* 4

UNIT I-INTRODUCTION TO MANAGEMENT:

Concepts of Management and organization- nature, importance and Functions of Management, Taylor's Scientific Management Theory, Fayol's Principles of Management, Mayo's Hawthorne Experiments, Maslow's Theory of Human Needs, Douglas McGregor's Theory X and Theory Y, Herzberg's Two-Factor Theory of Motivation, Systems Approach to Management and contingency approach.

UNIT II-DESIGNING ORGANIZATIONAL STRUCTURES:

Basic concepts related to Organisation - Departmentation and Decentralisation, Types of mechanistic and organic structures of organisation (Line organization, Line and staff organization, functional organization, Committee organization, matrix organization, Virtual Organisation, Cellular Organisation, team structure, boundaryless organization, inverted pyramid structure, lean and flat organization structure) and their merits, demerits and suitability.

UNIT III-OPERATIONS AND PROJECT MANAGEMENT:

Principles and Types of Plant Layout-Methods of production (Job, batch and Mass Production), Work Study - Basic procedure involved in Method Study and Work Measurement- Statistical Quality Control: chart, R chart, *c* chart, *p* chart, (simple Problems), Acceptance Sampling, Deming's contribution to quality.

Project management: Network Analysis, Programme Evaluation and Review Technique (PERT), Critical Path Method (CPM), Identifying critical path, Probability of Completing the project within given time, Project Cost Analysis, Project Crashing. (simple problems).

UNIT IV-MATERIALS MANAGEMENT:

Objectives, Need for Inventory control, EOQ, ABC Analysis, Purchase Procedure, Stores Management and Stores Records.

UNIT V-HUMAN RESOURCES MANAGEMENT (HRM):

Concept of HRM functions of HR Manager: Human resource planning, Recruitment, Selection process, Training and Development Performance Appraisal, Placement, Wage and Salary Administration, Promotion, Transfer, polisis, Grievance Handling and employee Welfare Administration.

UNIT VI-CONTEMPORARY MANAGEMENT PRACTICES:

Basic concepts of MIS, Just-In-Time (JIT) System, Six sigma and Capability Maturity Model (CMM) Levels, Enterprise Resource Planning (ERP), Business Process outsourcing (BPO), Business Process Re-engineering

TEXT BOOKS:

1. Aryasri: Management Science, TMH, 2004.
2. Stoner, Freeman, Gilbert, Management, 6th Ed, Pearson Education, New Delhi, 2004.

REFERENCES:

1. Kotler Philip & Keller Kevin Lane: Marketing Mangement 12/e, PHI, 2005.
2. Koontz & Weihrich: Essentials of Management, 6/e, TMH, 2005.
3. Thomas N.Duening & John M.Ivancevich Management—Principles and Guidelines, Biztantra, 2003.
4. Kanishka Bedi, Production and Operations Management, Oxford University Press, 2004.
5. Memoria & S.V.Gauker, Personnel Management, Himalaya, 25/e, 2005
6. Samuel C.Certo: Modern Management, 9/e, PHI, 2005
7. Schermerhorn, Capling, Poole & Wiesner: Management, Wiley, 2002.
8. Parnell: Strategic Management, Biztantra, 2003.
9. Lawrence R Jauch, R.Gupta &William F.Glueck: Business Policy and Strategic Management, Frank Bros., 2005.
10. L.S.Srinath: PERT/CPM,Affiliated East-West Press, 2005.

B.Tech III Year II Sem MICROPROCESSORS AND MICROCONTROLLERS **T C**
4+1* 4

UNIT-I 8086 ARCHITECTURE

Introduction to 8085 microprocessor, 8086 architecture- Functional Diagram, Register Organization, Memory segmentation, programming model , memory addresses physical memory organization, signal descriptions of 8086- common function signals, Minimum and maximum mode signals, Timing diagrams - interrupts of 8086.

UNIT-II INSTRUCTION SET AND ASSEMBLY LANGUAGE PROGRAMMMING OF 8086

Instruction formats, addressing modes, instruction set, assembler directives, macros, simple programs involving logical, branch instructions - sorting, evaluating arithmetic expressions - string manipulations. I/O INTERFACE**:**8255 PPI, Various modes of operations and interfacing to 8086, interfacing keyboard, display, stepper motor interfacing, A/D, D/A Converter Interfacing.

UNIT-III INTERFACING WITH ADVANCED DEVICES

Memory interfacing to 8086 - interrupt structure of 8086. Vector interrupt table, interrupt service routine, Introduction to DOS and BIOS interrupts, interfacing interrupt controller 8259, DMA controller 8257 to 8086.Serial Communication Standards, serial data transfer schemes - 8251 USART architecture and interfacing RS-232, IEEE -488, prototype and trouble shooting.

UNIT-IV INTRODUCTION TO MICRO CONTROLLERS

Overview of 8051 Micro Controller, Architecture, I/O ports and Memory Organization, Addressing modes and Instruction set of 8051 - Simple Programs.

UNIT-V REAL TIME CONTROL

Interrupts, Timer/Counter and Serial Communication, Programming Timer Interrupts, Programming External hard ware interrupts, Programming the serial communication interrupts, Programming 8051 Timers, Counters.

UNIT- VI AVR RISC MICROCONTROLLER ARCHITECTURE

Introduction, AVR family architecture, Register file, ALU, Memory access and instruction execution I/O memory EEPROM I/O ports, timers, UART, interrupt structure.

TEXT BOOKS:

1. D.V.Hall, "Micro Processor and Interfacing ", Tata McGraw-Hill. 2/e 2006
2. Kenneth J Ayala and Dhananjay V. Gadre, "The 8051 Micro Controller & Embedded Systems", CENGAGE learning, 2010.

REFERENCE BOOKS:

1. Advanced microprocessors and peripherals A.K. Ray and K M Bhurchandani TMH
2. The 8051 Micro controllers architecture and programming and applications K uma rao Andhe pallavi, pearson 2009.
3. Microcomputer Systems: The 8086/8088 Family: Architecture, Programming and Design, 2nd ed., Liu & Gibson PHI
4. "Microcontrollers and applications Ajay V. Deshmukh, Tata McGraw-Hill Companies – 2005

UNIT–I CONTROL OF DC MOTORS BY SINGLE PHASEAND THREE PHASE CONVERTERS

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

UNIT – II FOUR QUADRANT OPERATION OF DC DRIVES

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.

UNIT-III CONTROL OF DC MOTORS BY CHOPPERS

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

UNIT-IV CONTROL OF INDUCTION MOTOR BY STATOR VOLTAGE AND STATOR FREQUENCY

Variable voltage characteristics-Control of Induction Motor by Ac Voltage Controllers – Waveforms – speed torque characteristics. Variable frequency 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 drives (Block Diagram Only)

UNIT –V CONTROL OF INDUCTION MOTOR FROM ROTOR SIDE

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

UNIT – VI 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).

TEXT BOOKS:

1. Fundamentals of Electric Drives – by G K Dubey Narosa Publications
2. Power Electronic Circuits, Devices and applications by M.H.Rashid, PHI.

REFERENCE BOOKS:

1. Power Electronics – MD Singh and K B Khanchandani, Tata McGraw-Hill Publishing company,1998
2. Modern Power Electronics and AC Drives by B.K.Bose, PHI.
3. Thyristor Control of Electric drives – Vedam Subramanyam, Tata McGraw Hill Publilcations.
4. Analysis of Thyristor Power – conditioned motors, S K Pillai, Universities press, 1st Edition..

B.Tech III Year II Sem COMPUTER AIDED POWER SYSTEM ANALYSIS **T C**
4+1* 4

UNIT -I POWER SYSTEM NETWORK MATRICES

Representation of Power system elements, Essential characteristics of a good Algorithm, Steps involved in solving a problem using Digital computer - Graph Theory: Definitions, Bus Incidence Matrix, Y_{bus} formation by Direct and Singular Transformation Methods, Numerical Problems.

UNIT –III POWER FLOW STUDIES-I

Necessity of Power Flow Studies – Data for Power Flow Studies – Derivation of Static load flow equations – Load flow solutions using Gauss Seidel Method: Acceleration Factor, Load flow solution with and without 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) .

UNIT – III POWER FLOW STUDIES-II

Newton Raphson Method in Rectangular and Polar Co-Ordinates Form: Load Flow Solution with or without PV Busses- Derivation of Jacobian Elements, Algorithm and Flowchart. Decoupled and Fast Decoupled Methods.- Comparison of Different Methods .

UNIT – IV SHORT CIRCUIT ANALYSIS-I

Per-Unit System of Representation. Per-Unit equivalent reactance network of a three phase Power System, Numerical Problems. Symmetrical fault Analysis: Short Circuit Current and MVA Calculations, Fault levels, Application of Series Reactors, Numerical Problems.

UNIT –VI SHORT CIRCUIT ANALYSIS-II

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 with and without fault impedance, Numerical Problems.

UNIT –VI POWER SYSTEM 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. Derivation of Swing Equation. Determination of Transient Stability by Equal Area Criterion, Application of Equal Area Criterion, Critical Clearing Angle Calculation. Methods to improve Stability.

TEXT BOOKS:

1. Computer Methods in Power Systems, Stagg El – Abiad & Stags, Mc Graw-hill Edition.
2. Modern Power system Analysis – by I.J.Nagrath & D.P.Kothari: Tata McGraw-Hill Publishing Company, 2nd edition.
3. Power System Analysis by Nagsarkar and Sukhija, OXFORD University Press.

REFERENCE BOOKS:

1. Power System Analysis by Grainger and Stevenson, Tata McGraw Hill.
2. Computer Techniques in Power System Analysis by M A Pai, Second Edition, TMH.
3. Power System Analysis and Design by B.R.Gupta, S. Chand & Co, 6th Revised Edition, 2010.
4. Computer Modeling of Electrical Power Systems by J. Arrillaga and N. R. Watson, John Wiley Student Edition, 2/e.
5. Computer Techniques and Models in Power Systems by K. Uma Rao, I. K. International.
6. Electric Power Systems by S. A. Nasar, Schaum's Outline Series, Revised 1st Edition, TMH.
7. Power System Analysis by Glovar and Sarma, Thomson Publishers

B.Tech III Year II Sem **SWITCHGEAR AND PROTECTION** **T C**
4+1* 4

UNIT – I CIRCUIT BREAKERS

Circuit Breakers: Elementary principles of arc interruption, Recovery, Restriking Voltage and Recovery voltages.- Restriking Phenomenon, Average and Max. RRRV, Numerical Problems - Current Chopping and Resistance Switching - CB ratings and Specifications: Types and Numerical Problems. – Auto reclosures.Description and Operation of following types of circuit breakers: Minimum Oil Circuit breakers, Air Blast Circuit Breakers, Vacuum and SF6 circuit breakers.

UNIT – II ELECTROMAGNETIC RELAYS

Basic Requirements of Relays – Primary and Backup protection - Construction details of – Attracted armature, balanced beam, inductor type and differential relays – Universal Torque equation – Characteristics of over current, Direction and distance relays.

UNIT – III STATIC AND MICROPROCESSOR BASED RELAYS

Static Relays – Advantages and Disadvantages – Definite time, Inverse and IDMT static relays – Comparators – Amplitude and Phase comparators. Microprocessor based relays – Advantages and Disadvantages – Block diagram for over current (Definite, Inverse and IDMT) and Distance Relays and their Flow Charts.

UNIT – IV GENERATOR AND TRANSFORMER PROTECTION

Protection of generators against Stator faults, Rotor faults, and Abnormal Conditions. Restricted Earth fault and Inter-turn fault Protection. Numerical Problems on % Winding Unprotected.Protection of transformers: Percentage Differential Protection, Numerical Problem on Design of CT s Ratio, Buchholtz relay Protection.

UNIT –V PROTECTION OF FEEDERS AND TRANSMISSION LINES

Protection of Feeder (Radial & Ring main) using over current Relays. Itroduction to distance relays- Universal torque equation-Protection of Transmission line – 3 Zone protection using Distance Relays. Carrier current protection. Protection of Bus bars.

UNIT – VI PROTECTION AGAINST OVER VOLTAGES

Generation of Over Voltages in Power Systems.-Protection against Lightning Over Voltages - Valve type and Zinc-Oxide Lighting Arresters - Insulation Coordination –BIL.

TEXT BOOKS:

1. Switchgear and Protection – by Sunil S Rao, Khanna Publlishers
2. Power System Protection and Switchgear by Badari Ram , D.N Viswakarma, TMH Publications.
3. Fundamentals of Power System Protection by Y. G. Paithankar and S. R. Bhide, 2nd Edition, PHI.

REFERENCE BOOKS:

1. Transmission network Protection by Y.G. Paithankar ,Taylor and Francis,2009.
2. Power system protection and switch gear by Bhuvanesh Oza, TMH, 2010.
3. Electrical Power Systems – by C.L.Wadhwa, New Age international (P) Limited, Publishers, 3nd editon
4. Electrical power System Protection by C. Christopoulos and A. Wright, 2nd Edition, Springer International Edition

B.Tech III Year II Sem **RENEWABLE ENERGY SOURCES (CBCC)** **T** **C**
(for non EEE students) **4+1*** **4**

UNIT – I PRINCIPLES OF SOLAR RADIATION:
Role and potential of new and renewable source, the solar energy option, Environmental impact of solar power, physics of the sun, the solar constant, extraterrestrial and terrestrial solar radiation, solar radiation on titled surface, instruments for measuring solar radiation and sun shine, solar radiation data.

UNIT-II SOLAR ENERGY COLLECTION STORAGE AND APPLICATIONS
Flat plate and concentrating collectors, classification of concentrating collectors, orientation and thermal analysis, advanced collectors. Different methods, Sensible, latent heat and stratified storage, solar ponds. Solar Applications- solar heating/cooling technique, solar distillation and drying, photovoltaic energy conversion.

UNIT-III WIND ENERGY:
Sources and potentials, horizontal and vertical axis windmills, performance characteristics, Betz criteria

UNIT-IV BIO-MASS:
Principles of Bio-Conversion, Anaerobic/aerobic digestion, types of Bio-gas digesters, gas yield, combustion characteristics of bio-gas, utilization for cooking, I.C.Engine operation and economic aspects.

UNIT-V GEOTHERMAL ENERGY:
Resources, types of wells, methods of harnessing the energy, potential in India.

UNIT-VI OCEAN ENERGY AND **DIRECT ENERGY CONVERSION**
OTEC, Principles utilization, setting of OTEC plants, thermodynamic cycles. Tidal and wave energy: Potential and conversion techniques, mini-hydel power plants, and their economics.
Need for DEC, Carnot cycle, limitations, principles of DEC.

TEXT BOOKS:
1. Non-Conventional Energy Sources by G.D. Rai, Khanna Publishers
2. Renewable Energy Resources – Twidell & Wier, CRC Press(Taylor & Francis)

REFERENCE BOOKS:
1. Renewable energy resources by Tiwari and Ghosal, Narosa.
2. Renewable Energy Technologies by Ramesh & Kumar, Narosa.
3. Non-Conventional Energy Systems by K Mittal, Wheeler
4. Renewable energy sources and emerging technologies by D.P.Kothari,K.C.Singhal, PHI

B.Tech III Year II Sem **POWER ELECTRONICS (CBCC)** **T C**
(for non EEE students) **4+1* 4**

UNIT – I POWER SEMI CONDUCTOR DEVICES

Thyristors – Silicon Controlled Rectifiers (SCR's) – BJT – Power MOSFET – Power IGBT and their characteristics and other thyristors – Basic theory of operation of SCR – Static characteristics – Turn on methods- Dynamic characteristics of SCR - Turn on and Turn off times -Salient points.Two transistor analogy – SCR – R and RC Triggering - UJT firing circuit– Snubber circuit details .

UNIT – II SINGLE PHASE HALF CONTROLLED CONVERTERS

Phase control technique – Single phase Line commutated converters – Mid point and Bridge connections – Half controlled converters with Resistive, RL loads– Derivation of average load voltage and current - Numerical problems

UNIT – III SINGLE PHASE FULLY CONTROLLED CONVERTERS

Fully controlled converters, Mid point and Bridge connections with R-Load, RL load with and without freewheeling diode - Derivation of average load voltage and current - Effect of source inductance – Derivation of load voltage and current – single phase dual converters– Numerical problems.

UNIT – IV AC VOLTAGE CONTROLLERS & CYCLO CONVERTERS

AC voltage controllers – Single phase two SCR's in anti parallel – With R and RL loads – modes of operation of Triac -Numerical problems -Cyclo converters – Single phase mid point cyclo converters with Resistive and inductive load (Principle of operation only).

UNIT– V CHOPPERS

Choppers – Time ratio control and Current limit control strategies – Step down choppers Derivation of load voltage and currents with R, RL loads- Problems.

UNIT – VI INVERTERS

Inverters – Single phase inverter – Basic series inverter – Basic parallel Capacitor inverter bridge inverter – Waveforms –Voltage control techniques for inverters Pulse width modulation techniques – Numerical problems.

TEXT BOOKS :

1. Power Electronics – by M. D. Singh & K. B. Kanchandhani, Tata Mc Graw – Hill Publishing company, 1998.
2. Power Electronics : Circuits, Devices and Applications – by M. H. Rashid, Prentice Hall of India, 2nd edition, 1998.
3. Power Electronics - by V.R.Murthy , OXFORD University Press, 1st edition -2005.
4. Power Electronics-by P.C.Sen,Tata Mc Graw-Hill Publishing.

REFERENCE BOOKS :

1. Power Electronics – by Vedam Subramanyam, New Age International (P) Limited, 3rd Edition.
2. Thyristorised Power Controllers – by G. K. Dubey, S. R. Doradla, A. Joshi and R. M. K. Sinha, New Age International (P) Limited Publishers, 1996.
3. Principles of Power Electronics by John G. Kassakian, Martin F. Schlecht and George C. Verghese, Pearson.
4. Power Electronics - Essentials & Applications by L. Umanand, Wiley India Pvt. Ltd

B.Tech III Year II Sem **SIGNALS AND SYSTEMS (CBCC)** **T C**
(for non EEE students) **4+1* 4**

UNIT -I SIGNAL ANALYSIS:
Analogy between vectors and signals, functions, mean square error, closed or complete set of orthogonal functions, orthogonality in complex functions, exponential and sinusoidal signals, concepts of impulse function, unit step function.

UNIT- II FOURIER SERIES REPRESENTATION OF PERIODIC SIGNALS:
Representation of Fourier series, continuous time periodic signals, properties of fourier series, Dirichlet's conditions, trigonometric fourier series and exponential fourier series, complex fourier spectrum. Deriving fourier transform from fourier series, fourier transform of arbitrary signals, fourier transform of standard signals, fourier transform of periodic signals, properties of fourier transforms, fourier transforms involving impulse functions and signum function, Introduction to Hilbert Transform.

UNIT- III SIGNAL TRANSMISSION THROUGH LINEAR SYSTEMS:
Linear system, impulse response, response of linear system, Linear time invariant (LTI) system, Linear time variant (LTV) system, transfer function of a LTI system, Filter characteristics of linear system, Distortion less transmission through a system, signal bandwidth, system bandwidth, ideal LPF, HPF and BPF characteristics, causality and poly –Wiener criterion for physical realization, relationship between bandwidth and rise time.

UNIT -IV SAMPLING:
Sampling theorem – Graphical and analytical proof for Band Limited signals, impulse sampling, natural and Flat top sampling, Reconstruction of signal from its samples, effect of under sampling – Aliasing, Introduction to Band pass sampling.

UNIT-V CONVOLUTION AND CORRELATION OF SINGALS:
Concept of convolution in time domain and Frequency domain, Graphical representation of convolution, convolution property of fourier transforms, cross corre lation and auto correlation of functions, properties of correlation function, energy density spectrum, parseval's theorem, power density system spectrum, relation between correlation function and energy power spectral density function, relation between and convolation and correlation, detection of periodic signals in the presence of noise by correlation, extraction of signal from noise by filtering.

UNIT- VI LAPLACE TRANFORMS:
Review of Laplace transforms (LT), partial fraction expansion, inverse Laplace transforms concept of reason of convergence (ROC) for Laplace transforms. Constraints on ROC for various classes' signals, Properties of LT's relation between LT's, and FT of a signal, Laplace transform of certain signals using wave form synthesis.

TEXT BOOKS:

1. Signals, Systems & Communications – B.P.Lathi, 2009, BS Publications.
2. Signals and systems – A.V. Oppenheim, A.S.Willsky and S.H. Nawab, PHI, 2nd Edn.
3. Signals and systems – Simon Haykin and Van veen, Wiley, 2nd Edition.

REFRENCES:

1. Signals and systems – A. Ramakrishna rao – 2008, TMH.
2. Linear Systems and Signals – B.P.Lathi, Second Edition, Oxford University press, 2008.
3. Fundamentals of Signals and Systems Michel J. Robert, MGH International Edition, 2008.
   Signals, Systems and Transforms – C.L. Philips, J.M.Parr and Eve A. Riskin, Pearson education. 3rd Edn

B.Tech IV Year I Semester Course Structure

S.No.	Abbreviation	Subject	Periods / Week			Credits
			L	T	P	
1.		Principles of DSP	4	1	-	4
2.		Power System operation and Control	4	1	-	4
3.		Distribution of Electrical Power	4	1	-	4
4.		Utilization of Electrical Energy	4	1	-	4
5.		**Choice Based Credit Courses;: (for EEE students)** 1.Renewable Energy Sources 2.Power System Stability 3. Electrical Energy Conservation	4	1	-	4
6.		**Choice Based Credit Courses;: (for EEE students)** 1. Instrumentation 2. High Voltage Engineering 3. Soft Computing Techniques	4	1	-	4
7.		Micro Processors and micro controllers Lab	-	-	3	2
8.		Power System Simulation Lab	-	-	3	2
		Mini Project	-	-	-	2
		TOTAL	24	6	6	30

L – Lecture, T – Tutorial, P – Practical

PRINCIPLES OF DSP

T	C
4+1*	4

UNIT-I INTRODUCTION

Introduction to digital signal processing: discrete time signals and sequences, linear shift invariant systems, stability and causality, linear constant coefficient difference equations. Frequency domain representation of discrete time signals and systems.

UNIT-II DISCRETE FOURIER SERIES

Properties of discrete Fourier series, DFS representation of periodic sequences, discrete Fourier transforms: properties of DFT, linear convolution of sequences using DFT, computation of DFT. Relation between Z-Transform and DFS.

UNIT-III FAST FOURIER TRANSFORMS

Fast Fourier transforms (FFT)-Radix2 decimation in time and decimation in frequency FFT algorithms, inverse FFT and FFT for composite N.

UNIT-IV REALIZATION OF DIGITAL FILTERS

Review of Z-transforms, applications of Z-Transforms, solution of difference equations of digital filters, block diagram representation of linear constant-coefficient difference equations, basic structures of IIR systems, transposed forms, basic structures of FIR systems, system function.

UNIT-V IIR DIGITAL FILTERS

Analog filter approximations-Butterworth and chebyshev, design of IIR digital filters from analog filters, design examples: analog-digital transformations, Illustrative Problems.

UNIT-VI FIR DIGITAL FILTERS

Characteristics of FIR digital filters, frequency response. Design of FIR digital filters using window techniques, frequency

TEXT BOOKS:

1. Digital signal processing, principles, Algorithms and applications: John G. Proakis, Dimitris G. Manolakis, Pearson Education/PHI, 2007.
2. Digital signal processing , A computer base approach- Sanjit K Mitra, Tata McGraw Hill, 3rd edition, 2009.
3. Discrete Time Signal Processing-A.V. Oppenheim and R.W. Schaffer, PHI.

REFERENCES:

1. Digital signal processing: Andreas Antoniou, TATA McGraw Hill, 2006.
2. A Text book on Digital Signal processing – R S Kaler, M Kulkarni, Umesh Gupta, I K International Publisthing House Pvt. Ltd.
3. Digital signal processing: M H Hayes, Schaum's outlines, TATA Mc-Graw Hill, 2007

B.Tech IV Year I Sem **POWER SYSTEM OPERATION AND CONTROL** **T C**
4+1* 4

UNIT – I ECONOMIC OPERATION OF POWER SYSTEMS

Optimal operation of Generators in Thermal Power Stations, 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 OF TURBINE, GOVERNOR

Modelling of Turbine: First order Turbine model, Block Diagram representation of Steam Turbines and Approximate Linear Models. Modelling of Governor: Mathematical Modelling of Speed Governing System .

UNIT – IV LOAD FREQUENCY CONTROL - I

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

UNIT-V LOAD FREQUENCY CONTROL - II

Proportional plus Integral control of single area and its block diagram representation, steady state response – Load Frequency Control and Economic dispatch control.

UNIT – VI 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. Power System Analysis Operation and Control – A. Chakravarthi and S. Halder, 3rd Edition, PHI.
2. Modern Power System Analysis – by I.J.Nagrath & D.P.Kothari Tata M Graw – Hill Publishing Company Ltd, 2nd edition.
3. Electric Energy Systems by O I Elgerd, Mc Graw-hill Edition.
4. Electric Power Generation, Transmission and Distribution by S. N. Singh, 2nd Edition, PHI.
5. An Introduction to: Reactive Power Control and Voltage Stability in Power Transmission Systems by Abhijit Chakrabarti, D. P. Kothari, A. K. Mukhopadhyay and Abhinandan De, Eastern Economy Edition, 2010.

REFERENCE BOOKS:

1. Power System Analysis and Design by J.Duncan Glover and M.S.Sarma., THOMPSON, 3rd Edition.
2. Electric Power Systems by S. A. Nasar, Schaum's Outline Series, Revised 1st Edition, TMH

UNIT – I GENERAL CONCEPTS

Introduction to distribution systems, Load modelling and characteristics. Coincidence factor, contribution factor loss factor - Relationship between the load factor and loss factor. Classification of loads (Residential, commercial, Agricultural and Industrial) and their characteristics.

UNIT – II GENERAL ASPECTS OF D.C. AND A.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. Design Considerations of Distribution Feeders: Radial and loop types of primary feeders, voltage levels, feeder loading; basic design practice of the secondary distribution system. Voltage Drop Calculations (Numerical Problems) in A.C. Distributors for the following cases: Power Factors referred to receiving end voltage and with respect to respective load voltages.

UNIT – III SUBSTATIONS

Location of Substations: Rating of distribution substation, service area within primary feeders. Benefits derived through optimal location of substations. Classification of substations: **Air insulated 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 bus bar, sectionalized single bus bar, main and transfer bus bar Double breaker – One and half breaker system with relevant diagrams.

UNIT – IV POWER FACTOR AND VOLTAGE CONTROL

Causes of low p.f -Methods of Improving p.f -Phase advancing and generation of reactive KVAR using static Capacitors-Most economical p.f. 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 SYSTEM ANALYSIS AND POWER FACTOR IMPROVEMENT

Voltage drop and power-loss calculations: Derivation for voltage drop and power loss in lines, manual methods of solution for radial networks, three phase balanced primary lines.

Capacitive compensation for power-factor control - effect of shunt capacitors (Fixed and switched), Power factor correction- Economic justification - Procedure to determine the best capacitor location.

UNIT – VI PROTECTION AND COORDINATION OF DISTRIBUTION SYSTEMS

Objectives of distribution system protection, types of common faults and procedure for fault calculations. Protective Devices: Principle of operation of Fuses, Circuit Reclosures, line sectionalizes, and circuit breakers Coordination of Protective Devices: General coordination procedure.

TEXT BOOK:

1. "Electric Power Distribution system, Engineering" – by Turan Gonen, Mc Graw-hill Book Company.
2. Electric Power Distribution – by A.S. Pabla, Tata Mc Graw-hill Publishing Company, 4th edition, 1997.

REFERENCE BOOK:

1. Electric Power Distribution Automation by Dr. M. K. Khedkar and Dr. G. M. Dhole, University Science Press.
2. Electrical Power Distribution Systems by V. Kamaraju, Right Publishers.
3. Electrical Power Systems for Industrial Plants by Kamalesh Das, JAICO Publishing House

B.Tech IV Year I Sem **UTILIZATION OF ELECTRICAL ENERGY** **T** **C**
4+1* **4**

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 AND WELDING
Advantages. Methods of Electric heating – Resistance, arc, Induction and dielectric heating.
Types – Resistance, Electric arc, gas welding. Ultrasonic, Welding electrodes of various metals, Defects in welding.

UNIT – III ELECTROLYTIC PROCESS
Electrolysis - Faradays laws, Application of Electrolysis, Power supply for Electrolysis.

UNIT – IV ELECTRIC DRIVES
Advantages, Types of D. C and A. C Motors and their Characteristics – Electric Breaking. Speed Control of D. C and A. C Motors – Temperature Rise and Load Equalization – Selection of Motors for particular Drive.

UNIT – V ELECTRIC TRACTION -I
Introduction – Systems of Electric Traction. Comparison between A. C and D. C Traction - Mechanics of train movement. Speed-time curves of different services – trapezoidal and quadrilateral, speed-time curves – Numerical Problems.

UNIT – VI ELECTRIC TRACTION-II
Calculations of tractive effort, Power, specific energy consumption - effect of varying acceleration and braking retardation, Adhesive weight and coefficient of adhesion – Problems.

TEXT BOOK:
1. Utilization of Electric Energy – by E. Openshaw Taylor and V. V. L. Rao, Universities Press.
2. Utilization of Electrical Power – by R. K. Rajput, Laxmi Publications.

REFERENCE BOOKS:
1. Utilization of Electrical Power including Electric drives and Electric traction – by N.V.Suryanarayana, New Age International (P) Limited, Publishers, 1996.
2. Art & Science of Utilization of electrical Energy – by Partab, Dhanpat Rai & Co

B.Tech IV Year I Sem **RENEWABLE ENERGY SOURCES (CBCC)** **T** **C**
(for EEE students) **4+1*** **4**

UNIT – I PRINCIPLES OF SOLAR RADIATION:
Role and potential of new and renewable source, the solar energy option, Environmental impact of solar power, physics of the sun, the solar constant, extraterrestrial and terrestrial solar radiation, solar radiation on titled surface, instruments for measuring solar radiation and sun shine, solar radiation data.

UNIT-II SOLAR ENERGY COLLECTION STORAGE AND APPLICATIONS
Flat plate and concentrating collectors, classification of concentrating collectors, orientation and thermal analysis, advanced collectors. Different methods, Sensible, latent heat and stratified storage, solar ponds. Solar Applications- solar heating/cooling technique, solar distillation and drying, photovoltaic energy conversion.

UNIT-III WIND ENERGY:
Sources and potentials, horizontal and vertical axis windmills, performance characteristics, Betz criteria

UNIT-IV BIO-MASS:
Principles of Bio-Conversion, Anaerobic/aerobic digestion, types of Bio-gas digesters, gas yield, combustion characteristics of bio-gas, utilization for cooking, I.C.Engine operation and economic aspects.

UNIT-V GEOTHERMAL ENERGY:
Resources, types of wells, methods of harnessing the energy, potential in India.

UNIT-VI OCEAN ENERGY AND **DIRECT ENERGY CONVERSION**
OTEC, Principles utilization, setting of OTEC plants, thermodynamic cycles. Tidal and wave energy: Potential and conversion techniques, mini-hydel power plants, and their economics.
Need for DEC, Carnot cycle, limitations, principles of DEC.

TEXT BOOKS:
1. Non-Conventional Energy Sources by G.D. Rai, Khanna Publishers
2. Renewable Energy Resources – Twidell & Wier, CRC Press(Taylor & Francis)

REFERENCE BOOKS:
1. Renewable energy resources by Tiwari and Ghosal, Narosa.
2. Renewable Energy Technologies by Ramesh & Kumar, Narosa.
3. Non-Conventional Energy Systems by K Mittal, Wheeler
4. Renewable energy sources and emerging technologies by D.P.Kothari,K.C.Singhal, PHI

B.Tech IV Year I Sem **POWER SYSTEM STABILITY & CONTROL (CBCC)** **(for EEE students)** **T** **4+1*** **C** **4**

UNIT- I: THE ELEMENTARY MATHEMATICAL MODEL AND SYSTEM RESPONSE TO SMALL DISTURBANCES

A Classical model of one machine connected to an infinite bus – Classical model of multimachine system – Problems – Effect of the excitation system on Transient stability. The unregulated synchronous Machine – Effect of small changes of speed – Modes of oscillation of an unregulated multimachine system – Regulated synchronous machine – Voltage regulator with one time lag – Governor with one time lag – Problems.

UNIT- II: DYNAMIC STABILITY & TRANSIENT ANALYSIS

Concept of Dynamic stability – State space model of one machine system connected to infinite bus – Effect of excitation on Dynamic stability – Examination of dynamic stability by Routh's criterion –

UNIT- III: TRANSIENT ANALYSIS

Transient Analysis of Three-Phase Power Systems Symmetrical Components in ThreePhase Systems - Sequence Components for Unbalanced Network Impedances - The Sequence Networks - The Analysis of Unsymmetrical Three-Phase Faults - The Single Line-to-Ground Fault - The Three-Phase-to-Ground Fault.

UNIT- IV: POWER SYSTEM STABILIZERS

Introduction to supplementary stabilizing signals - Block diagram of the linear system - Approximate model of the complete exciter – Generator system – Lead compensation – Stability aspect using Eigen value approach.

UNIT- V: EXCITATION SYSTEMS

Excitation system response – Non-continuously regulated systems – Continuously regulated systems – Excitation system compensation – State space description of the excitation system - Simplified linear model – Effect of excitation on generator power limits. Type –2 system: Rotating rectifier system, Type-3 system: Static with terminal potential and current supplies - Type –4 system: Non – continuous acting - Block diagram representation – State space modeling equations of these types.

UNIT - VI: STABILITY ANALYSIS

Review of Lyapunov's stability theorems of non-liner systems using energy concept – Method based on first concept – Method based on first integrals – Quadratic forms – Variable gradient method – Zubov's method – Popov's method, Lyapunov function for single machine connected to infinite bus. What is voltage stability – Factors affecting voltage instability and collapse – Comparison of Angle and voltage stability – Analysis of voltage instability and collapse – Integrated analysis of voltage and Angle stability – Control of voltage instability.

TEXT BOOKS:

1. P.M.Anderson, A.A.Fouad, "Power System Control and Stability", IOWA State University Press, Galgotia Publications, Vol-I, 1st Edition.

2. Transients in Power System, Lou Van Der Sluis, John Wiley & Sons.

REFERENCE BOOKS:

1. M.A.Pai, Power System Stability-Analysis by the direct method of Lyapunov, North Holland Publishing Company, New York, 1981. EPS R-13 2 JNTUA COLLEGE OF ENGINEERING (Autonomous) PU

B.Tech IV Year I Sem **ELECTRICAL ENERGY CONSERVATION (CBCC)** **T** **C**
(for EEE students) **4+1*** **4**

Unit I Energy Auditing
Introduction, Economics Analysis of investments, Present value criterion, Average rate of return criterion, Return on investment, Payback period criterion.

Unit II Electrical Load Management
Introduction, Transformer, Reduction of transformer losses, Power factor improvement, Methods of improving power factor, Location of capacitor installation, Demand Management, Energy efficiency issues.

Unit III Electric motors
Introduction, Selection and application, Factors affecting performance, operational improvements, Retrofit improvements, Field testing, Energy Efficiency motors, Existing motor details, Power factor correction, variable speed drives ,Energy saving controllers.

Unit IV Lighting
Introduction, Illumination, Glare, Colour and colour rendering, Incandescent, Fluorescent, high intensity discharge, Low pressure sodium, Energy efficiency, Replacing lamps and fixtures, Improving lighting control, maintenance.

Unit V Energy management Information System
Introduction, Fieldtransducers, PLC, Communicationnet work energy bench marking.

UNIT VI Energy Instruments
Energy Instruments - Wattmeter, Data loggers, Thermocouples, Pyrometers, Lux meters, Tongue testers, Application of PLC's.

Text Books:

1. Handbook on Energy Audits & Management – A.X.Tyagi – Teri, New Delhi
2. W.R. Murphy & G. Mckay Butter worth, Energy management, Heinemann publications.
3. John, C. Andreas, Energy efficient electric motors, Marcel Dekker Inc. Ltd, 2nd edition, 1995

B.Tech IV Year I Sem **INSTRUMENTATION (CBCC)** **T C**
(for ECE students) **4+1*** **4**

UNIT-I CHARACTERISTICS OF SIGNALS

Measuring Systems, Performance Characteristics, - Static characteristics, Dynamic Characteristics; Errors in Measurement – Gross Errors, Systematic Errors, Statistical Analysis of Random Errors.

UNIT-II SIGNALS AND THEIR REPRESENTATION

Signal and their representation: Standard Test, periodic, aperiodic, modulated signal, sampled data, pulse modulation and pulse code modulation

UNIT-III DATA TRANSMISSION AND TELEMETRY DATA ACQUISITION SYSTEM (DAS)

Methods of Data Transmission – General Telemetry System – Land line Telemetry System – Voltage, Current and position. Land line with feedback system.

Analog and Digital Acquisition systems – Components of Analog DAS – Types of Multiplexing Systems: Time division and Frequency division multiplexing – Digital DAS – Block Diagram

UNIT-IV SIGNAL ANALYZERS

Wave Analysers- Frequency selective analyzers, Heterodyne, Application of Wave analyzers- Harmonic Analyzers, Total Harmonic distortion, spectrum analyzers, Basic spectrum analyzers, spectral displays, vector impedance meter, Q meter. Peak reading and RMS voltmeters

UNIT-V TRANSDUCERS

Definition of transducers, Classification of transducers, Advantages of Electrical transducers, Characteristics and choice of transducers; Principle operation of resistor, inductor, LVDT and capacitor transducers; LVDT Applications, Strain gauge and its principle of operation, guage factor.

UNIT-VI MEASUREMENT OF NON-ELECTRICAL QUANTITIES

Measurement of strain, Gauge Sensitivity, Displacement, Velocity, Angular Velocity, Acceleration, Force, Torque.

Measurement of Temperature, Pressure, Vacuum, Flow, Liquid level.

TEXT BOOKS:

1. Transducers and Instrumentation by D.V.S Murthy, Prentice Hall of India
2. A course in Electrical and Electronic Measurements and Instrumentation, A.K. Sawhney, Dhanpat Rai & Co.

REFERENCE BOOKS:

1. Measurements Systems, Applications and Design – by D O Doeblin, Mc Graw Hill Edition.
2. Principles of Measurement and Instrumentation – by A.S Morris, Pearson /Prentice Hall of India
3. Electronic Instrumentation-by H.S.Kalsi Tata MCGraw-Hill Edition, 3/e.
4. Modern Electronic Instrumentation and Measurement techniques – by A.D Helfrick and W.D.Cooper, Pearson/Prentice Hall of India.
5. Industrial Instrumentation – Principles and Design by T. R. Padmanabhan, Springer

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B.Tech IV Year I Sem HIGH VOLTAGE ENGINEERING(CBCC) T C
(for ECE students) 4+1* 4

UNIT-I INTRODUCTION AND BREAK DOWN IN GASEOUS LIQUID DIELECTRICS AND SOLID DIELECTRICS

Introduction to HV technology, need for generating high voltages in laboratory. Industrial applications of high voltage, Electrostatic precipitation, separation.

Gases as insulating media, collision process, Ionization process, Townsend's criteria of breakdown in gases, Paschen's law, Liquid as Insulator, pure and commercial liquids, breakdown in pure and commercial liquids.

Intrinsic breakdown, electromechanical breakdown, thermal breakdown, breakdown of solid dielectrics in practice, Breakdown in composite dielectrics, solid dielectrics used in practice.

UNIT – II GENERATION OF HV AC AND DC VOLTAGE

HV AC-HV transformer: Need for cascade connection and working of transformers units connected in cascade. Series resonant circuit- principle of operation and advantages - Tesla coil - HV DC- voltage doubler circuit, Cockroft- Walton type high voltage DC set - Calculation of high voltage regulation, ripple and optimum number of stages for minimum voltage drop.

UNIT - III GENERATION OF IMPULSE VOLTAGE AND CURRENT:

Introduction to standard lightning and switching impulse voltages - Analysis of single stage impulse generator-expression for Output impulse voltage - Multistage impulse generator working of Marx impulse generator, Rating of impulse generator - Components of multistage impulse generator - Triggering of impulse generator by three electrode gap arrangement - Trigatron gap and oscillograph time sweep circuits, Generation of switching impulse voltage - Generation of high impulse current.

UNIT –IV MEASUREMENT OF HIGH VOLTAGES:

Electrostatic voltmeter-principle, construction and limitation - Chubb and Fortescue method for HV AC measurement - Generating voltmeter- Principle, construction - Series resistance micro ammeter for HV DC measurements - Standard sphere gap measurements of HVAC, HVDC and impulse voltages - Factors affecting the measurements - Potential dividers-resistance dividers capacitance dividers mixed RC potential dividers. Measurement of high impulse currents-Rogowsky coil.

UNIT – V NON-DESTRUCTIVE INSULATION TESTING TECHNIQUES

Dielectric loss and loss angle measurements using Schering Bridge - Transformer ratio Arms Bridge. Need for discharge detection and PD measurements aspects - Factors affecting the discharge detection, Discharge detection methods-straight and balanced methods.

UNIT – VI HIGH VOLTAGE TESTS ON ELECTRICAL APPARATUS

Definitions and terminology, tests on isolators, circuit breakers, cables, insulators and transformers.

TEXT BOOKS:

1. High Voltage Engineering by M.S.Naidu and V. Kamaraju – TMH Publications, 4th Edition
2. High Voltage Engineering by C.L.Wadhwa, New Age Internationals (P) Limited, 1997.
3. High Voltage Engineering Problems & Solutions, R. D. Begamudre, New Age International Publishers, First Edt., 2010.

REFERENCE BOOKS:

1. High Voltage Engineering: Fundamentals by E.Kuffel, W.S.Zaengl, J.Kuffel by Elsevier, 2nd Edition.
2. High Voltage Insulation Engineering by Ravindra Arora, Wolfgang Mosch, New Age International (P) Limited, 1995.
3. High Voltage Technology by L. L. Alston, OXFORD University Press, Second Edition, 2009

B.Tech IV Year I Sem **SOFT COMPUTING TECHNIQUES(CBCC)** **T C**
(for ECE students) **4+1* 4**

UNIT – I ARTIFICIAL NEURAL NETWORKS AND ESSENTIALS OF ARTIFICIAL NEURAL NETWORKS

Introduction, Biological Neuron, Artificial Neuron, Basic concepts of Neural Networks, Basic Models of ANN Connections, McCulloch-Pitts Model, Characteristics of ANN, Applications of ANN.

Artificial Neuron Model, Operations of Artificial Neuron, Types of Neuron Activation Function, ANN Architectures, Classification Taxonomy of ANN – Connectivity, Neural Dynamics (Activation and Synaptic), Learning Strategy (Supervised, Unsupervised, Reinforcement), Learning Rules, Types of Application.

UNIT–II SUPERVISED LEARNING NETWORKS AND ASSOCIATIVE MEMORY NETWORK

Perceptron Network, Perceptron Learning Rule, Architecture, Perceptron Training Algorithm, ADALINE, MADALINE, Back Propagation Network, BP Learning Rule, Input Layer Computation, Hidden Layer Computation, Output Layer Computation, Radial Basis Function.Training Algorithms for Pattern Association, Auto Associative Memory Network, Hetero Associative Memory Network, BAM, Hopfield Networks.

UNIT – III CLASSICAL & FUZZY SETS

Introduction to classical sets - properties, Operations and relations; Fuzzy sets, Membership, Uncertainty, Operations, properties, fuzzy relations, cardinalities, membership functions.

UNIT IV FUZZY LOGIC SYSTEM COMPONENTS

Fuzzification, Membership value assignment, development of rule base and decision making system, Defuzzification to crisp sets, Defuzzification methods.

UNIT V GENETIC ALGORITHMS

Introduction, Basic Operators and Terminologies in GA, Traditional Vs Genetic Algorithm, Encoding, Fitness Function, Reproduction, Crossover, Mutation Operator.

UNIT VI APPLICATIONS TO ELECTRICAL SYSTEMS

ANN based Short term Load Forecasting, Load flow Studies, Fuzzy logic based Unit Commitment and Genetic Algorithm based Economic Dispatch.

TEXT BOOKS

1. Principles of – Soft Computing by S. N. Sivanandam and S. N. Deepa, Wiley India Edition.
2. Neural Networks, Fuzzy logic, Genetic algorithms: synthesis and applications by Rajasekharan and Pai – PHI Publications.
3. Nureal networks by Satish Kumar , TMH, 2004.
4. Neuro Fuzzy and Soft Computing by J. S. R. Jang, C. T. Sun and E. Mizutani, Pearson Education.

REFERENCE BOOKS:

1. Neural Networks – James A Freeman and Davis Skapura, Pearson Education, 2002.
2. Neural Networks – Simon Hakins , Pearson Education
3. Fuzzy Logic with Engineering Applications by T. J. Ross, 2nd Edition , Wiley India Edition.
4. Neural Networks and Fuzzy Logic System by Bart Kosko, PHI Publications.
5. Genetic Algorithms by D. E. Goldberg, Addison – Wisley, 1999

B.Tech IV Year II Semester Course Structure

S.No.	Abbreviation	Subject	Periods / Week			Credits
			L	T	P	
1.		Fundamentals of HVDC and FACTS devices	4	1		4
2.		Reliability Engineering	4	1		4
3.	MOOCs-I	**Massive Open Online Courses-I** 1. Neural Networks and Fuzzy logic 2. Energy auditing and Demand side Management 3. Principles of Power Quality	4		-	4
4.	MOOCs-II	**Massive Open Online Courses-II** 1. Smart Grid Technologies 2. Management of Deregulated Power Sytems 3. Special Electrical Machines	4		-	4
5.		Project Work	-	-	-	8
6.		Seminar	-	-	-	2
7.		Comprehensive Viva-Voce	-	-	-	4
		TOTAL	8	2	-	30

L – Lecture, T – Tutorial, P – Practical

B.Tech IV Year II Sem FUNDAMENTALS OF HVDC & FACTS DEVICES T C
4+1* 4

UNIT-I INTRODUCTION
comparison of AC and DC Transmission systems, Application of D.C. Transmission, Types or DC links, Typical layout of a HVDC converter station. HVDC converters, pulse number, Analysis of & phase Bridge circuit with and without overlap, converter Bridge characteristics, equivalent circuits or Rectifier and inverter configurations Twelve pulse converters.

UNIT -II CONVERTER AND HVDC SYSTEM CONTROL
Principles of DC links control, converter control characteristics, system control Hierarchy, Firing angle control, current and extinction Angle control starting and stopping of DC link.

UNIT -III HARMONICS, FILTERS AND REACTIVE POWER CONTROL
Introduction, generation of Harmonics, AC and DC Filters, Reactive power requirements at steady state. Source of reactive power, static VAR system.

UNIT -IV POWER FLOW ANALYSIS IN AC/DC SYSTEMS
Introduction, Modeling of DC/AC converters, controller equations, solutions of AD/DC load flow-simultaneous approach and sequential approach.

UNIT – V FACTS CONCEPTS
Flow of power in AC parallel paths and Meshed systems, Basic types of FACTS controllers.

UNIT - VI STATIC SHUNT AND SERIES COMPENSATORS
Objectives of shunt compensation, Methods of controllable VAR generation, Static VAR compensators. Objectives of series compensation, variable impedance type-thyristor switched series capacitors (TCSC), switching converter type series compensators power angle characteristics – Basic operating control Schemes. Introduction, unified power flow controller (UPFC), Basic operating principle, Independent real and reactive power flow controller, control structure.

TEXT BOOKS:

1. HVDC power Transmission systems by K.R. Padiyar, Wiley Eastern Limited
2. Understanding of FACTS by N.G. Hingorani & L. Gyugyi, IEEE Press.
3. Flexible AC Transmission Systems (FACTS) Young Huasong & Alian T. hons, The Institution of Electrical Engineers, IEE Power and Energy Series 30.
4. An Introduction to: Reactive Power Control and Voltage Stability in Power Transmission Systems by Abhijit Chakrabarti, D. P. Kothari, A. K. Mukhopadhyay and Abhinandan De, Eastern Economy Edition, 2010.

REFERENCE BOOKS:

1. **EHV - AC, HYDC Transmission & Distribution Engineering,** S.Rao,Khanna publishers, 3rd edition 2003.
2. **Power Electronic Control in Electrical Systems-** E Acha. VG Agelidis & O Anaya-Lara. THE Miller – Elsevier, 2009

UNIT I : Generating System Reliability Analysis – I
Generation system model – Capacity outage probability tables – Recursive relation for capacitive model building – Sequential addition method – Unit removal – Evaluation of loss of load and energy indices – Examples.

UNIT II : Generating System Reliability Analysis – II
Frequency and Duration methods – Evaluation of equivalent transitional rates of identical and non-identical units – Evaluation of cumulative probability and cumulative frequency of non-identical generating units – 2-level daily load representation - Merging generation and load models – Examples.

UNIT III : Operating Reserve Evaluation
Basic concepts - Risk indices – PJM methods – Security function approach – Rapid start and hot reserve units – Modelling using STPM approach.

Bulk Power System Reliability Evaluation
Basic configuration – Conditional probability approach – System and load point reliability indices – Weather effects on transmission lines – Weighted average rate and Markov model – Common mode failures.

UNITI V : Inter Connected System Reliability Analysis
Probability array method – Two inter connected systems with independent loads – Effects of limited and unlimited tie capacity - Imperfect tie – Two connected Systems with correlated loads – Expression for cumulative probability and cumulative frequency.

UNIT V : Distribution System Reliability Analysis
Basic Techniques – Radial networks – Evaluation of Basic reliability indices, performance indices - Load point and system reliability indices – Customer oriented, loss and energy oriented indices – Examples.Basic techniques – Inclusion of bus bar failures, scheduled maintenance – Temporary and transient failures – Weather effects – Common mode failures – Evaluation of various indices – Examples.

UNIT VI : Substations and Switching Stations
Effects of short-circuits - Breaker operation – Open and Short-circuit failures – Active and Passive failures – Switching after faults – Circuit breaker model – Preventive maintenance – exponential maintenance times.

Text Books:
1. Roy Billinton and Ronald N. Allan, Reliability Evaluation of Power Systems, Plenum Press, New York and London, 2nd Edition, 1996.
2. J. Endrenyi , Reliability Modeling in Electric Power Systems, John Wiley & Sons, 1st Edition, 1978